



NORDIC INNOVATION

HEALTH USE CASE

Visualising the effect of a realized Vision 2030 on Nordic businesses

By Green Innovation Group

In collaboration with Nordic Center for Sustainable Healthcare (NCSH), Upgraded, Akademias, and Oslo Municipality

 **Nordic
Innovation**

Health Use Case — Visualising the effect of a realized Vision 2030 on Nordic businesses

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This report was published in July 2022
by [Green Innovation Group A/S](#)

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www.nordicinnovation.org

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Foreword

With the **Health, Demography and Quality of Life** program, we connect people, data and innovation for a better life – and help make the Nordics the most sustainable and integrated health region in the world, providing the best possible personalized health care for all its citizens.

With this program we hope to:

1. Help the Nordic region become a global test region and role model for sharing health data.
2. Establish collaboration platforms and connections between local ecosystems in the Nordics and potentially interesting global markets to increase Nordic export and competitiveness.
3. Contribute to develop better and more efficient health systems and increase health and welfare in the Nordic region.

We believe that the use and exploitation of health data will play a crucial role in our journey towards a more sustainable healthcare that will benefit Nordic citizens and businesses.

On assignment from Nordic Innovation, a Nordic Consortium led by Green Innovation Group (DK) with Nordic Centre for Sustainable Healthcare (SE), Upgraded (FI), Oslo Municipality (NO), and Akademias (IS) have conducted this Use-Case that simulates the effect of Vision 2030 on Nordic Business.

The Use-Case is based on several Nordic Innovation projects executed under the Health, Demography and Quality of Life Program, such as the Bridging Nordic Data: Legal Overview (Deloitte, 2020), Scenario Process and the Nordic Interoperability Project.

The goals of the use-case are to:

- Visualize the effects of a realization of the Vision 2030
- Path a way to bridge and utilize national and personal health data
- Boost innovation in Nordic public and private sectors

This Use-Case also lays foundation for a Business Case that assesses the fiscal effects on the economies of the Nordic Countries if Vision 2030 of the Health, Demography, and Quality of Life program is realized. The Business Case will be published in the fall of 2022.

We hope that this report will facilitate the realization of Vision 2030 and inspire Nordic Business and decision makers to join us on this journey. As demonstrated in the report there is a lot to be gained and the positive effects of a realized Vision 2030 will affect countless aspects of Nordic Business and contribute to improving the Quality of Life in the Nordic region.

Oslo, August, 2022

— Svein Berg, **Managing Director, Nordic Innovation**

Executive Summary

By 2030, the Nordics will be the most sustainable and integrated health region in the world, providing the best possible personalized health care for all its citizens.¹

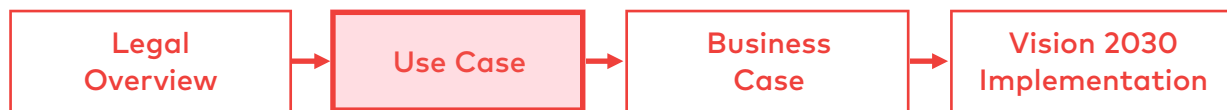
The Nordic Vision 2030 is ambitious, implying significant developments for hospitals, universities, and other public actors, as well as companies of all sizes in the private sector. It entails development and innovation of products, operations, and legal frameworks alike, in the direction of environmental, social, and financial sustainability.

For Vision 2030 to be realised, several topics for cross-regional collaboration are at play. In particular, the sharing and utilisation of health data across the Nordic region is central to the future of health and care in the region. This requires new ways of sharing data safely and effectively between device innovators, primary care institutions, public authorities, drug developers, etc.

This project outlines a comprehensive use-case for the benefits of shared Nordic data for a range of organisation types. This is achieved by simulating the expected outcomes of realising the Vision 2030 for SMEs and companies of several sizes, as well as public institutions and healthcare actors. Through a combination of deep ideational processes and wide analyses, we outline the potentials for innovation, improved health, increased exports and integrated environmental sustainability, among other parameters. The goal of the project is thus to provide examples of how the realised vision of shared data contributes directly to constituting the ideal future of Nordic healthcare.

FIGURE ONE

Vision 2030 Full Process Overview



This project builds upon previous work on the subject, namely, the comprehensive legal overview and other works on the healthcare of the future. The project leads into a business case for shared data in the Nordics to guide decision making on the subject.

A wide range of methodologies have been applied: More than 200 stakeholders have been engaged in this project, through workshops, expert roundtables, and interviews. Further, the project has produced a dataset of 112.000 entities in Nordic healthcare, mapped and categorised by sector, employment and revenue.

Emerging from the data and research are seven key themes that summarise the complex cornerstones of a sustainable development of the Nordic health space. The seven themes are:

-  **1.** Improving Interoperability
-  **2.** Mental Health and Well-Being
-  **3.** Personalised Treatments
-  **4.** Telehealth and Decentralised Monitoring
-  **5.** Decentralised Clinical Trials
-  **6.** Sustainability Data Measurement and Transparency
-  **7.** Transition to Preventive Care

The full range of project activities and analyses additionally serve to further develop the Vision 2030, providing nuance to key goals and the projected pathway there.

It is shown that through sharing health data a 2030 scenario can be reached where systems, devices and regions are interoperable and collaboration amongst Nordic countries is easily possible, mental health in the Nordics is largely improved, tailored treatments and medicines are developed, remote care and decentralised monitoring are a widely used standard, treatment development is accelerated through wider access to data, environmental impact data of treatments and products is taken into account and health issues are diagnosed earlier or even prevented.

Moving towards the best possible future of healthcare is a complex and very rewarding process, supported by the efforts of this and similar projects.

FIGURE TWO

Summary of Conclusions in each Theme

	Current Status	Vision 2030 Scenario
Interoperability	Data exchange barriers create fragmented health systems and slow innovation	Shared health data between diverse systems, devices, and regions creates one integrated health region in Nordics with a myriad of benefits at all levels of society
Mental Health	Mental health data is overlooked and underutilised, leading to highest societal burden-of-disease	Integration of population-scale data driven diagnostics and interventions allows significant amelioration of many mental health incidents and co-morbidities
Personalised Treatments	Prevailing one-size-fits-all approach with limited consideration of diversity and differing needs, as well as no harmonised and secure data system yet.	Deployment of tailored treatments and medicines benefiting patients, companies and the planetary environment, enabled by a new generation of data-driven medicine

Current Status

Vision 2030 Scenario

Telehealth

Cost optimisation is main driver for decentralised treatments, leaving potential benefits of telehealth unfulfilled

Remote medicine, decentral monitoring, and digital tools are implemented widely, reducing both treatment gaps for marginalised populations and environmental impact

Decentralised Trials

Rigid data requirements decrease scope and success rate of medical trials, with Nordics missing out on opportunities to export trial operations

Homogenised data requirements and exchange could enable the Nordic region to spearhead medical trials with citizens gaining access to potential treatments and companies increasing development speeds

Sustainability Data

Dissimilarity in environmental impact data and public and private entities developing own data banks for environmental impact of their services are slowing collaboration on key planetary issues

Streamlined impact data is available to both public and private actors through non competitive LCA data hubs, enabling collaboration and continual vetting to highest scientific standards

Preventive Care

Most health issues are addressed when symptoms are significant, and relatively expensive to treat financially, socially, and environmentally

The integration of next generation data sharing allows many health issues to be diagnosed and addressed early or even prevented, fueling great increases in quality of life as well as sector innovation to be shared globally



Photo by Claire Nolan on Unsplash

1 Introduction

1.1 Introducing the Health Use Case

The ideal healthcare of the future is defined by increasingly data-driven solutions and innovations, along with steady improvements in the quality of care and patient-centricity of health offerings. As part of Nordic Innovation's (NI) overall vision of making the Nordics the most sustainable and integrated health region in the world by 2030, this project "Health Use Case – Visualising the Effect of a Realized Vision 2030 on Nordic Businesses" was initiated in 2021 under NI's Health, Demography and Quality of Life Program.² The aim of the project is to help pave the way for bridging national health data and personalised data to boost innovation in both the public and private sectors through easier and better utilisation.

Nordic Innovation is an organisation under the Nordic Council of Ministers with the aim to make the Nordics a pioneering region for sustainable

economic, social and ecological growth. In the effort to realize this, this project has been approached through a pan-Nordic collaboration. The full consortium consists of Green Innovation Group (DK), Nordic Center for Sustainable Healthcare (SE), Upgraded (FI), Akademias (IS), and Oslo Municipality (NO).

More specifically, the key objective of this project is to visualise the effects that NI's Vision 2030 will have on Nordic businesses with a use case conducted on actual businesses of various sizes within health and life science in each of the Nordic countries. The use case integrates perspectives from simulations incorporating private industries, public stakeholders, and connected industries alike to provide the necessary context for the further development of Vision 2030, shining a light on how we might get there.

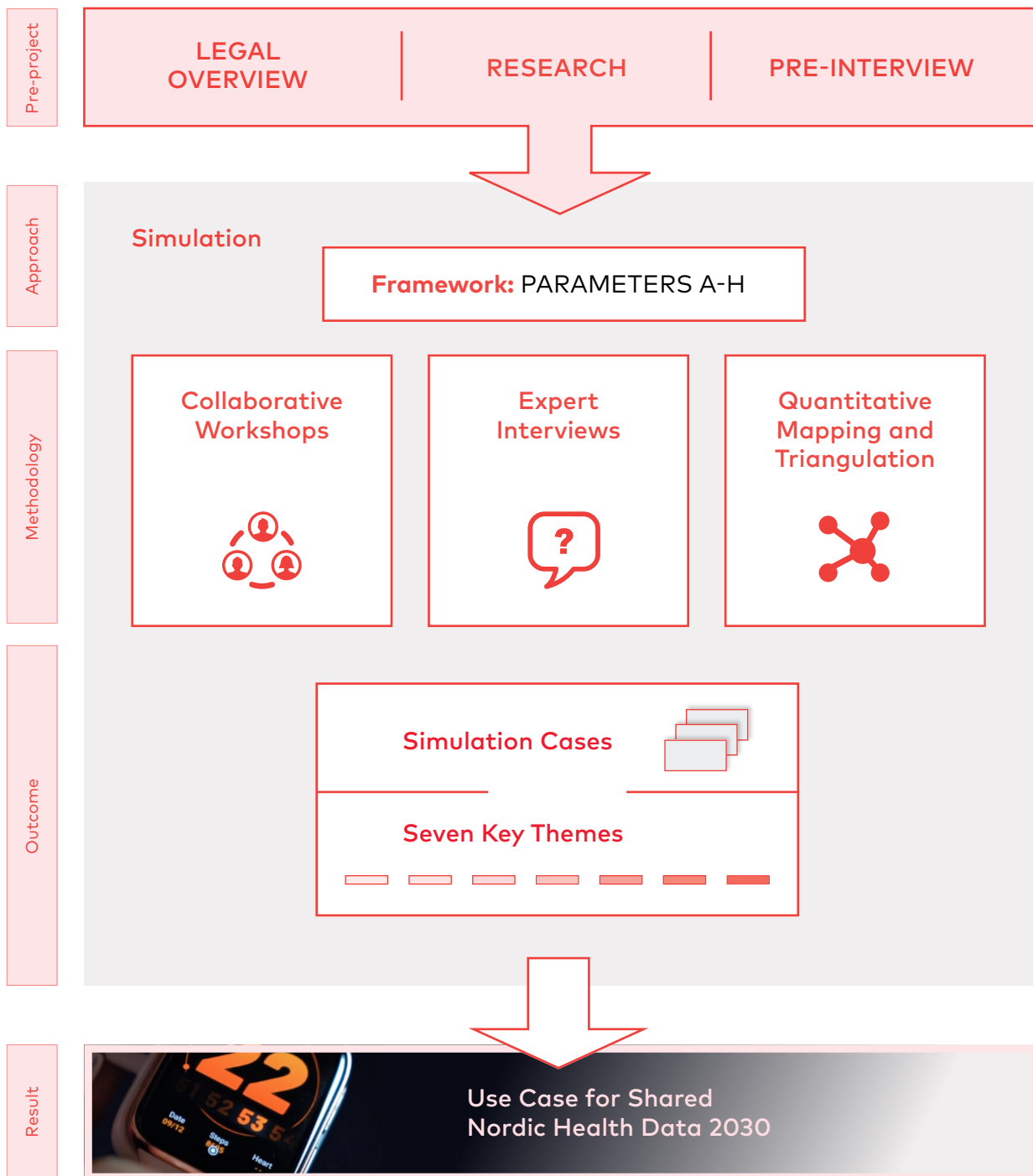
Project Design

The use case covers the effects on Nordic businesses within the following eight parameters as outlined by NI:

- A.** The overall sustainability of the Nordic healthcare sector
- B.** Product development and innovative capabilities
- C.** The impact on Nordic collaboration
- D.** The capabilities of Nordic companies to deliver sustainable healthcare solutions
- E.** Exports of Nordic products and solutions
- F.** Promotion of the UN 2030 Sustainable Development Goals
- G.** Business and capital attraction of the Nordic region
- H.** The Effects on equality and inclusion

FIGURE THREE

Simulation of Vision 2030



Project activities have included **1)** a workshop track, **2)** an expert interview track, and **3)** complementary research:

1) Workshop Track

If we are to succeed with a future scenario where personalised and national health data is accessible, then all relevant stakeholders need to be involved in the process. Getting input from all the different actors was thus an important element and first step in the project design towards visualising a realisation of that goal. To do so, a **workshop series** consisting of six workshops was conducted with ca. 170 actors within healthcare (public), life science (private) and connected sectors (public and private). The workshop track enabled not only the involvement of a wide range of actors, but more importantly a dynamic exchange of ideas between them. This is input that could not be achieved by working with each actor individually and a quite essential element when attempting to simulate a future that is dependent on everyone.

2) Expert Interview Track

The next step was to dive deeper into the perspectives of key actors, unfolding the potential in shared Nordic health data. To do so, 35 **expert interviews** were conducted with a range of different actors but a majority being actual businesses that could qualify the general learnings from the workshop track and lay the foundation for the use case simulations. The aim of the interviews was thus twofold: 1) To get an understanding of the status quo and barriers for achieving Vision 2030, and 2) To get an understanding of, what they would be able to achieve if these barriers were removed. The interviews were conducted within all eight parameters, making sure that relevant experts covered relevant topics.

3) Complementary Research

In order to contextualise the project findings and the case-based simulations of a realised Vision 2030, it was necessary to further develop and expand the understanding of this vision. To paint the picture of what that world could look like, **desktop research** was carried out to uncover the most important technological progress that play an important role in shaping the future development within healthcare and life science.

Based on the two main tracks of the project and the complementary research, seven themes ultimately stood out: **1)** Improved Interoperability, **2)** Mental Health and Well-Being, **3)** Personalised Treatments, **4)** Telehealth and Decentralised Patient Monitoring, **5)** Decentralised Clinical Trials, **6)** Sustainability Data Measurement and Transparency, and **7)** Transition to Preventive Care.

In the final section of the report, the topic of each theme is introduced and analysed, and a Vision

2030 future scenario is outlined. For each theme, one or more simulation cases are described. They have their outset in the dilemmas and barriers brought forth by the interviewed businesses, incorporating the context provided by the wide range of stakeholders in the workshop tracks. The overall simulation in this project, together with the contextual work, represent a use case that showcase the potential for sustainable growth and improved healthcare in the Nordic region, if data around health is better utilised and shared in the future.

1.2 Defining Key Concepts

Simulation

As visualised in the project design above, the central pillar of this project is the simulation of a realised Vision 2030, as it pertains to a range of company and organisation types, sizes and sectors. To generate a comprehensive image of what the realised vision will mean for the different actors in the sector, an aggregate methodology has been employed in the simulation.

The simulation consists of both the collective and individual explorations, ideations, and case-specific assessments of the effects of shared Nordic health data. The Vision 2030 was simulated through the concrete examples of new organisational realities and potential innovations described by each company and public entity through interviews and workshops.

From the body of work this simulation represents, a handful of specific simulation cases have been selected, demonstrating in detail the effects of a realised Vision 2030 on each type of organisation.

Use case

In the context of this project, the use case refers to the projected realisation of the Vision 2030, and the consequent utilisation of health data in Nordic healthcare, for both public and private stakeholders. Specifically, this use case describes the extent to which businesses, health authorities, hospitals, among other actors in the healthcare sector would utilise data, in terms of access, exchange, and interoperability, aimed at the benefits for innovation, sustainable development, quality of and access to health, among others.

Health data

Leaning on the definitions outlined in the report *Bridging Nordic Data*,³ health data refers to personal information. This includes:

- 1 Medical data – such as doctor referrals and prescriptions, medical examination reports, laboratory tests, and other health indicators, regardless of the collection via doctors, wearables, personal devices, etc.
- 2 Administrative and financial information relating to health – such as the scheduling of medical appointments, invoices for healthcare services and medical certificates for sick leave management, as well as sustainability data such and consumption data for sites and life cycle assessment (LCA) data for treatments and products.
- 3 Clinical data collected from clinical trials

Health data is central for innovators developing solutions that integrate with existing healthcare. However, in the increased use and sharing of health data across systems and borders, questions of privacy, data safety, and ethics arise. Current and novel methods of anonymisation, encryption, legal structuring, and even data recycling will inform innovations in this field. Most of these concepts are addressed in the analysis, but further developments in definitions and concept usage is to be expected in the coming decades.

Stakeholders

The Nordic health apparatus is an exceedingly complex ecosystem. For the sake of analysis, the full range of stakeholders is in this report categorised into the healthcare sector (public), the life science sector (private), and connected industries (public, semi-public and private). The public healthcare sector includes hospitals, sanatoriums, nursing and care homes, medical and dental practices, ambulance transportation, complementary medicine as well as medical laboratories, and other research facilities. The private sector covers the extensive number of SMEs as well as larger corporations in the fields of pharmaceuticals, biotechnology, medical devices, biomedical technologies, food processing, and other areas involving the processing of living organisms. Several semi-public institutions play a

role in the landscape of Nordic healthcare as well, such as patient organisations, networks, and hubs, which among others fall into the connected sectors category.

Sustainability

Throughout this report the concept of sustainability refers to healthy and balanced systems where humans and nature flourish equally.⁴ In such systems, practices are employed that augment the quality of life from a financial and social standpoint while also reducing negative environmental impacts. As such, sustainable development and growth therefore points to both environmental, social, societal, and financial sustainability long term.





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1.3 Context

Nordic Context – Strongholds and Barriers

This section summarises the key findings of the Bridging Nordic Data report, contextualising the current strongholds and barriers in use and sharing of data across countries in the region. Overall, the innovative use of health data for innovation in healthcare and connected industries currently faces several legal obstacles. In principle, use is possible, but it is restricted to varying degrees within each Nordic country. All the countries initially allow the use of health data for research and development, but there are different access routes, for example via ethics committees or successive application processes, which make access to the data more difficult. Furthermore, health data is used for statistics, administrative planning, education, knowledge management, quality assurance and quality development. The interplay of these systems is cumbersome and dampens innovation efforts.

Nordic and Country-Specific Strongholds

The Nordics are among the world's best when it comes to health data and data infrastructure. The region's societal commonalities, such as the spirit of voluntary community work and citizens' trust in authorities, provides a unique opportunity to position the region as a world-leading hub for health innovation. Furthermore, there is a long tradition of cooperation between the five countries and the three self-governing territories, also regarding legislative changes.

As for the country-specific strongholds, Finland holds a leading position in terms of the utilisation of health data generally. The country has adopted a single permit system for the secondary use of health data that enables smoother access. Additionally, the quality of information resources is generally high and, importantly, innovation is regarded as a legitimate purpose for the secondary use of health and social data.



In the case of Denmark, the country has implemented a completely electronic medical records system with e-journals and an ID-numbering system for Danish citizens. Furthermore, Denmark has public and private registries such as biobanks. These data owners enable access to more comprehensive data for research and development purposes, but legal barriers dampen the speed and ease of access.

In Iceland, health data has been electronically collected since 1980, leading over time to high health data coverage and quality. The country established a nationwide digital uniform medical records system that is based on a reliable public health data infrastructure.

Sweden is strong on documenting healthcare provided to Swedish citizens, as they extract this information into various information sources that are used for secondary purposes.

Nordic Barriers

Each Nordic country has unique regulatory barriers, but some parallels can be drawn between countries. For example, decentralised registries or the decentralised storage of information in general is an obstacle in all Nordic countries except Finland. Thus, the location of data owners may fall under different regional legislation, be managed through different data systems, and/or supervised by various public authorities, even within the same national framework. This barrier to innovation is exacerbated across national borders.

Another challenge shared by the Nordic countries with the exception of Finland is the lack of innovation-specific regulation. Denmark allows access to data but only for research. In cases

where innovation requests for data access are denied, Iceland, Norway, and Sweden require the researchers to get the subjects' permission to use their data, which limits innovative activities.

Country-Specific Barriers

Although Finland stand as a prime example for their regulatory framework regarding secondary use of health data, some obstacles remain. Most importantly, data requests are only possible with a Finnish personal identity code via the Suomi.fi identification portal. Åland has the same legal basis as Finland, albeit it has its own data protection authority, Datainspektionen. Nevertheless, Findata is the primary source of information.

In Denmark, the main obstacle is permission paths. Access to data in Denmark requires approval from various authorities, e.g. The Scientific Ethics Committee, the Danish Patient Safety Authority, and for projects involving testing of medicines, the Danish Medicines Agency. The Danish legislation is directly applicable to the Faroe Islands and Greenland, but the information resources are not as advanced and extended as in Denmark.

For Iceland, a predominant issue stems from the setup that healthcare facilities are not legally required to store data, leading to a lack of interoperability for electronic medical records. Furthermore, data portability for user generated data is an obstacle, as the legal framework does not allow entering user generated data into medical records, which severely limits the utilisation of user generated data. Thirdly, restricted access to medical records of deceased patients limits the pool of accessible data.

The Swedish legal landscape presents three other country-specific hurdles. First, strict secrecy rules are not aligned with data protection legislation, thus requiring an obligatory secrecy agreement. Secondly, special limitations for lawful search criteria limits the use of special categories of personal data as search criteria in registries. Thirdly, limitations in medical record sharing means that files can only be shared for the purpose of preventing, examining, and treating diseases and injuries or for issuing a care certificate.

European Context

In parallel to Vision 2030, the EU is developing the eHealth Digital Service Infrastructure (eHDSI), which will be rolled out in 25 European countries by 2025. The framework supports two main cross-border health services. Firstly, ePrescription

and eDispensation will allow EU citizens to obtain their medication in pharmacies located in other EU countries than their own. Secondly, patient summaries will provide general information on important health-related aspects.

In addition, the EU Commission is promoting a Health Data Space, which will facilitate the exchange of and access to different types of health data, healthcare, research, and health policymaking within the common European Health Data Space.

In the spirit of technological progress in recent years, the EU has also adapted frameworks for medical devices and diagnostics to the post-pandemic world with new regulation. New labelling conditions create a framework that ensures interoperability, comparability, and uniformity of devices and systems, which is part of push to improve general cross-border interoperability.



2 Project Activities and Findings

2.1 Introduction to Project Activities

This project was designed to employ a combination of methodologies in order to generate the deepest possible insights on the use case for realising vision 2030, exploring and simulating the opportunities and barriers of health data sharing in the Nordics. A series of collaborative workshops and explorative roundtables were organised, gathering more than 170 stakeholders from public, semi-public, and private organisations of different types and sizes from across the entire Nordic region. More than 30 semi-structured interviews were conducted

with experts to generate direct and more in-depth insights, and to ensure a range of case-specific simulations of the 2030 vision. The collaborative and qualitative elements were supplemented by wide-ranging desktop research and a mapping of 112.000 Nordic entities in the health space. The research and quantitative mapping were carried out to contextualise and complement the other findings and to support the further development and nuancing of vision 2030.

As a starting point, the range of methodologies was chosen to provide a comprehensive assessment of the Nordic region on the following parameters:

PARAMETER A: The Overall Sustainability of the Nordic Health Sector

PARAMETER B: Product Development and Innovative Capabilities

PARAMETER C: The Impact on Nordic Collaboration

PARAMETER D: The Capabilities of Nordic Companies to Deliver Sustainable Healthcare Solutions

PARAMETER E: Exports of Nordic Products and Solutions

PARAMETER F: Promotion of the UN 2030 Sustainable Development Goals

PARAMETER G: Business and Capital Attraction of the Nordic Region

PARAMETER H: The Effect on Equality and Inclusion

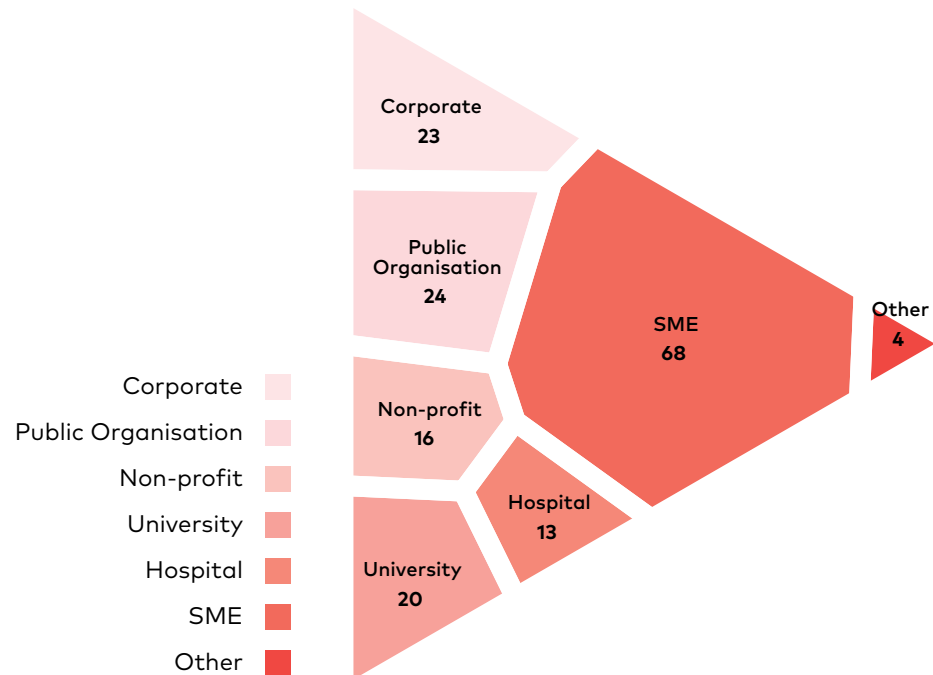
FIGURE FOUR

Vision 2030 Simulation Participants by Organisation Type

Each of the parameters above constitute a part of the intended effects of a realised 2030 vision for Nordic health data. The following sections describe how each project activity relate to the eight investigated parameters and provide an aggregate assessment for each of them.

As the reader will note, the parameter assessments do not by themselves cover the complexity of the Nordic health space, nor the simulating aspects of this use-case for the 2030 vision. Throughout both workshops, interviews, and research activities, a range of themes stood

out and were highlighted by the participants. These seven themes each point to critical intersections of specific technological and societal trends, use of and potential innovation in health data, as well as key elements of the shared Nordic vision for health in the region and beyond. Chapter 4 outlines each of the seven themes emerging from the analytical process, tying each of them to specific simulation cases, in which actual companies assess the potential for their type of organisation, in the case of a realised vision 2030.



2.2 Workshops, Roundtables and Interviews

Objectives and Methodologies

In total, 174 participants signed up for six events, of which three were collaborative workshops taking place in December 2021, and the other three expert roundtables taking place in January 2022. Both workshops and roundtables were divided into three different tracks respectively covering healthcare (public), life science (private), and connected industries (public and private). In total, virtually all types of stakeholders from health ecosystems across the entire Nordic regions were represented in the workshops, providing comprehensive input to the use case for Nordic health data in 2030. A mix of methods were employed, including collaborative 2x2 matrix brainstorming, science-fiction prototyping, individual idea sprints, and keynotes inspiring advanced discussion among stakeholders.

The main objective of the interviews was to build upon the findings from the workshops as well as to utilize the chance to explore the insights and expert opinions in-depth in a confidential face-to-face environment to build the foundation for the use case simulations. It is crucial to understand the current situation of organisations as well as the barriers that hinder them from achieving Vision 2030 and what organisations need to be able to reach Vision 2030. The interviews include opinions from experts in each of the parameters. During the project, the consortium conducted 30 interviews with 23 various experts from public and private organisations. The interviews followed a semi-structured approach in which an interview guideline was created that was followed, with interviewees provided the chance to complement the structured questions to follow up on specific points when needed. The question catalogue consisted of two main sections. The first section constituted a general part where questions were asked about e.g. the degree of

ease of sharing and receiving health data in the Nordics or the degree of value that access to Nordic health data would bring for the organisation. The second section consisted of further in-depth question for each of the eight parameters regarding the current status of the parameter, barriers, the related value of shared health data, incorporation in current laws, as well as potential regulatory improvement and pitfalls. The insights generated in the interviews were then qualitatively analysed by identifying prevalent topics and common as well as distinct opinions which helped further understanding the experts' and organisations' visions. This deep input informed both the following parameter assessments, as well as the theme analysis and simulation cases in the final section of the report.

Main Findings

The workshop and expert roundtable participants participated in a fruitful dialogue across sectors and with actors from different fields, addressing the commonalities, barriers, and potential for utilising health data with a realised 2030 vision. In the following, key insights related to each of the eight parameters are illustrated.

It is worth noting that while the Nordic health sector is currently relatively sustainable and innovative, compared to other regions, the participants interviewed assess the following areas in terms of potential improvements towards an ideal future scenario.

When looking at the expert interviews, most of the interviewees (73.6%) find it relatively hard to



FIGURE FIVE
73.6% of the interviewees find it hard to access and share health data.

access and share health data, even though most of the participants rely on Nordic health data to generate value in their operations. Increased access to shared health data, as attested by the interviewees, would lead to an increase in successful health start-ups and SMEs. Enabling companies to train their software with data from the entirety of the Nordic region, would mean faster development of capabilities, bringing solutions to market both at home and abroad, increasing quality of care for local and global populations alike. This is especially beneficial to SMEs since development costs are one of the most prohibitive barriers to the health sector for growing companies. According to interviewees, it would lead to better issue prioritization, quicker decision-making, safer products, cross-country access to healthcare, as well as a decline in the cost of healthcare. Therefore, "real-time access or real-time experience of data must be key to the development of Vision 2030."⁵ 59.1% of the interviewees agree that current laws and regulations to some extent enable access to

shared health data (3 out of 5 rating). Among possible improvements, the interviewees mentioned better access to data and clearer guidelines on how it is possible to use data. Also, laws should be purpose-oriented and allow secondary use of data when appropriate, for instance in life science research. The interviewees suggested a common European regulatory framework for data access but also cautioned against overregulation and urged to keep the number of laws and regulations at a minimum, at least those regarding research and product development, as too strict regulation could significantly hinder innovation. Also, a sole focus on individual regions should be avoided. There is a strong need to streamline the entire regulatory framework without compromising ethical aspects and maintaining a high level of data security. In order to update the legislation successfully, it is imperative that politicians and lawmakers listen to the experts within the field and keep decisions at the institutional level transparent.



FIGURE SIX
59.1% of the interviewees agree that current regulations enable access to shared health data to some extent.



Photo by Jared Erondu on Unsplash

A

The Overall Sustainability of the Nordic Health Sector

The overall sustainability of the Nordic Health Sector was deemed to be little to non-existent by the workshop and roundtable participants mainly referring to environmental and social sustainability aspects. In terms of social sustainability, it was highlighted that care development is currently rather based on (national) regulations than centered around the patient and that the system is fragmented, not only between countries but also between industries as "nations are acting too slow on getting alignment across the region."⁶ This not only relates to lacking aligned strategies for care quality but also in terms of environmental sustainability."⁷ In the current scenario with fragmented health data, "private mega corporations develop global healthcare solutions based on profit, not sustainability"⁸ and "SMEs are struggling to make an impact".⁹ Participants from healthcare, life science, and the connected industries stated that they lack knowledge or incentives to apply existing solutions to their models. Yet, as the healthcare sector is responsible for 4-6 percent of worldwide greenhouse gas emissions, healthcare systems play a significant part in global improvement and impact in terms of environmental sustainability.¹⁰

The participants agreed that the way forward is horizontal collaboration with likeminded stakeholders and that this will be the most effective way to incorporate shared health data.

None of the interviewees rated the overall sustainability of the Nordic health sector at the highest level. While the interviewees highlighted the progress that has been made, they also concluded that the industry is "still in the stage of awareness"¹¹ and more decisive action is needed to unify the scope of sustainability and outline the path to realisation from an environmental, social and financial perspective.¹² According to the interviewees, the major barriers currently are the "lack of economic understanding and investment,"¹³ "fragmentation of the healthcare ecosystem and its data,"¹⁴ "workforce availability"¹⁵ and flawed procurement practices. They suggest overcoming those barriers by raising awareness and informing about improved solutions,¹⁶ common technical standards,¹⁷ and involving more private companies to work within the public healthcare as they are the real drivers of innovation. Additionally, the interviewees anticipated that shared access to Nordic health data could lead to better decision-making and clearer actions towards sustainability.¹⁸ In terms of laws and legislation, there is a demand for more focus on circular procurement and secondary use of data.

B

Product Development and Innovative Capabilities

The workshop and roundtable participants agreed that data sharing has the potential to improve product development and innovative capabilities. As one said, "with a better base of data and shared data the progress of solutions and products will be easier and faster".¹⁹ The main issues that participants highlighted with a fragmented data scenario, which is basically the current state of affairs, was that there are lots of solutions but no proven standards, efficiency is low as the data is not serving providers or clients in optimal ways,²⁰ and that competitive edge is lost in innovation processes as it generally takes too long to get access to the data needed.²¹ More specifically, the many closed systems and company-based solutions lead to companies operating in silos – developed services are simply not connected.²² Another consequence is that SMEs are hindered in accessing and contributing data on treatments and devices, with the development of new solutions taking place within the corporates instead²³ causing very high entry barriers for the smaller innovative companies, which ultimately keeps them out of the loop.²⁴ Yet, this leaves room for improvement, e.g. by creating incentives for the use of data and connection of industries. As participants highlighted, new combinations of data should pave the way for new business models, which will allow more innovation to happen across both public and private spheres with more common solutions leading to faster development.²⁵

Product development and innovation capabilities of Nordic companies were praised by the interviewees. They emphasised the great potential of the Nordic companies that comes from a high education, skill and innovation level, well-established infrastructure, and good support from the governments. What hinders them is the difficulty of finding sufficient funding, especially for hardware development, as well as "lack of collaboration and coordination"²⁶ and a nationalist data protection approach.²⁷ Product development, especially within healthcare, takes time and money, for instance "if you want to launch a vaccine, it typically takes around 8 years and 900 million euro, and this is the average for any pharmaceutical product."²⁸ "Most innovative start-ups lack resources, personnel or money" and often find it "insurmountable"²⁹ to comply with all the necessary regulations, overcome data barriers, and scale at the same time.

To alleviate these issues, interoperability and collaboration efforts need to be elevated to enable access to large data sets for companies that require such data for further improvements and innovation. At the same time, it is crucial to provide companies with enough funding to stay afloat during long product

development cycles as currently, "there is not enough venture capital that specialises in healthcare specifically."³⁰ Additionally, the interviewees noted that access to shared Nordic health data would not only shorten the product development and clinical investigation cycle and therefore allow a faster market entry³¹ but also assist co-development and the ability to scale both within and outside the region. "Larger volumes of data also create much better substance in the analysis and give more variety" as innovation "not only in Sweden or Finland but also Denmark" enables "much more interesting variations."³²

Although the interviewees did not regard current laws and regulation particularly amenable to sustainability aspects of product development and innovation, they pointed out ways to overcome this obstacle. For instance, "regulation that dictate lower energy consumption for data centres"³³ as well as supply chains should be implemented, e.g. "if the certification of a medical product requires a sustainable component, [...] it enables implementation of the sustainable practice but also generates data that can be used to look at more sustainable practices."³⁴ Additionally, using diverse data sets to develop ethical AI and presenting a unified Nordic stand on data privacy and ethics could cement the region as a global frontrunner on these topics. Yet, the experts are stressing the importance of preventing overregulating to not end up in a situation where the innovation is killed off before it even started.³⁵



The impact on Nordic Collaboration

It was generally agreed by the workshop and roundtable participants that shared health data would have a large impact on the collaboration in the Nordic region. "Currently, the Nordic region is thriving, but nations aren't going at the same speed."³⁶ When it comes to the management of health data both structure, organisation, and responsibility differ between the Nordic countries. How healthcare systems are organised (regional or centralised) varies widely, and different actors are at different maturity stages, in terms of integrated data usage. When looking at the collaboration opportunities between hospitals and private companies for example, hospitals will often have data sharing technology in place, but typically use their own internal software, which is not compatible with industry standard software. Also, the level of involvement from the private sector varies widely between the different Nordic countries due to unclear financing structures, differing areas of expertise, and mandates of operation.

An overarching issue mentioned by the participants is the lack of effective standardization when it comes to data formats, legislation, and transparency-privacy concerns, to name some of the challenges for shared health data. It was pointed out, that without data sharing, companies solve singular issues not cross-sectional ones,³⁷ and it becomes almost impossible to collaborate across borders³⁸ and engage in transboundary alliances.³⁹ Therefore, the Nordic governments "will have a big impact on collaboration between nations adopting legislation for shared data."⁴⁰

Generally, many companies and universities already use data lakes, but are afraid to share data because of uncertainty about interpretation in legislation. Having clearer legislation on data sharing would highly increase trust and create incentives for innovation and multi-stakeholder collaborations. Companies have an advantage when working in integrated consortiums instead of trying to develop and sell solutions by themselves - through the larger data pools that Nordic collaboration would enable, more innovation and insight generation would be enabled.⁴¹

For the interviewees, the biggest improvement that could happen in the field of Nordic healthcare by 2030 is "increased collaboration based on new technology and utilisation of data for innovative solutions."⁴² Yet, the interviewees see the small individual Nordic markets⁴³ and the fact that there are lots of silos⁴⁴ as a major barrier. "Building cooperation would be one way to make our companies more credible and impactful,"⁴⁵ yet, "companies are often frightened to collaborate because they see other companies as competitors. We have to make it obvious that we can work together."⁴⁶ Also, "small and big companies need partners. [...] If they are co-developing or sharing data it could help them develop nationally or launch something potentially big."⁴⁷

Generally, the interviewees mentioned that there are fewer barriers in the Nordics compared to other regions, "but we are still talking about independent countries with different ecosystems, languages, cultures, and healthcare systems."⁴⁸ One way to move past these obstacles is "by collaboration – not just national but also cross-border collaboration. The decision makers need to understand that there is only a certain amount of capable people in each country [and therefore] you must share the knowledge."⁴⁹ Here, "starting from a roundtable leading to joint projects would be the best approach. [...] Funding should also be viewed from the perspective of combining the projects and not breaking it up to fund each group separately."⁵⁰



Photo by manusama on Pixabay

D

The Capabilities of Nordic Companies to Deliver Sustainable Healthcare Solutions

The workshop and roundtable participants agreed that increased health data sharing would improve the capabilities of Nordic companies to deliver sustainable healthcare solutions. As is elaborated in chapter 3, increased Nordic data sharing will address social issues such as center-periphery divides and health inequities. Simultaneously, the potential for addressing environmental sustainability through health data is significant.

The Nordic brand is already strong and stands for both quality and sustainability, which was mentioned by the participants as an important factor, "with high standards for efficiency and sustainability [...], Nordic actors (public and private) can be lighthouses for development of global solutions."⁵¹ It was remarked that shared health data would better enable the Nordics to export carbon-effective health solutions to the rest of the world but also to use health data to validate environmentally-friendly but also socially sustainable solutions.⁵² More specifically, "sustainable operations and reduction of environmental impact from hospitals and other healthcare facilities benefit from shared health data."⁵³

The interviewees mainly assessed the environmental sustainability capacity of Nordic companies. Even though capabilities and technology exist within organisations, more often than not the "innovative companies are too small to overcome the market barriers."⁵⁴ Additionally, there hasn't been much focus on delivering environmentally sustainable solutions within healthcare previously, so companies are just starting to orient themselves. Thus, currently a transition "between the old world and the new world"⁵⁵ is occurring.

Different factors complicate this transition. New regulation, e.g. the Medical Device Regulation (MDR), as well as a lack of trusted subcontractors for manufacturing components are some of the aspects that the interviewees highlighted as impeding the development of more sustainable solutions. "We need a good environmental practice to understand how different products can be managed,"⁵⁶ so bringing awareness could arguably mitigate the issue. However, the amount of information that the companies need to integrate is immense. A roadmap providing relevant information regarding best practices and implementation of regulation in a simplified way would be a great help to companies.⁵⁷ The potential for health data sharing to benefit social and financial sustainability is addressed through the 7 emerging themes and the simulation cases in chapter 3.

E

Exports of Nordic Products and Solutions

When looking at the exports of Nordic products and solutions, the workshop and roundtable participants determined that sharing health data lays a good foundation for sustained competitiveness in the future. Yet, currently, solutions are not optimally integrated and/or connected with different systems or groups globally⁵⁸ making it difficult to spread Nordic solutions internationally. "Innovations in the Nordics are usually tested in the home market and then they are internationalized."⁵⁹ Therefore, when setting up export strategies of Nordic products and solutions, a large focus should be laid upon the interoperability of systems in order to make it more easily scalable globally. In other words, the larger and more homogenised that Nordic home market is, the better conditions Nordic companies will have for adapting and scaling into international markets.

According to the interviewees, there is a "need to see shared health data as an export opportunity that can sell innovation and knowledge."⁶⁰ The Nordics could be at the forefront, but so far "investors aren't seeing the opportunities in this field."⁶¹ When commenting on current exports of Nordic products and solutions, the interviewees pointed out that "most of the export is carried out by the large companies who have the capabilities and quality systems in place."⁶² "From a commercial point of view, the Nordic countries combined are the size of a large European country, which creates more weight in international cooperation and commercial scaling. We could combine efforts for increased exports or create something together."⁶³

Yet, the interviewees noted a lack of opportunities for intra-Nordic export, as selling to other Nordic countries requires at least as many references for implementing their solution, as when scaling to a larger European market. And getting the necessary references in their Nordic country of origin is a significant barrier to exports. Homogenising the Nordics as one market for health data solutions will both ease the path to approval and increase the strength of references for Nordic companies.

According to the interviewees, harmonising EU legislation with national frameworks is likewise a pressing matter. In Finland, for instance, researchers are forced to turn down Horizon 2030 funding because by law they are not allowed to share the necessary data.

F

Promotion of the UN 2030 Sustainable Development Goals

The workshop and roundtable participants agreed that without a doubt the outcome of successfully shared health data will connect to a wide span of the SDGs and therefore promote the UN 2030 Sustainable Development Goals. Yet, it was noted that "[Vision] 2030 is only possible through SDG17 [i.e. partnerships for the goals] and that requires integrated data."⁶⁴

According to the interviewees, the application of the SDGs within the Nordic health sector is underdeveloped. The interviewees stressed that "we need to get politicians to decide on funding [and] we need a common approach to implement SDGs."⁶⁵ More data on the integration of SDGs into the health sector is required to show quantifiable results that go beyond talking points. Once again, the interviewees cautioned against overregulation.

G

Business and Capital Attraction of the Nordic Region

As mentioned by the workshop and roundtable participants, shared health data also improves financial sustainability of the Nordic health sector by influencing the business and capital attraction of the Nordic region. In a world with shared health data, the participants imagined the Nordics to be a prime destination for clinical research as access to data would be smooth and easy⁶⁶ making the Nordics very attractive for investors,⁶⁷ as one participant noted, "without data sharing, i.e. with data in silos, it is hard to attract investors to the region."⁶⁸ Having a common Nordic data lake could also improve the competitiveness of the Nordic life science sectors, creating jobs and other types of value in the region.⁶⁹

Current business and capital attraction of the Nordic region was positively rated by the interviewees. The Nordics have a "great reputation in innovation."⁷⁰ The issues in this area are mainly related to the size of the market as well as certain tax barriers in place, which make it hard to improve business and capital attraction.⁷¹

According to the interviewees, increased data sharing will lead to the development of more innovative solutions, which is necessary to increase the region's capital attraction. "Having access to comprehensive shared health data would give the Nordics a competitive advantage compared to other EU markets" as "better access to data gives you more insight" and "you would probably have more SMEs who say, we can build a product from this. They would most likely also make products that sell better because you understand the Nordics better."⁷² Also, improving public-private partnerships and having "a direct way to engage with trials in hospitals as well as being able to sell to the public sector make it easier to attract capital."⁷³

H

The Effect on Equality and Inclusion

According to the workshop and roundtable participants, sharing health data also influences equality and inclusion, thus increasing social sustainability of the Nordic health systems. Currently without data sharing, patient continuity is often lost making it harder for patients and companies to get or provide good services.⁷⁴ Thus, with fragmented data, healthcare systems are weaker⁷⁵ as efficiency is decreasing but at the same time patient load is growing. Additionally, participants highlighted that patients are currently not at the center of care-development.⁷⁶ Yet, by providing more insightful and remote services from healthcare providers it is on the one hand possible to reduce the pressure on healthcare systems and on the other ensure more equal access to healthcare.⁷⁷

Equality and inclusion regarding health data within the Nordic countries is deemed fair by the interviewees. Access to healthcare is free but still not universal, especially when it comes to "geographical distribution,"⁷⁸ and it is therefore critical to keep equality in the political focus. According to the interviewees, the regulation is made "to be inclusive, but a more modern way of thinking about inclusiveness has not been built into the laws."⁷⁹ Research on more diverse populations and emphasis on preventive care could also help increase equality and inclusion. "It's easier to take action and solve a problem if you have data to back it,"⁸⁰ therefore, more actionable data on the potential benefits of a more equal and inclusive healthcare system could pave the way for updated and improved policies. Also, "sharing health data would make it easier in a critical situation to move to other countries" and "help people get the clinical care they need not only in their country but across the Nordics."⁸¹ To increase equality and inclusion, the interviewees highlighted digitalization as a way forward, although the aging population needs to be considered in this matter.⁸²

2.3 Mapping of Companies

Objectives and Methodology

As a supplement to the variety of qualitative and single-organizational methods applied in the simulation of Vision 2030, this project has also seen the completion of a mapping of more than 112.000 actors in the Nordic Healthcare sector. Specifically, the business registries of Denmark, Finland, Norway, and Sweden were systematically explored for data on both private and public entities within sectors related to health and care. Considering the diversity and distribution of companies in terms of size, revenue, area of expertise, among other factors, the sample is considered widely representative of the full landscape of healthcare actors in the Nordic region.

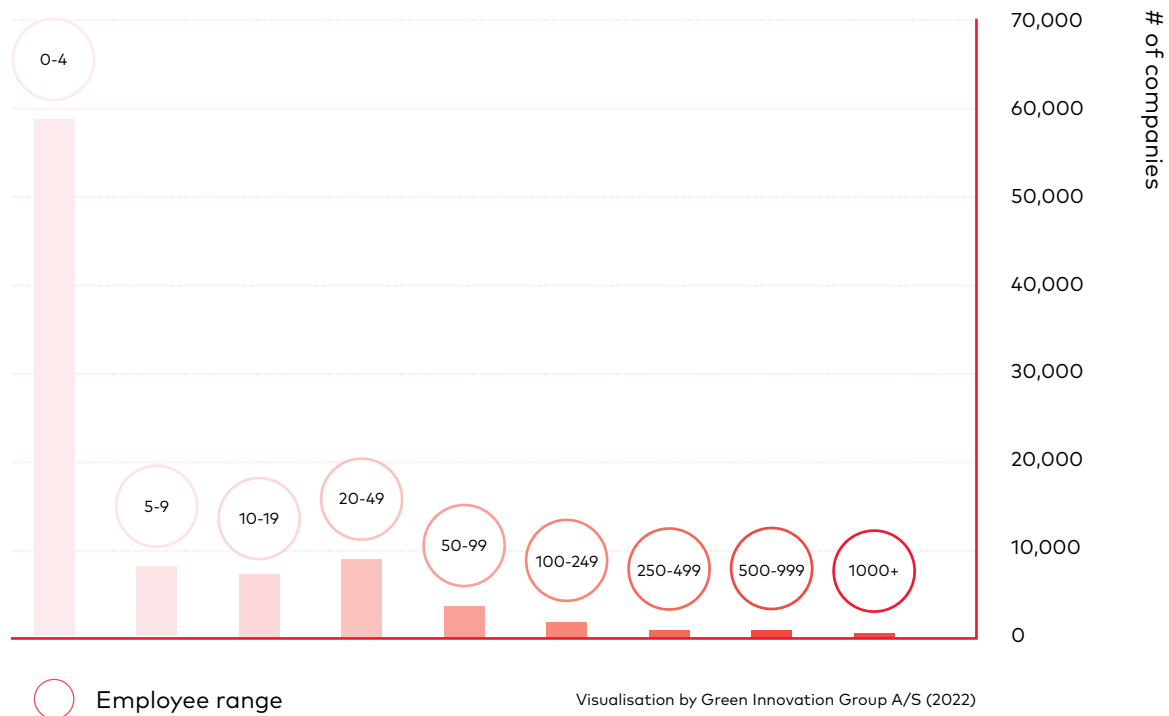
The quantitative data from this mapping serves to supplement the deep findings of this project and is available to build the bridge to the wider scope of the following business case for shared Nordic health data. The full cohort of business entities has had their national categorisation translated into the NACE framework to enable comparative analysis in an international scope, as well as allow the application investors' frameworks.



Photo by Fortytwo on Unsplash

FIGURE SEVEN

Companies Broken Down by Employee Range



Main Findings

While the comprehensive dataset will need systematic unpacking to yield the full scope of findings, a couple of facts stand out to the reader, even at a cursory glance.

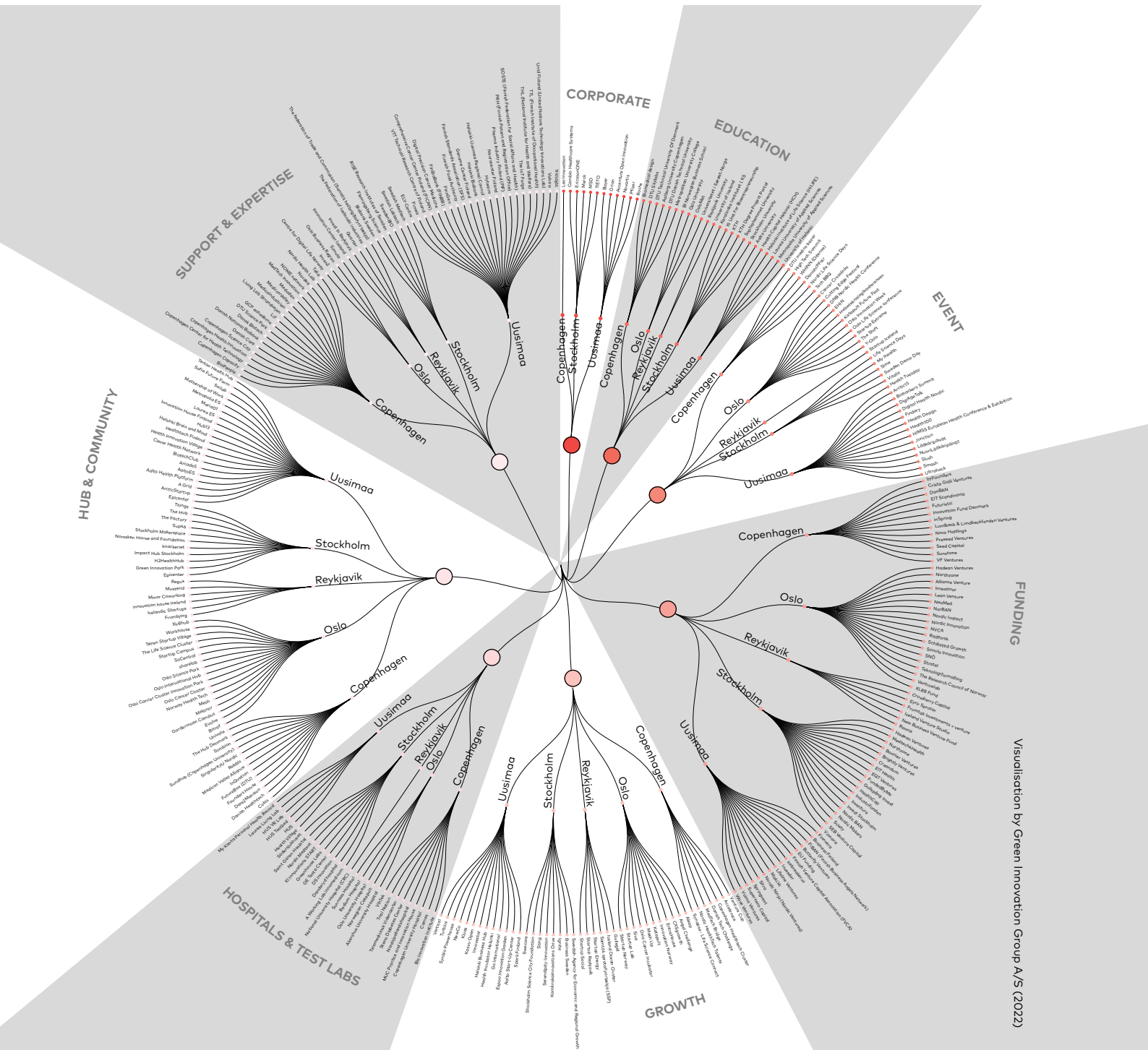
- Overall, the Nordic health sector is populated by young and small companies. Almost half of the entities have four or fewer employees. Less than 1000 of the entities with available data have more than 250 employees.
- Age of the businesses in question is significant with around half having been founded between 2009 and now. A trend is also emerging, with an annual increase in the number of companies founded in recent years.
- It turned out that Norway, as the country with the lowest population number of the four countries compared, has the most companies based in the health sector. This is remarkable as countries with higher population could be expected to foster more businesses in the healthcare space.

FIGURE EIGHT

Nordic Health Ecosystem

Organisations divided by sectors for all the Nordic capitals

- Corporate ●
- Education ●
- Event ●
- Funding ●
- Growth ●
- Hospitals & Test Labs ●
- Hub & Community ●
- Support & Expertise ●



Visualisation by Green Innovation Group A/S (2022)

2.4 Summary of Findings from Project Activities

Throughout the workshops, interviews, and the research several topics emerged that pointed beyond the eight parameters. When asked what the experts see as the biggest improvement that could happen in Nordic healthcare by 2030, they touched upon several topics e.g. value-based healthcare, life cycle assessments, increased collaboration, national data workflows, harmonising best practices, digital revolution, approaches to data handling and distribution, personalised medicine, and interoperability.

The topic of interoperability was mentioned by many different stakeholders in workshops and interviews. The idea of a "Nordic data pool" seemed to resonate with many experts in the workshops as this "would make this whole sector much more competitive globally."⁸³ In the interviews, several experts expressed a strong need to create a common standard for data sharing and access. For instance, FHIR7, a standard for health data exchange, is gaining traction and could be a way to increase interoperability between the Nordic countries, providing a bridge to further health integration in the Nordic region.

When asked about improved health aspects that can be achieved through health data sharing, another emerging topic was the development of a more holistic view on health in established systems, in particular concerning mental health.

"Prevention of mental illness will be an economic opportunity for any government – the productivity loss is immense."⁸⁴

One of "the biggest improvements that we could see from shared health data is personalised medicine"⁸⁵ "Through sharing data and knowledge in collaborations/cross-sectorial partnerships, a much better fitted product can be created for patients - patient-centric care instead of profit-centric"⁸⁶ For example, "more accurate diagnostics and effective care plans" which will "lead to faster recovery and better patient outcomes"⁸⁷

Another topic that was often mentioned was digitalization and how to best make use of it within this scope. Through the Covid-19 pandemic, there has been an upsurge in remote patient monitoring and telehealth offerings, "enabling to move more treatment to patients' home and reduce the amount of patients needing to come to the hospital"⁸⁸

Digitalization also plays a large role in the field of clinical studies. When asked what organisations would be able to do with shared health data, answers related to creating "digital models, e.g. digital clinical trials with better access to clinical trials and more effective use of 'patients' for clinical trials"⁸⁹



When considering the environmental sustainability angle, there are hospitals focusing on value-based procurement, i.e. "creating a more sustainable value-based healthcare sector" where solutions should be "adopted that create a more cost-efficient system and patient value".⁹⁰ Also, the "Greenhouse Gas impact can be reduced from this development".⁹¹ One interviewee even mentions there could be reductions up to 80% in hospitals beds and carbon emissions.⁹² However, environmental data needs to be collected and distributed in a transparent and comparable manner for this potential to be realised.

Shared health data also appears to be a condition for the transition into preventive health models. "Currently, there is a stagnant health care system (less efficiency and more patient load). By enabling data sharing, fostering

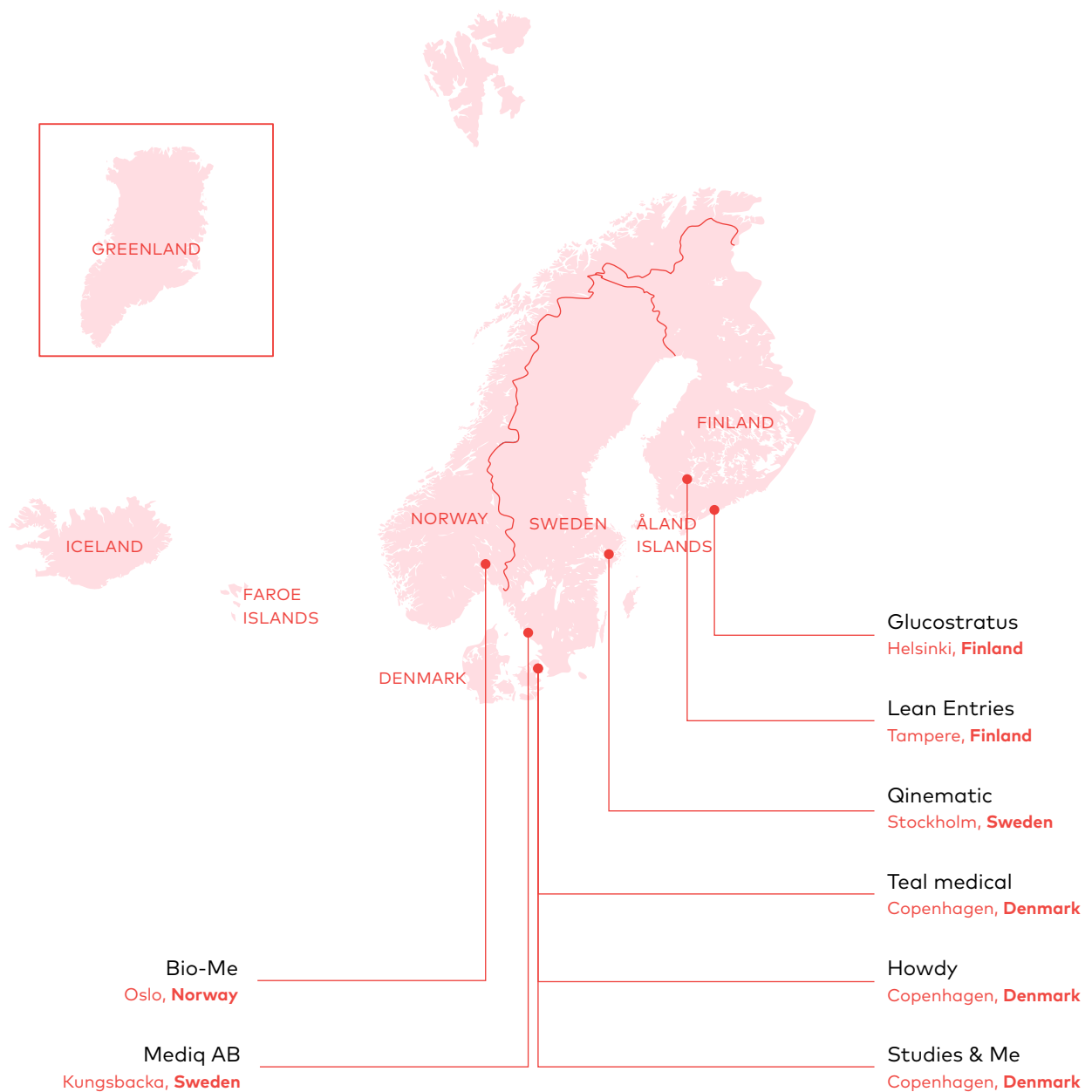
innovation and progress, and focusing on preventive care, the overall health and well-being of the Nordic population can be drastically improved"⁹³ through "prolonging the period that people are in good health"⁹⁴ which "will replace much of the hospital space, needing fewer beds, and medicine and equipment".⁹⁵ And "if innovations are exported globally, it can also help improving global health".⁹⁶

To provide a more complete picture of the benefits of shared Nordic health data, the analysis and simulation cases should include the topics above, as addressed by the experts.

The following chapter outlines the following seven themes emerging from the analytical process, and describes in-depth simulation cases for each:

1. Interoperability
2. Mental Health and Well-being
3. Personalised Treatments
4. Telehealth and Decentralised Patient Monitoring
5. Decentralised Clinical Trials
6. Sustainability Data Measurement and Transparency
7. Transition to Preventive Care

3 Seven Emerging Themes





3.1 Improving Interoperability

When addressing the healthcare of the future, no single concept is more important than interoperability. It is the key theme emerging from all the data sources in this project, highlighted in workshops and interviews as the main intersection of current and future technologies, public and private stakeholders, and the potential for better care for all citizens of the region.

Definition

HIMSS, a global not-for-profit organization focused on better health through information and technology, defines interoperability as “the ability of different information systems, devices or applications to connect, in a coordinated manner, within and across organizational boundaries to access, exchange and cooperatively use data amongst stakeholders, with the goal of optimizing the health of individuals and populations”.²⁷ In other words, interoperability describes the ability of different actors to work together. This can be related to systems, devices or applications that can interact with each other regardless of regional or national differences.





The Nordic region has a population of about 27.5 million people. For more than ten years, studies have been published on the potential for interoperability in the Nordic health sector, paving the way for possible collaboration in areas such as patient records and biobanks.

Important first steps towards interoperability of the diverse systems in the Nordics is already being undertaken in projects such as the Nordic Interoperability Project and Nordic Commons. The vision of the Nordic Commons includes a Nordic health cloud, a health metadata repository based on a coherent legal and ethical framework, and a research funding program for technology and competence development.

Collaboration for the Future

Achieving interoperability means increasing the integration of health and data. To realise this, sharing and translation of data between systems is required and operations need to be streamlined on several levels, both between clinics and hospitals regionally, but also cross-nationally in the Nordic region. Additionally, this applies to individual medical devices as well as between devices and systems. Furthermore, both public and private stakeholders are involved.

Interoperability of systems can be improved by sticking to data standards between systems, yet innovators should also develop from the user's perspective and incorporate users from the early stages of development

— Interview, University Hospital Stakeholder⁹⁸



Vision 2030

Interoperability is a fundamental pillar in Vision 2030. When imagining a more ideal future health system, the ability to seamlessly cooperate and work across both systems and borders is essential. Such a high degree of interoperability requires vast amounts of data. If this data is to be meaningfully and usefully operationalized, an equally large degree of innovation is required to ensure data sharing is secure.

For instance, one interviewee mentioned that “with standardisation of data structures, it would be easier to enhance larger data sets which would improve our research. In my field, the more data you have, the more questions you can answer. Medical applications can be developed and produced easier if the data is set up by medical standards”.⁹⁹

Additionally, improved interoperability would enable companies “to combine the open, shared data with their own data and use it for business development and medical development”.¹⁰⁰

In other words, the health system of the future requires interoperability, interoperability streamlines the usage of large amounts and varieties of data, and for that reason significant innovation in safe data sharing is necessary.

Barriers and Pitfalls

In the interviews and workshops, experts agreed that moving towards interoperability entails several challenges. Firstly, “we have a public health sector that is slow to innovate” and secondly, the “lack of testing environments”¹⁰¹ make it difficult especially for the small and medium sized companies to drive innovation forward. Also, the operational division between different kinds of businesses and sectors as well as the “national protectionist approach” of regions and countries are not fruitful either.¹⁰² Yet, “it’s going to be much more difficult to develop good treatments for patients if we cannot access the data on pan-regional level”.¹⁰³ Having “without integrating with other areas, many standalone solutions don’t offer much value to the user”¹⁰⁴ making interoperability a necessity.



SIMULATION CASE ONE

Lean Entries



Lean Entries Ltd. enables socially responsible governance by protecting GDPR for citizens while providing smoother processes for R&D in companies and institutions. They have developed a digital platform that educate health tech developers – ranging from start-ups to large companies and accredited test labs – on regulatory compliance through different types of training sessions. More specifically, when companies set up clinical investigations to develop medical devices, the GDPR and data privacy requirements are quite considerable. Lean Entries ease that process by clarifying the basics, e.g. how the product should be classified, so that the companies can focus on what they do best, i.e. develop their products.



Tampere, Finland

Current Scenario – Working with Health Data

Companies would have to utilise external consultants to comply with country-specific regulation and the start-ups especially can hardly bear those costs.

— Heikki Pitkänen, interview

Lean Entries does not process health data themselves but works towards simplifying and easing the process of handling health data for their clients. Thus, the mechanics around health data “touches us quite significantly” as Heikki Pitkänen, CEO of Lean Entries, puts it. While GDPR has standardised some aspects when it comes to data privacy and safety, the differences in national legislation, like the Secondary Use of Data Act in Finland for instance, mean that it is always an immense amount of work to figure out what the regulation is, depending on the country in which a clinical investigation takes place. Thus, it is a highly complex field to navigate, especially for the smaller companies, which lack the necessary knowledge. This sets them back in the R&D processes.



For Lean Entries, working more concretely with health data is actually on their radar. Currently, they are rebuilding their digital platform “to be able to take medical device software requirements into account as well, so that when the time comes it is eligible to be utilised in a clinical setting. However, that lies far into the future.” When answering what the main obstacle is for moving forward with this strategy now, Heikki Pitkänen highlights, that to do so would put them in the same position as any medical device software provider, and “if you compare that to let’s say a basic wellness application, which is not regulated, you might need three-four-five times more capital to set it up, simply because of the regulatory requirements.” Thus, the non-standardised legislation across the Nordic countries is impeding the progress for not only the companies utilising health data directly, but also the ones working with it indirectly.

Simulation – Effects of a Realised Vision 2030

In a Vision 2030 scenario where health data legislation is unified across the Nordic region, the effects on a company like Lean Entries can be expected to be significant. As they specialise in European and country-specific Finnish regulation for medical devices, it would drastically change the scope of their business as their service would become applicable not just to Finland but the entire region. Thus, their client base would expectedly increase significantly. Although a simplified regulatory framework might mean less companies would need their service, it is very unlikely that it would remove the demand completely and with the access to a bigger market, their business is likely to grow. Heikki Pitkänen believes that “it would increase our [Lean Entries’] business, because things would be easier for our clients.” This would obviously have implications for the service they provide, but at the same time holds

■ Effects on Nordic Collaboration

Lean Entries is already collaborating with the Danish Life Science Cluster on developing their digital service even further by expanding it with a workshop element. However, despite the cross-border cooperation, their targeted clientele is still Finnish because of the country-specific regulation in place. In a realised Vision 2030 scenario, the depth of existing partnerships is likely to grow as the opportunities in the other Nordic markets would be greater. Simultaneously, this would open the door for a wider range of collaborations in general. “It’s a win only for all countries that get involved. When it comes to data and privacy, in the Nordics we are top notch, among the best already – becoming even better within this field, would make collaborations much stronger as well.”



■ Effects on Product Development and Innovative Capabilities

Currently, their digital platform is centred around guiding professionals within the health tech field through the relevant regulatory requirements. However, they would like to expand the type of services they provide – as described in the current scenario. Specifically, one of their strategic goals is to develop their platform so that it could be utilised as a tool in clinical settings as well. Nevertheless, achieving that has long-term implications. Basically, this would imply starting to work directly with health data, which means facing the same challenges as the companies they are currently helping – as such, they know exactly how many resources that require, which is why they haven't already taken these steps. A Vision 2030 scenario "would clarify the path" to achieving these goals and taking the steps would also be way less "decisive" as Heikki Pitkänen puts it. He stresses, that "the legislation should be made as clear and uniform as possible across the Nordics, the more harmonised the better. Then we [Lean Entries] as a service provider could tap into that. If it was indeed simpler, it would integrate better with our digital service model and enable sharing throughout the Nordics, thus we might find other ways of utilising the platform. At this moment it would be very cumbersome to create a meaningful service, but with harmonised legislation, there is no doubt it would be much easier."

■ Effects on Sustainability

The digital platform of Lean Entries is essentially scalable and could cover other topics than health tech regulation. They have been in dialogue with sustainability managers from larger companies about developing a service within the EU taxonomy for sustainability focus, clearing the path for larger manufacturers for instance through their platform. As a small company, however, they need to be careful how they use their resources and "pick the ripe fruits first". Thus, in a Vision 2030 scenario with greater emphasis on organisations conducting their business in an environmentally, socially and financially sustainable mannerly lies creates numerous business opportunities for companies like Lean Entries. and it is likely that they would have more resources to expand the services they provide on their platform as the market they navigate would be less complex, in reference to points made in above section.



SIMULATION CASE TWO



Teal Medical

Teal Medical extracts and prepares health data sets from hospital systems to assist their clients with their research or developmental efforts to produce innovative solutions and improve treatment outcomes. Their Teal Engine service automatically de-identifies medical images to comply with regulatory requirements at a lower cost and in a shorter time – in fact, it can be up to 100-1000 times faster than a standard manual workflow. Additionally, it functions as a search engine enabling easier access to the relevant data as well.



Copenhagen, Denmark

Current Scenario – Working with Health Data

Teal Medical uses artificial intelligence to process health data for use in the private sector. Current legislation hinders public-private partnerships, as health data can only be shared with private companies without its metadata and thus person-specific identifiers from public institutions that hold the data, such as hospitals. Hence, their core business revolves around treating medical imagery by anonymising datasets, making them accessible to researchers and companies. This process is very complex as there are thousands of types of metadata in images. Due to the enormous number of images in datasets Teal's service drastically streamlines this process and time spent removing sensitive data. Their main customers are hospitals, and more specifically radiology departments.

Teal Medical treats health data with their artificial intelligence, but do not analyse these records as this would impose further legal requirements. Generally, it is easier to get access to data if it is anonymised. Scientists that are granted ethical approval can't access data that is not relevant for their research, so Teal pseudonymises the images. Anders Lykkestrup, CFO in Teal Medical, says, since they are merely processing the images, they are not dealing with legislation, but their customers are. He continues, they try to help them with the legal requirements by setting up standards for interpretation with the regional authorities.



Simulation – Effects of a Realised Vision 2030

■ Effects on Nordic Collaboration

Between the Danish regions there are different requirements and interpretations of the legal framework set up. Teal Medical is legally only allowed to pseudonymise and not anonymise the data. The legal departments of the Danish regions are inconsistent with their interpretation on the use of data which further complicates public-private partnerships. In a Vision 2030 scenario, a unified legal framework would thrive cooperation and the potential of start-ups. With uniform legislation, Teal Medical's tool would lead to a universal solution for handling health data. It would therefore be logical for more and more companies in the Nordics to approach Teal Medical for handling and thus providing data.

■ Effects on Sustainability

Teal is tapping into the SDGs by initially trying to ensure healthy lives and well-being (Goal 3) and consequently tries to streamline the process of accessing data to make sure researchers spend more time on their studies. Teal Medical also believes in fuelling sustainability through more efficient processes. A legal unity for the secondary use of data could save a lot of work, as the requirements remain the same. Time and computing power could thus be invested in other things. Anders says "we are currently only talking about preparing data. The next, much more important step would be the actual use of the data, which will change the world." He continues, "in the Nordics, we have the best foundation for innovation, as we have a highly educated workforce."

In another realm of sustainability, Teal Medical is developing the concept of data recycling. Currently, the legal framework demands that data must be destroyed as soon as the research on it is finished. However, often the same dataset is required to be reused or further examined either by the researchers or by a new project. Anders emphasises, "data recycling would allow us to reuse the data i.e., millions of images, without investing the time, energy, and compute-intensive treatment of the data again, as it had already taken place when the data set, was prepared for the first time. Thus, the potential for the clients to analyse the data sets is substantial."



3.2 Mental Health and Well Being

Mental illness is a leading cause of the global burden of disease. Mental illness causes more years lived with disability (32.4 percent) than any other health condition and nearly as many disability-adjusted life-years (13.0 percent) as cardiovascular disease (13.5 percent). People living with mental illness are also more likely to develop physical health problems and have poorer physical health outcomes, including higher rates of premature mortality. Mental health is defined by WHO as “a state of wellbeing where individuals realize their potential, can cope with normal challenges in life, can work productively, and contribute to their community”.¹⁰⁵

Addressing mental health is especially important for the Nordics. The region is the lamentable leader in the statistics of suicide rates globally. The treatment of mental health is paramount, but stigmatization is still a major hindering factor. Furthermore, mental illness is directly linked with our labour market. When unemployment increases, general mental health issues and psychiatric admissions rise as well. As an example of the seriousness of mental health issues, the general mortality rate of psychiatric

admissions of men with borderline in Denmark is 23 percent. Thus, the illnesses are driving up both personal, societal, and financial costs.

The consequences of mental health issues have a range of unequal distributions. Men are more likely to commit suicide while women have a higher risk of being diagnosed with depression. These figures underline the severity of the current situation and necessitate a responsible approach to mental health considering preventive health as well as adequate research.

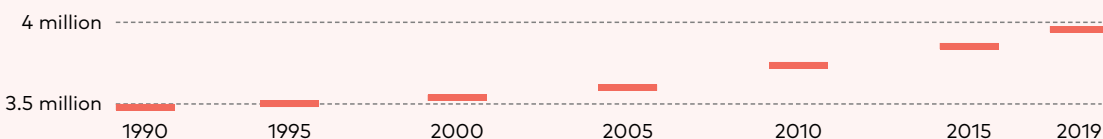
Given the scale and scope of the consequences of mental illness, a change in perspective and recognition of mental health as real health is paramount. Further, mental health must be considered from an economic perspective several axes: Are the resources sufficient, are they used efficiently, equity, and is the financing for mental health sustainable.

The WHO summarises the need for overall investment in mental health into three arguments. The sacrifice of health, happiness, and well-being from a humanitarian perspective,

FIGURE NINE

Number of People with Mental Health Disorders, 1990 - 2019

Number of people with mental health and neurodevelopmental disorders in the Nordic region, not including alcohol and drug use disorders. Figures attempt to provide a true estimate (going beyond reported diagnosis) of prevalence based on medical, epidemiological data, surveys and meta-regression modelling.



Source: Our World in Data from IHME, Global Burden of Disease



as well as rights, opportunities, and equality in terms of equity, and finally lost income, production, and consumption.

However, it is useful not only to show the burden of mental illness but also the positive effects that well-being has on the population. In Denmark, the prevalence of well-being was 34.7 percent in 2016. This flourishing was associated with significantly lower health care costs and sickness benefit transfers. Projections show that if the population were fully well, health care costs would be €1.1 billion lower in 2017.

Link to Data

Health data relates directly or indirectly to a person's physical or mental health. Health data is a key variable in innovators using personal data. However, anonymized data is no longer considered health data in this context, as health data is subject to much stricter regulations than general personal data. This also includes services that disclose indirect data, such as genetic data. These may include information about the physiology or health status of the individual and are often derived from an analysis of biological samples of the individual. Furthermore, data may be pseudonymized for use by healthcare providers or authorities under the more lenient provisions of the General Data Protection Regulation by means of specific identification keys.

Variability of Data Sources

The scope of the available data should not only refer to the established institutions, as data on mental health is already being generated through various platforms that are not properly utilized. We are looking at mobile devices, online platforms as well as social statistics. Furthermore, we could discuss how the use of data could be used by employers or even schools in preventive health or psychiatric breakdown prevention, as this is not currently used proactively. The current best practice for data generation in the context of mental health treatment is app prompts, as they query data and generate new data.

There is a clear potential for mental health apps. Searches have increased fivefold since 2014. As a result, there are over 100,000 different health apps available in the Nordics.¹⁰⁶ The use of smartphones for data collection holds a lot of potential due to their ubiquity. Furthermore, querying data such as current mental health status via push notifications can quickly reflect the well-being of many users in a transparent way.



Vision 2030

“We are still early stage there, but mental care is another thing which could take massive improvements, [...] and using data here could drastically lower the cost of health care”.¹⁰⁷ A realised Vision 2030 would in this case make it possible to establish an overarching data system that could be of great service in terms of research, preventive assistance, and combating systemic diseases. For example, it could build contextual systems for employers and institutions to securely share data about their employees while getting the support they need to shoulder some of the health burdens. Expanded use of current devices, such as the non-invasive use of mobile devices, could highlight or encourage behaviours to prevent mental health crises. Furthermore, the integration of wearables into psychiatric diagnostic practice could minimize unsupervised breakdowns.

Barriers and Pitfalls

The handling of personal data, even if it is anonymized and securely shared between institutions, is likely to meet resistance from parts of the Nordic population. Personal health data and especially mental health data are considered very private. One argument could be the stigmatization of diseases and in particular mental diseases. Furthermore, it could be feared that the data could fall into the wrong hands or be misused for other purposes. Addressing these concerns is an important part of integrating mental health data in the healthcare system of the future.



Photo by Geran de Klerk on Unsplash

SIMULATION CASE THREE

Howdy

Howdy is an app that reports and measures the well-being of the employees. The tool works preventively to avoid sick leave and provides an insight into the overall wellbeing at the workplace.

A prevailing problem with mental health is that preventive maintenance is mostly disregarded. The necessary help and attention is often postponed to a time when symptoms are more severe, and it is too late for the workplace to help address. With Howdy, caring for the employees is systematised in an easy and effortless manner for the employees providing the data. The results are higher levels of well-being and a lower sick leave. The experiences of working with Howdy at the Danish Slagelse Hospital are positive.¹⁰⁸

The use of the app is a good example of taking mental health into account in the workplace to prevent sickness absence and allows management to measure and pay special attention to wellbeing while saving time and money. The app is based on the World Health Organisation Well-Being Scale (WHO-5), and a study using data from Howdy has shown clinically significant improvement after a brief psychological intervention, making preventive care more accessible.¹⁰⁹



Copenhagen, Denmark

Current Scenario – Working with Health Data

Howdy's analysis of mental health and wellbeing is based on the use of health data. They generate this independently using their app and can therefore ensure that their services are efficient and effective. Rasmus Hartung describes that they are focused on finding the Data to prove that Howdys services are a good way of treating mental health. However, this becomes less and less urgent, as they collect more data moving their case. Because of the value of data, collaborations that go beyond a scientific nature are currently severely limited.

Furthermore, the central dynamic in the nature of prevention is that the attraction of new patients cannot happen through individual demand, as they are mostly unaware of their need for preventive health in the first place.

Simulation – Effects of a Realised Vision 2030

Vision 2030 would drastically change the availability of Howdy. The current B2B model would evolve into a general preventive mental health tool through integration with the Nordic health sector, possibly even independent of the workplace. There is also great potential for collaborations of the app within the Nordics through the use and access of health data, as well as a treatment tool to be prescribed by doctors.

■ Effects on Nordic Collaboration

In Vision 2030, Rasmus sees the future of Howdy in good cooperation with the Nordic health system. If they are not required to gather data themselves and can rely on being provided by the public sector, they will be able to shift their focus. He says, "I can envision a health system where we are a peevish software where we are plugged into the big health care system". So, rather than aggregating data, they could broaden their current operations and focus on other things, such as more effective treatments. Furthermore, he sees the app integrated into a health care system as an enabler of self-selected treatment. This means that an individual can choose their own physiotherapist or therapist. Generally, the tools availability would trip a cascade resulting in an increase in awareness for preventive health care and thus adequate and necessary treatment.

■ Effects on Product Development and Innovative Capabilities

There is also a lot of potential in prescribing apps and software from doctors to patients, following the German model. Germany is the first mover in enabling GPs to prescribe medical or health apps for mobile devices as treatment. For this reason, Howdy is also facing expansion in the German market. An app like Howdy integrated into the public market could thus reach more people and contribute to preventive treatments, which could save a lot of human suffering as well as costs.

In collaboration with the Danish psychologist and professor Per Beck Howdy has been able to prove a significant effect on the impact on the individual patient's health and recovery. A unified Nordic treatment and access to health data could profit. It is to be believed that such a model provides the basis for scalability to the Nordics health sector.

3.3 Personalised Treatments

Personalised treatments and personalised medicine present a potential to advancing medical technology and can be a way to address health issues at a societal scale. When asked in interviews and simulation workshops, Nordic experts and stakeholders consistently point to “personalised treatment and medicine” as the focal point for major technological trends and the solutions required to address large-scale health goals for our societies.

More specifically, the increased rate of data generation, the increased computational power, as well as the development of tools to process data safely and anonymously could converge during the coming decade, to allow for unprecedented levels of precision in all types of medical treatments and interventions. For the Nordic region, as the population ages and general treatment quality increases, a growing number of illnesses have complex origins, context, co-morbidities, and treatments. Personalised treatments can mitigate those factors through innovation and integrated sharing of data between systems across the region.

Defining Personalised Medicine

Personalised medicine (sometimes called precision medicine) targets individuals or groups rather than populations. By separating people into different groups, the medical model aims to tailor medical decisions, practices, interventions and/or products to the individual patient, based on his or her predicted response or risk of disease.¹¹⁰

Steps Already Taken to Healthcare of the Future

The area of personalised medicine is not a future scenario without connection to current practice. At the World Economic Forum Centre for the Fourth Industrial Revolution Japan,¹¹¹ they have already been working to improve the use of data and technology in healthcare. Highly individualised medicine is now within reach, making a whole new approach to healthcare possible.

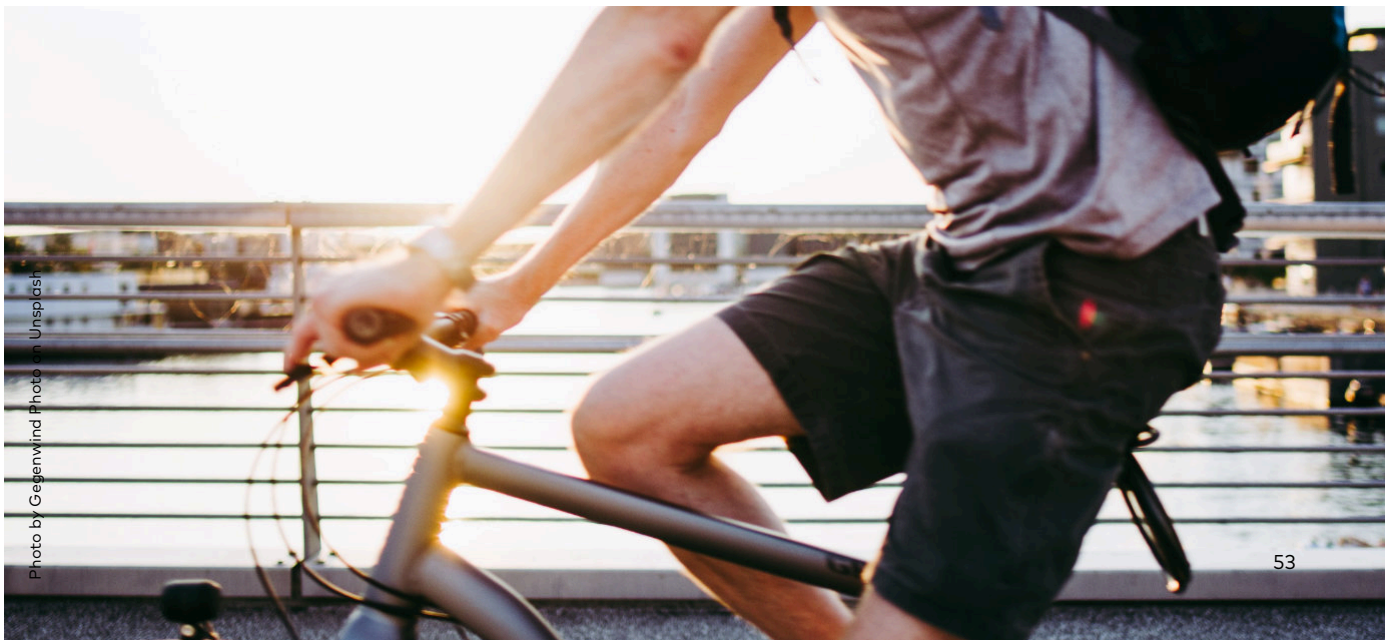
However, the road to true personalised medicine is long and requires many developmental steps. Digitalization in healthcare is one of them, demanding a multi-stakeholder collaboration between medical institutions, companies and governments. It is important for the public in the Nordic region to influence how data is managed in those collaborations. The best-case scenario is an integrated Nordic region facilitating and utilising safe and easy data sharing to benefit every citizen.

The overall point is to shift away from a one-size-fits-all approach to one more focused on diversity in order to maximize health and wellbeing. It is a shift from "the greatest happiness of the greatest number"¹¹² to "the greatest happiness of the greatest diversity".¹¹³ One of the endpoints could be an anonymized yet anchored digital health personal.¹¹⁴

Vision 2030

Imagine that personalised treatments are standard procedure. Each individual gets an effective, precise, and low-cost treatment based on his or her lifestyle and other factors. The treatment takes in the whole complexity of the person's medical history, socioeconomic background, co-morbidity, etc. This could be achieved by establishing an anonymised digital health persona for each citizen, granting of control over data and privacy to the citizen, while allowing health professionals to work with more comprehensive journals.

In addition to more precise treatment, this bridges the treatment gap between well-educated or self-verbalizing citizens, and low-income or immigrant population groups. Hospitals with specialised expertise disproportionately benefit citizens in their local area. With widespread access to personalized data, they can both further increase the precision of their operations and more easily accept patients from more remote areas.



Data is Crucial to Advance Personalised Treatments

Personalised treatment is completely dependent on large amounts of data, from each individual in question. The data is "utilised to build healthcare services for preventive and personalised care, learn about best practices and build more accurate diagnostics and effective care plans".¹¹⁵ Therefore, a new level of computation that utilizes the width of available data to generate the personalised treatments is necessary. Individualization in treatment so far has been too inefficient. However, the emergence of artificial intelligence and big data has made it possible to pursue individualization and inclusion efficiently, basing medical support and treatments on age, region, lifestyle and other factors.¹¹⁶

There is a need for novel systems for managing, anonymizing and utilizing personal data. New systems of data management across stakeholder platforms – from individual to hospital to innovator to device, back to hospital for practice and so on – requires new formats for collaboration, mediated not only by new technologies but also innovations in legal frameworks.

Such a data-driven and diversity-focused health system would be more inclusive than what we see today, because it would be able to respond to individual lifestyles, disease profiles, and nursing-

care needs. More data and new technologies make it still easier to target individual healthcare needs, while costs keep falling. This opens up possibilities to tailor treatment plans for each individual, as well as better accommodating personal preferences with regard to risks or medical interventions.¹¹⁷

In order for this to happen, though, we need to fuse the digital and analogue worlds. A great example of doing that is Taiwan. Early in the COVID-19 pandemic, Taiwanese authorities leveraged the power of National Health Cards, cashless payments and the universal health insurance system to ease medical supply bottlenecks and get masks to people who needed them. The elderly was not able to purchase the masks, though. Not until the authorities provided specific additional information to elderly people, like directing them to go to specific pharmacies at specific times.¹¹⁸

Barriers and Pitfalls

The barriers and pitfalls identified through the expert interviews and workshops of the simulation can be summarised in two main points:

1. Lack of platform standardisation
2. Ethical implications

Even though the Nordic countries are similar in many ways, the digital systems, platforms, and regulations differ. The road to harmonizing these systems, without compromising safe use of data, privacy, protection of marginalized groups or other barriers for advancing personalised treatments is long and bumpy.

The ethical implications of personalised treatments are also a challenge. How should equal access to the health system across countries, regions or socioeconomic classes be secured? How do we guarantee a system with a certain level of self-determination for each

citizen, while upholding the benefits of shared and comprehensive sets of data? Which level of access to data should be given to the private sector – like insurance companies? Which role should data play in science in order to advance personalised treatments?¹¹⁹

The questions are many, as are the pitfalls and ethical implications. However, the Nordic region has a great tradition for cooperating, and a high level of trust in systems and government among the citizens. This provides solid ground for building global leadership in the advancement of personalised treatments.



SIMULATION CASE FOUR

Bio-Me

Gut microbiome research has become essential to almost every medical research field. There is a need to translate microbiome research findings into actionable clinical solutions. However, application of Next-generation sequencing faces several challenges related to precision, turnaround time, cost per sample, and the need for complex bioinformatic pipelines. Bio-Me provides researchers and industry with a microbiome analysis service that delivers rapid, accurate and highly reproducible microbiome analysis solutions. Bio-Me which is based in Norway, has seven employees.

To be able to do this, Bio-Me provides access to precise gut microbiome data, access to fecal samples, and anonymized medical registries. For this purpose, Bio-Me has developed a Precision Microbiome Profiling-system. Further, they are collaborating with HUNT4 to gain microbiome biobank access.



Oslo, Norway

Current Scenario – Working with Health Data

Bio-Me is in cooperation with the research hub and biodatabase "Hunt" in Norway. However, they also independently generate data on stool samples that are sent to them in the laboratory. Furthermore, they access health registries and the prescription registry in Norway.

Handling and analysing data is their core business. They analyse them according to three categories. Firstly, researchers who want to complement Bio-Me's analysis possibilities with their research. Data from stool samples can provide information about diabetes, autism, skin and the brain. Secondly, consumers who are health conscious or people who suffer from irritable bowel syndrome that is approximately 10-15% of the population. Third, clinical applications using microbiome profiling to help physicians on which drug to give a patient.

Simulation – Effects of a Realised Vision 2030

A more free secondary use of health data would not significantly change Bio-Me's active business model, but it would enable long-term development

dynamics. They could widely expand their services and health offerings. Furthermore, there would be great potential for preventive healthcare. A larger volume of available data would open up diagnoses for society as a whole.

■ **Effects on Product Development and Innovative Capabilities**

There are various possibilities to gain insights into the condition of people. So far, we are focusing our perspective only on blood samples, but could learn so much additionally about stool samples. This is important because the gut offers insights into the biome, which opens up many possibilities in terms of preventive health, as the biome is not genetically predefined but can be improved via treatments.

In a world where these samples could be analysed in a decentralised manner, thus not having to be sent to Bio-Me's lab, founder Morten Isaksen sees a bright future. In a network of free-flowing data, what is now the lab could be on a chip. More freely available information would also mean that problems that more people have, or perhaps even societal issues, could be reflected in the data and thus recommendations could be tailored to them.

Morten envisions a world of smart toilets that, like self-driving cars and their information about traffic to avoid accidents, the more they are used, the better specific information for specialised treatments.

■ **Effects on Nordic Collaboration**

Morten Isaksen sees cross-border cooperation in the Nordic as a natural development towards the new regulatory framework of Vision 2030. The analysis of stool samples could thus be carried out decentrally at doctors' offices across the Nordics or from home. Many health benefits could be expected. Through regular testing, such as weekly or daily testing, which would be made possible, people's health as well as treatment could be better recorded and treatment could be adjusted if necessary. Furthermore, cross-border collaboration would result in a larger, more general data set that would be able to provide more insights into human health, as eating habits vary by country across the Nordics.

Morten also believes that without cross-national collaboration, the knowledge gains will be significantly hampered and slowed down.



3.4 Telehealth and Decentralised Monitoring

As much as 80 percent of all GP consultations are technically or medically unnecessary. Moving more activities to digital platforms could relieve congestion at hospitals and clinics, reduce traffic around them, and transportation time. It could also reduce bacteria exposure and increase productivity. Further, it could make way for easier access to specialist consultations, especially for remote population, mobility impaired, or low-income population groups.

It is important, though, to fully support elderly and other population groups who cannot be expected to utilise digital platforms smoothly. It is also important to map the specific psychosocial and anthropological functions that human contact provides in order to create the best conditions for using for instance a GP in conjunction with remote healthcare.

Defining Telehealth

Telehealth is the distribution of health-related services and information via electronic information and telecommunication technologies.¹²⁰

Telehealth and decentralised patient monitoring involves remote treatment like telemedicine, treatment and advice through online tools, and self-treatment. It involves remote monitoring through sensors, cameras, reminders, and data collection. It also involves remote meetings, both between health care professionals, and between

citizens and health care professionals. Finally, innovation and new digital solutions relating to infrastructure for digital services or new service models are part of the telehealth area.¹²¹

The Role of Telehealth and Decentralised Patient Monitoring in Today's Healthcare System

The use of wearables and integration of current devices enables decentralised patient monitoring and diagnostics. This gives doctors and patients alike access to more comprehensive and precise data, powering better decisions, and preventing a range of time-dependent local health issues.

For instance, health care in Sweden currently finds itself at a crossroad as regards digitalization. There is a rapid increase in popularity of telemedicine, primarily among care physicians. From this follows increasing demands for telemedicine. Telemedicine seems appreciated by patients, and it eases accessibility of primary care. The video calls save time for patients, the risk of infections during physical visits is reduced, and physicians' working time flexibility is increased.¹²²

Another aspect is self-measurement that helps people improve their well-being and opens a path to preventive health and well-being services. According to a survey by Sitra, smart devices that measure well-being are already used by a large

share of the population. The survey indicates a potential in creating services and service ecosystems that are based on combining data. With these ecosystems, the Nordics spearheaded by Finland could lead the way in building new kinds of comprehensive well-being services, due to a generally higher interest in self-measurement than people in other countries.¹²³

Globally, self-service is widely used by consumers turning to the internet for health information. A survey by EY showed that during a year, 50 percent had undertaken general research online on a health matter, while 38 percent had searched for diagnostic information and healthy living content such as diet or fitness advice.¹²⁴

Virtual consultations have also been found to be both accepted by patients and to improve outcomes or have no difference in outcomes to care as usual. That goes for such diverse areas as diabetes, chronic obstructive pulmonary disease (COPD), chronic pain, post-surgical support and caring for the elderly. Acute exacerbations of COPD, asthma and community-acquired

pneumonia have been found to be safely treated outside of the hospital, at a lower cost, and with a positive impact on patient satisfaction.¹²⁵

Vision 2030

In 2030, the healthcare sector could be closer to being a seamless and digitally convenient sector to the citizens. In such a future, the digitalisation of health care services would be standard and as such taken for granted. In this scenario, the use of technology frees up time for valuable in-person interactions between the citizens and their care provider. Time is no longer wasted on unnecessary visits, prescription refills are ordered online, costs are lowered, and convenience increased. Things that do not need to be done in person are done virtually.¹²⁶

The benefits of virtual care are many: It is more convenient to the patient, who in addition spends less time away from work, eliminates travel time, and is able to receive care out-of-hours.





Moreover, the time gained from telemedicine eases the burden for children, parents, and employers and thus eventually also on public finances.

The time saved by staying home instead of going to the hospital or the doctor's office leads to environmental benefits as well. The load on the roads is eased, the pollution from transportation is removed, and the spreading of bacteria and diseases in waiting rooms is brought to a minimum. The doctors' time too is spent more efficiently, as they can meet more patients in the same timeframe.

It is a long road. First, we need to implement remote care, home care or care for elderly, secure data interfaces between home care and hospital data systems, and analyse data to find indicators for treating common and rare diseases. Telemedicine needs to be established, and integrated fully. Once we have it set up, researchers need to find means or techniques to make a quality feedback loop.¹²⁷

The Role of Data

The increased digitalisation of the health care sector requires more data to support remote healthcare, like the integration of wearables that offer real-time monitoring.

In isolation, a mobile device is of limited benefit. But when connected to a suite of services, the smartphone can become a gateway by which we access data, make informed decisions and interact with the health care system through clinically oriented technologies such as AI-assisted diagnostics, imaging analysis and medication management.¹²⁸

Digital prescriptions make it possible to visit any pharmacy to buy the medicine. Recently, it has also become possible to order home delivery of medicine, something especially useful for the elderly or those with mobility restrictions. However, attention should be drawn to regulating this new form of health care.¹²⁹

Video calls between patients and doctors can save time and increase convenience. Data could help explaining and diagnosing symptoms, so that, by the time the video call comes through, both doctors and patients can spend their time more efficiently on medical questions rather than on administrative formalities.

Doctors argue that much information about a patient can be learned from a video call in regard to diagnosing the patient. As technology advances, the range of diagnoses that may be feasible through telemedicine increases. One example is blood-pressure monitors that can easily be connected to smartphones. The results for using telemedicine to treat mental illness as well are promising, and a literature review shows that there is no significant difference in diagnosis compared with physical visits.

Increased competition and globalization may also make new medical instruments more feasible for homeownership, which is especially vital for patients who often require access to health care.¹³⁰

Barriers and Pitfalls

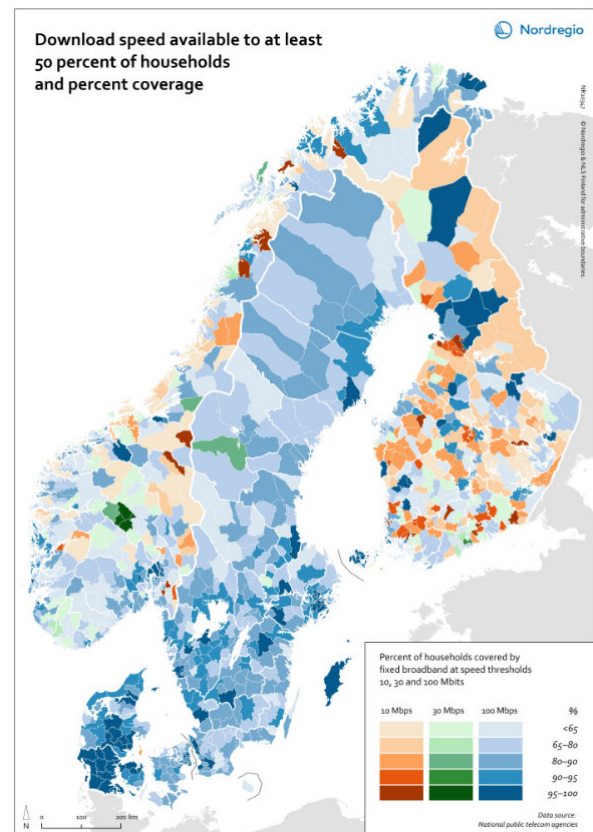
Throughout simulation workshops and interviews experts have highlighted a handful of barriers to the integration of telehealth in the healthcare system of the future:

1. Unequal access to connectivity and digital infrastructure across region
2. Socio-cultural scepticism and lacking awareness
3. Educational basis and clinicians' adoption of solutions
4. Data privacy and safety concerns in line with current health data debates
5. Increased collaboration is needed between profession silos (e.g. doctors and engineers)

Another overall need regarding telemedicine is to develop best practices for digital care. There is a need for better and more systematic knowledge about which forms of care can be provided by the telemedicine companies.¹³¹

FIGURE TEN

Broadband Speed Availability and Coverage



Designer/Cartographer: Oskar Penje, Linda Randall; Data source: National government telecom agencies 2020; from <https://nordregio.org/maps/broadband-speed-availability-and-coverage/>



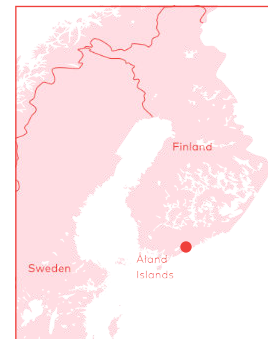
SIMULATION CASE FIVE

Glucostratus



Persons with asthma, hypertension and diabetes make measurements and notes in their everyday life as part of their care. For nurses and doctors, data written in paper forms is cumbersome to handle, prone to error, and paper forms can go missing. Glucostratus offers a remote monitoring service. Patients report their readings with a mobile application, and healthcare professionals have fast and easy access to reliable up-to-date results and ready-made reports. Digital self-monitoring data also facilitates virtual appointments which are increasingly used to improve the accessibility and cost effectiveness of healthcare services.

It is of high importance that the app data can be shared safely and easily. The service smoothenes the communications between patients and healthcare professionals and supports the allocation of resources, for example physical appointments, in a more cost-efficient manner.



Helsinki, Finland

Current Scenario – Working with Health Data

Glucostratus obtains its health data from the users. Thus, the data is generated by the individual users and provided to Glucostratus. As a telehealth service provider, Glucostratus offers the network and platform to store, sort, process and provide the data from patient wearables to doctors or healthcare professionals.

Naturally, some access to health data is already available at this stage, but it is in analogue form, which slows down and obfuscates the exchange of information, making it much more difficult for doctors and other health professionals to work. In addition, the status of a patient is not transparent, as their status is only visible during medical consultations. Thus, potentially vital care procedures may come too late.



Simulation – Effects of a Realised Vision 2030

The potential for telemedicine as a whole can be seen in Glucostratus' application for mobile devices. With easier access to shared health data in the Nordics, the communication between patients and healthcare professionals, would be significantly more efficient, precisely tailored to the patient and the treatment in question. According to experts and SMEs working in this space, it is hard to overstate the potential improvements in treatment precision and access to health coming from the integration of data from wearables and decentral real-time patient monitoring.

With the health data in question increasingly being digitalized simultaneous with the process of decentralisation, the speed obstacles and error margins of analogue data management are avoided, allowing resources to be allocated directly for effective treatments and preventive efforts alike. In this way, the theme of telehealth and the potential developments in decentral patient monitoring plays directly into the realisation of Vision 2030, regarding among others the aspects of interoperability, increased access to health for remote populations, and increased quality of care for all Nordic citizens.

For an SME like Glucostratus, the access to shared Nordic data allows the integration of their platform into wider-ranging public-private partnerships, innovating on new features for doctors to utilised the expanded data availability and increased precision. Thus, the development of health data use for telemedicine would make it possible for Glucostratus to increase data precision for doctors using their service, to cost-effectively integrate medical services to new and more remote regions, as well as consistently enable faster and more sustainable environmentally-friendly healthcare by eliminating resource intensive analogue data management.

There are several opportunities for Glucostratus to further develop their platform to a wider scope, such as more or less passive monitoring of known or unknown chronic diseases. Such a service element would benefit greatly from regular updates and the ever-increasing resolution of data coming from shared Nordic data access. Furthermore, their digital platform could be integrated into the Nordic public health sector network and become a general reporting tool in public healthcare systems.

Finally, there is the possibility to make the data available for cooperation with other stakeholders, both public and private, in terms of research and development. The fact that users create the data themselves would massively support access to this data set for uses such as preventive healthcare. Thus, by means of cooperation, there is a great potential for a tailor-made and sustainable network of actors that could introduce new and improved services to the health sector.



3.5 Decentralised Medical Trials

Defining Decentralised Medical Trials

This project works from a comprehensive and inclusive approach to trials, encompassing not only clinical trials for pharmaceutical products, but also MedTech, devices, data systems for healthcare operations, and related elements that need to be tested before implementation in the healthcare system. Hence this section uses the open-ended term 'medical trial', rather than specifically clinical trials.

Stakeholders representing patient associations, healthcare professionals, and the industry have all expressed anticipation for the potential benefits of decentralisation and digitalisation of clinical trials, as a supplement to physical clinic attendance. A classic clinical trial is carried out by the patient coming into a hospital unit for a series of visits with planned activities. In a

decentralised trial the patient does not attend physically for all visits. Here the patient talks with nurses and doctors through other communication channels. This is enabled by the use of digital tools for gathering, managing, and analysing clinical data. Video-based consultations, mobile apps for data collection, and medical devices for home measurements are all examples of digital tools making the trial participation easier and improving the quality of the data.¹³²

Decentralised medical trials are also known as "virtual" studies and characterized by less dependence on traditional research facilities or specialist intermediaries for data collection. In a fully decentralized medical trial, subject recruitment, delivery and administration of study medication, and acquisition of trial outcomes data all proceed without involving in-person contact between the study team and the patient or subject.¹³³



According to experts in this field, there is a negative trend of decreasing number of clinical trials in the Nordic countries. This is mainly due to much of the clinical research moving out from the region. The experts thus point to a need for better conditions for Nordic trials. If stakeholders and governments in the region do not manage to elevate the level of collaboration in the field, more multinational trials will be moved to other areas of the world, diminishing access to new treatment methods and products for the Nordic population. Outsourcing of clinical trials also entails that key industry actors move their trial activities to other countries, making it harder for SMEs to access established trial infrastructure and develop new products and services.¹³⁴

If the improvement in data sharing happens, it would benefit development of our services in clinical investigations. We could better design them and get better proof for the organisations we service.

— Heikki Pitkänen, Lean Entries (part of labquality), CEO & Founder

Decentralised Trials Benefit All Levels of Society

Today, there is no single or public source that provides an overview of existing and ongoing trials. With more transparency on ongoing trials, physicians and doctors in the region could better help patients access trials that are relevant for their predicaments.

Decentralising trials the populations of the Nordic countries at large. Decentralised clinical trials can

lead to better and more reliable data – as opposed to high error margins seen in current trials – and fewer trials that are being cancelled. This has the potential of translating into faster, safer, and more reliable development of new treatments for the benefit of citizens in the Nordic and beyond as “the easier access to data you have, the less work you have to do. Clinical investigations would become shorter and [...] your product would be faster to market”.¹³⁵

Decentralised clinical research offers some obvious benefits compared to classic clinical research. A real example of this is a Danish patient, severely disabled by his rheumatic disease for more than ten years, until he participated in a clinical trial, in which he was given biological medicine. However, he found it very difficult to take part in a trial and finding the information relevant to him. It was a struggle to fit the trials into a busy life and receiving information along the way. The shift from classic to digital clinical trial meant that he went from having almost no information to being able to find all the information, he needed, when he needed it.¹³⁶

Vision 2030

In 2030 decentralised clinical trials could lead the way to a much simpler, shorter and less expensive process. The decentralised clinical trials potentially have a democratising effect on research, while including a wide range of the population and making research more available with a minimum of interference in everyday life. Additionally, diversity in study population will likely increase through decentralisation, and the



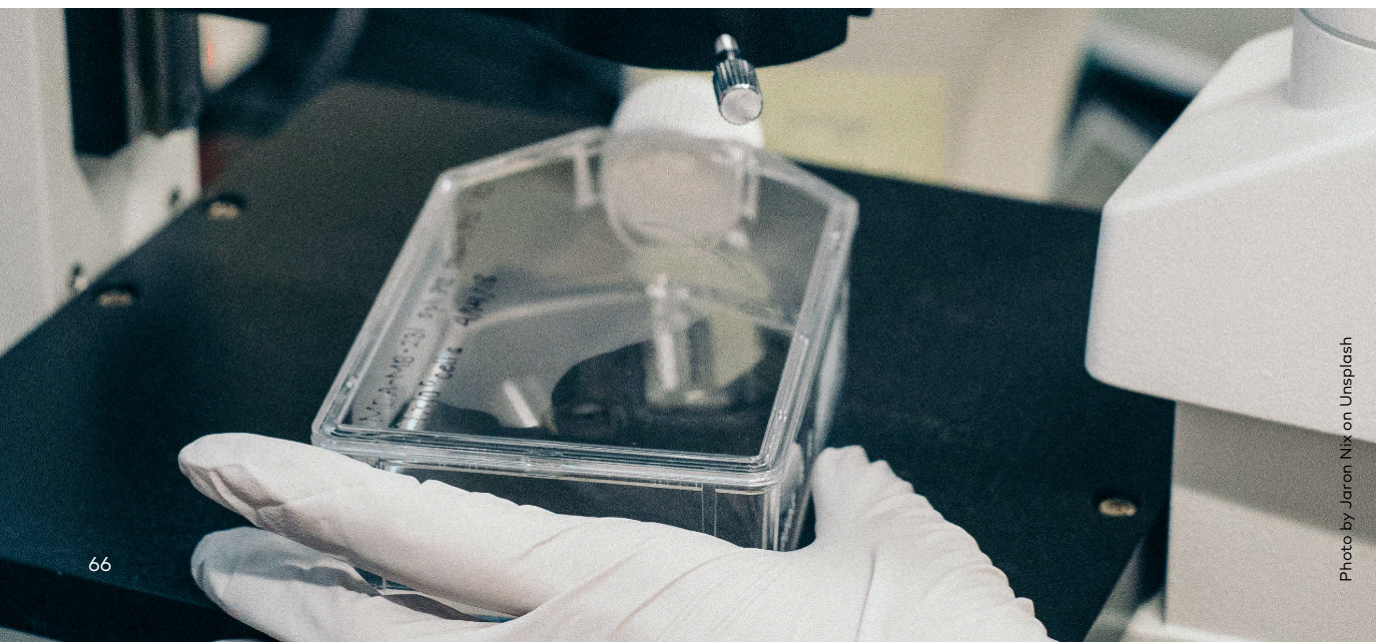
digital approach provides deeper insight into the development of diseases and the effects of treatments on a larger variety of the population.¹³⁷

An increased Nordic cooperation on clinical research could not only reverse the current negative trend and raise the number of joint clinical trials but even create the “possibility to become a global region of excellence for clinical research and clinical trials”¹³⁸ as well as it “would allow us to strengthen our region economically, in talent recruitment and retention, and in becoming a forefront leader in creating precision medicine in actuality and therefore directly impacting the patient journey”.¹³⁹ This can boost the attractiveness of the Nordic countries as partners in research, promote knowledge

transfer, and increase efficiency and research output.¹⁴⁰

The prevalence of decentralised clinical trials could add value to centralised trials by increasing accessibility to development and market for SMEs,¹⁴¹ lowering costs through decreasing the size of the studies as well as the staff size, increasing transparency and access to trials for citizens,¹⁴² and creating a more diverse pool of patients.¹⁴³

The decentralisation further has a significant export potential for Nordic countries, as well as reduced environmental footprint, due to the significant reductions in physical materials, transportation, and documentation.





A Need for Shared Solid Data

Many clinical trials take place in collaboration between public and private sector. Decentralising trials requires safe and effective management of a range of health data across devices and systems, public as well as private.

The Norwegian based Nordic Proof is an example of a platform that provides structured access to leading Nordic health institutions and testing hubs in the Nordic countries, making it easier to manage the different parts of the trial.¹⁴⁴

One strength of using digital and databased tools is that it is possible to carry out measurements of the patient with the patient, all the time. The patient can be monitored continuously and thereby achieve a far better standard of data.¹⁴⁵

Furthermore, the responsible sharing of clinical trial data is in the public interest to advance scientific knowledge that benefits future patients and society as a whole. Data sharing makes data from clinical trials available to other investigators for secondary uses, which include carrying out additional analyses, analysing unpublished data, reproducing published findings, and conducting exploratory analyses to generate new research hypotheses.¹⁴⁶

Barriers and pitfalls

The barriers and pitfalls identified through the expert interviews and workshops of the simulation can be summarised in three main points:

1. Data security
2. Medicine shipping and treatment logistics
3. Device usage, mitigated by Bring Your Own Device protocols (BYOD)

Data security is a matter of high importance when decentralising clinical trials, both technically and legally. There are also other technical issues to overcome, system-wise and for parts of the population who find it hard to navigate an app or other digital tools. Mitigating this barrier is a high priority in existing public-private collaborations on health data usage in trials, like OSCAR.¹⁴⁷ The work of such partnerships should be scaled up, especially across Nordic borders to help the integration of health data in Nordic medical trials.

Much of the required technology is still at an early stage and not yet sufficiently developed. This – in conjunction with the challenge of storing data and ensuring privacy – creates some uncertainties that need to be addressed.

Decentralised clinical trials also require shipping to multiple coordinating sites and directly to patient homes. Therefore, there must be assurance of drug stability and appropriate storage facilities in the patient's home, as well as measures to prevent unauthorized access. In addition, local laws may need to be addressed, just like the complexity of decentralised drug shipping and management introduces potentially greater complexity to the field and a higher risk in clinical trials.¹⁴⁸

SIMULATION CASE SIX

Studies & Me

Studies&Me is the first virtual contract research organisation (CRO) in Europe, enabling clinical trials to be conducted with a decentralised approach, based on digital tools designed to put the patients front and centre. The patients receive guidance and support, and they will be able to report back to the hospital from the comfort of their homes, reducing the number of physical visits to the hospital.¹⁴⁹

A recently approved study paves the way for future collaborations between private and public healthcare sector. Danish Studies&Me will be providing the digital platform for the Copenhagen Actinic Keratosis Study (the COAK study) for Swedish Coegin Pharma in a partnership approved by the Medicines Agency and the Ethics Committee in Denmark. The partnership makes it easier for the patient to engage in the development of a treatment for Actinic keratosis, a very common pre-cancerous skin disorder.¹⁵⁰

As Studies&Me is a spinout of LEO Innovation Lab under LEO Pharma, the example is further a good example of an open approach to innovation can lead to increased collaboration between SMEs and established companies, while enabling faster and better medical trials based on solid data.

Studies&Me®



Copenhagen, Denmark

Current Scenario – Working with Health Data

Studies&Me work directly with health data, especially clinical data from trials. They receive the data from the companies with which they have a cooperation and process them to make them available for the client's study. The handling of the data has to be approved by administrative or regulatory entities, like for example the Danish Ethics Council being part of approval processes for studies in Denmark.

This legally binding administrative intermediate step makes it difficult for Studies&Me to establish collaborations freely, as a range of authorities could

terminate projects at relatively late stages, reducing transparency and security in operation planning. Exacerbating this uncertainty, some entities like the Ethics Council reject access to health data as a principle, needing specific processes of documentation to show the trial in question has legitimate innovative purposes.

In a general cross-regional Nordic context, there are diverging legal requirements for trials in different countries and regions, and each could require differing approval processes from different authorities. This presents a fundamental hurdle for Studies&Me in terms of expanding collaborations and supporting digital integration of medical trials, especially across the Nordic borders.

Simulation – Effects of a Realised Vision 2030

Currently, Studies&Me focus only on studies, but with a uniform arrangement for data handling across the Nordics, the SME could see themselves in significantly more frequent and diverse projects, reaching across national borders. In the same vein, collaborations supported by shared data would make it easier for Studies&Me and their partners to develop new studies and onboard partners, as many of the hurdles would be removed. In addition, it would be easier for companies commissioning studies to obtain subjects, studies could be developed more quickly, and a centralised network would ensure patient retention.

Vision 2030 brings well-established frameworks for sharing data around trials, which would enable digital-centered organisations like Studies&Me to contribute to public transparency by pointing to their work in a centralised database for ongoing and pending medical trials in the region. Currently, no such information is available for citizens to get an idea if any possible trial treatments might benefit their specific medical situation. For many people suffering unique (co-morbid) conditions, such transparent information is highly sort after, according to patient organisations and industry experts.

The increased ease in sharing and safely storing health data will invariably lead to higher data quality of most medical trials, since digital systems are less prone to errors than analogue data management. The increased data quality will not only lead to more precise outcomes of individual trials, but also allow Studies&Me and other SMEs in the health innovation space to conclude successful trials faster, allowing development of new treatments to



happen at a faster pace, for the benefit of Nordic and global societies alike. This resource efficiency has significant impact on emissions and environmental resource savings as well.

Currently, Studies&Me is the first primarily digital contract research organisation in Europe. With vision 2030 realised, they and CROs like them can push the development of smarter, faster and more accessible testing through validated medical trials. As a field, this will inevitably lead to the growth of similar and complementary SMEs in the sector of digitally supported medical trials. More actors in the field will strengthen the quality and competitiveness of the Nordic trial organisations, and experts point out the great potential for the Nordics to be a prime hotspot for top-quality sustainable medical trials, exporting this service to the global healthcare sector, driving innovation and quality of care. The specific societal and financial benefits of this likely development need to be further investigated in a business case but will surely be significant for the Nordics as an integrated region.

3.6 Sustainability Data Measurement and Transparency

With some 4.4 percent of global greenhouse gas (GHG) emissions, the healthcare sector accounts to one of the most emissions-intensive service sectors worldwide.^{151 152} Most of these emissions result from the health systems energy and resource use, the related GHG emissions produced, but also from the utilization of toxic chemicals as well as waste and wastewater generation.

Electronic health (e-health) demonstrates great potential to not only enhance the quality and access to healthcare, but also to help decreasing pollution and environmental impact through e.g. less travelling to health appointments.¹⁵³ Next to digitalizing healthcare pathways it is however also crucial to measure the environmental impact of products and processes, i.e. collect impact data. This data can be then used to make informed strategic decisions for example when deciding which products or services to purchase or when designing clinical trials.

Procured goods and services constitute the majority of a health systems operational environmental footprint¹⁵⁴ and therefore (green) procurement is a critical area to look at when wanting to green the healthcare sector.

Defining Green Procurement and Impact Data

Green procurement is a process aiming for purchasing goods and services that have a lower impact on the environment throughout their lifecycle when compared to goods and services with similar functions that would have otherwise been purchased.¹⁵⁵ But in order to make more sustainable procurement decisions, it is crucial to have reliable environmental impact data on which such decisions can be based upon.



Impact data refers to data showing the environmental footprint of a product, service or process. The main techniques of impact data measurement are lifecycle assessments (LCA). **Life cycle assessments** are an internationally recognized and a standardized approach for quantifying the impacts on the environment of products, services or processes throughout their whole lifecycle from cradle-to-grave, i.e. starting from raw material sourcing to production, utilization, end-of-life treatment, recycling and ultimate disposal. The ISO 14040 and 14044 standards set a general framework for LCA studies, however, they do not cover detailed LCA methodologies or techniques.^{156 157} As a lifecycle assessment usually results in fine-grained data, it is a highly suitable method for impact studies on product-level, may however, be difficult to realise for complex, multi-layered systems such as healthcare systems or hospitals.¹⁵⁸

Increased Data Generation and Sharing as a Prerequisite for Sustainability

Environmental sustainability is becoming an increasingly important business case for the public but also the private health sector. But in order to be able to take sustainability into account, environmental impact data (such as LCA data) is needed – as without the respective data it is impossible to determine and quantify the sustainability of products, processes and services.

Yet, so far, lifecycle assessments are only scarcely used and are therefore not a standard practice within the pharmaceutical and healthcare.¹⁵⁹ Self-conducting environmental assessments to gather this data oneself is a highly complex, costly and time-intensive undertaking for which often the sufficient resources are missing, especially in small and medium-sized companies (SMEs). Additionally, there is also solely limited open-source LCA data for the healthcare sector available. And even if data is available, there is often a large dissimilarity in the datasets due to differing methodological aspects or impact categories.

This makes results incomparable, decreases the reproducibility of the results and reduces the possibility to generate green strategies based on sector insights and tendencies.¹⁶⁰

Not having enough or reliable data impedes the creation of internal or industry benchmarks making it challenging to assign a proper meaning and significance to the data. Therefore, to increase the benchmarkability of LCA studies but also to generally lay the basis for more environmental studies, a data sharing approach seems to be highly feasible. Also, from a procurement perspective the access to such environmental data is crucial to make informed decisions.

Currently "payers (hospitals) are not incorporating sustainability into its decisions to buy or not - they must demand this".¹⁶¹ Yet, without sufficient comparable data, procurement departments cannot verify the sustainability of



the respective solutions, accurately compare product profiles and are therefore not able to justify the choice of alternative products nor prioritize correctly. One way to share this knowledge and data would be through the creation of a cross-border database.¹⁶² The Japanese Ministry of the Environment for example, supports the Green Purchasing Network, which is an NGO that operates a database listing sustainable products and sustainable procurement guidelines.¹⁶³

Vision 2030

The Nordic region is already at the forefront of the green transition and aims to “become the most sustainable and integrated region”¹⁶⁴ in the world by 2030. A large focus therefore lays on

achieving carbon neutrality, increasing greener production and consumption, enhancing knowledge and innovation and also drive international co-operation.¹⁶⁵

The Nordic countries by themselves have relatively limited capabilities of creating data and innovation due to their small sizes and populations. When combined, however, the Nordics form a strong force and already now serve as a sustainability role model for many. Through increasing the availability and accessibility of environmental impact data, the Nordics can not only increase their position as global thought leader but also increase the attractiveness of the region to conduct research such as clinical trials as well as foster innovation and consolidate the already strong image of the Nordic brand.





Sharing health data within the Nordics enables access to "more and better data, better measures, better reactions to data and better decisions and actions towards sustainability".¹⁶⁶ Having access to a broader range of quantifiable and comparable environmental impact data also allows Nordic companies and healthcare institutions to base procurement decisions on profound numbers and therefore help greening the sector through creating demand for more environmentally friendly alternatives.¹⁶⁷ Increased demand drives the provision and therefore the availability of more sustainable solutions making it hence also easier for public and private organisations as well as citizens to opt for greener choices.

Barriers and Pitfalls

The main challenge relates to the current inaccuracy of LCA data. Due to the relative openness of the ISO 14040/14044 standards in terms of methodological choices and a lack of healthcare specific standards and guidance, LCA datasets often show noticeable discrepancies - even in studies on identical products which are only being performed by different LCA experts. LCA assessments are generally very complex to conduct and require high amounts of effort, money, resources and knowledge as well as time to be conducted properly. And even if a company is diligent about monitoring and reporting environmental data on company or site level, it often remains a challenge to translate such data records to a product level.¹⁶⁸



Therefore, especially small companies encounter large difficulties in assessing their products' or services' environmental impacts due to lacking knowledge and resources. As this is likely to become the new standard it is crucial to enable smaller companies with less funds to conduct such environmental assessments and remain competitive in the Nordics but also global space through e.g. grants, loans or financial support programmes.¹⁶⁹

The goal does not have to be to collect perfect data right from the beginning - even vague or incomplete data is a starting point and still better than no data at all. Thus, it is substantial

to start creating the awareness as well as to build the competences to collect and make use of environmental impact data.

Simultaneously, the EU is also in the process of developing a more harmonised way to collect environmental impact data by means of the Product Environmental Footprint (PEF) concept which is an LCA method that aims at providing more specialized LCA methods for specific product categories and therefore making LCA analyses more comparable and reproducible. This makes it also easier for companies to verify their sustainability claims and for consumers to choose the right product.^{170 171 172}



Photo by Hendrik Morkele on Unsplash



SIMULATION CASE SEVEN

Mediq Sverige AB



Mediq Sverige AB is a provider of a wide range of products and services to healthcare facilities in Sweden. They supply healthcare articles and medical devices to private and public customers but also but also realize warehousing and logistics.

Mediq Sverige AB is medium-sized with around 130 employees and is part of the Mediq Holding BV which is headquartered in the Netherlands. Mediq Holding BV also has other country divisions in the Nordics, such as in Denmark, Norway and Finland. The divisions operate locally in the countries, yet when combined, they are meaningful representation of the Nordic region and together they constitute one of the largest distributors of healthcare products in Northern Europe.



Kungälv, Sweden

Current Scenario – Working with Health Data

Mediq has been certified compliant to ISO 9001 and ISO 14001 and strongly worked on establishing sustainability as one of their central business focus areas. Through continual analyses they determined energy consumption, transport emissions, packaging materials and procurement and purchase of products as the main priority areas of their sustainability endeavors. They are constantly striving towards decreasing their CO₂ emissions, but also aim at offering more sustainable environmentally-friendly alternatives to their customers. Ideally, they would like to provide elaborate sustainability information of their products in their web shop.¹⁷³

However, currently it is still a relatively complex undertaking to collect sufficient product sustainability environmental impact data and provide a transparent and comparable overview to the customers.

| We see sustainability as a central part of our business concept.¹⁷⁴



Simulation – Effects of a Realised Vision 2030

In a vision 2030 scenario where access to data in the Nordic region is significantly facilitated, it can be expected that companies like Mediq highly benefit from such a reality. Having access to shared LCA data would enable Mediq not only to fulfill their aspired sustainability goals but even would help them exceed them as illustrated in the following:

■ Effects on Exports

Through shared health sustainability data, Mediq would be able to offer a larger range of green alternatives and would have the potential to become the largest sustainable healthcare product distributor in Northern Europe as well as to expand its reach and market lead to other countries and regions.

■ Effects on Product Development and Innovative Capabilities

As better environmental data fosters innovative progress in technological development and improves quality and effectiveness of costs and resources, large advances in quality and sustainability of their products and services can be achieved.¹⁷⁵

Through access to LCA data, they would also be able to take more environmentally friendly purchasing decisions by comparing the different products' environmental footprints and therethrough make more quantifiably verified and transparent procurement and supplier choices.



■ Effects on Nordic Collaboration

One of Mediq's goals is to achieve an increased environmental cooperation with their suppliers and customers.¹⁷⁶ Better mutual access and use of LCA data will enable a joint assessment and development of sustainable and efficient solutions with suppliers and customers. In this way, awareness and information about green procurement could be largely increased.

In collaboration with our suppliers, customers and partners, we want to increase knowledge and awareness of responsible purchasing. Hereby we create conditions for working for improvements and promoting sustainable development locally as well as globally.¹⁷⁷

■ Effects Related to the SDGs

The main effect related to the UN 2030 Sustainable Development Goals would concern the SDG Nr 12 of sustainable production and consumption. Through access to LCA data, it would be possible to carry out more thorough environmental impact analyses and create standards and guiding values for product areas. This can then help foster sustainable decision-making in procurement and product development.

Mediq would additionally be able to publish elaborated and transparent sustainability information of their products in their web shop facilitating green consumption choices for their customers.

Also, lifecycle analyses increase the knowledge about a firms' ecological impact and can be used to train the employees on the environmental effects of their activities and products.



3.7 Transition to Preventive Care

The "biggest improvement in healthcare would be a shift from reactive to more preventive health",¹⁷⁸ i.e. shifting away from only treating symptomatic diseases to focusing on preventive care. This calls for a more holistic approach to improving life instead of preventing death. "The integration of preventive healthcare will make much of the hospital space redundant, building new hospitals, we will need fewer beds, heating space, medicine and medical equipment" - what is needed is "remote preventive analysis on individual level".¹⁷⁹ A big part of it will be "eliminating human contact where it's not necessary, and then improving it where it is. Also, if we had a bigger focus on preventive health, healthcare will be cheaper, for the individual and society".¹⁸⁰

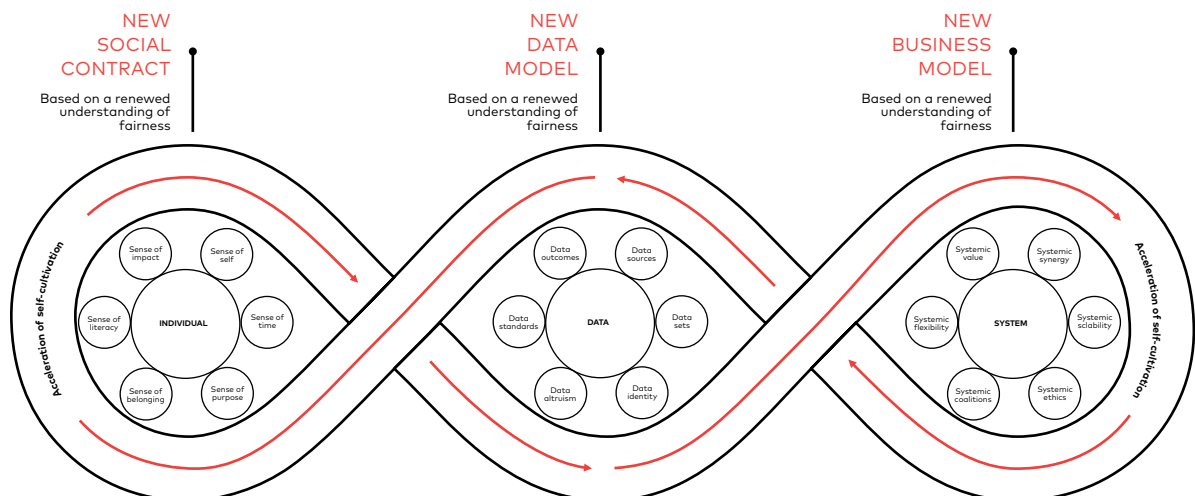
The shift from "sick care" to preventive care could further empower the citizens to be individuals rather than just being patients. In such a future, individuals have ownership and control over their data, thereby being in power of their own care. Data will no longer be an asset to be owned, monetised and siloed, but rather curated and shared to drive better outcomes. Also "hospitals have woken up and want to use the data for other purposes than research [such as] patient analytics and flow with the focus on preventive medicine to meet the requirements of the health and social care reform".¹⁸¹ The personalisation of health also has the potential to make it more affordable and accessible the people by reducing inappropriate care.¹⁸²

FIGURE ELEVEN

The Sustainable Health Model

Developed in the [Nordic Health 2030 Magazine](#) - Towards Preventive Care

The sustainable health model visualises the philosophy and the key concepts developed over the course of the Nordic Health 2030 workshop series. Sustainability surfaced as the main discussion point throughout the workshop exercises. The loop below illustrates how individuals data, and the system can enable the urgent transition from sick to preventive health. The red arrows shows how a societal movement drives the synergy between these three elements that will support preventive health.





Nordic countries have high levels of trust and many similarities between the countries. By benefitting from this, current issues with demographic inequality, restrictions of data sharing across countries, and disconnected sectors within healthcare can be overcome. In such a future, data is shared in a secure way across countries, while privacy is upheld. Private and public sector work together with a holistic perspective determining the preventive care of each individual. And time and place will be less of an issue, when accidents or illness strike.¹⁸³

Key Points from the Themes

The overarching goal for interoperability is to increase the integration of health and data. In imagining a future health system, the ability to seamlessly cooperate and work across both systems and borders is essential. However, such a degree of interoperability requires vast amounts of data. If this data is to be meaningfully and usefully operationalized, an equally large degree of innovation is required to ensure data sharing is secure.

People living with mental illness are more likely to develop physical health problems and have poorer physical health outcomes, including higher rates of premature mortality. A realised Vision 2030 would make it possible to establish an overarching data system that could be of great service in terms of research, preventive assistance, and combating systemic diseases. Expanded use of current devices and the integration of wearables could highlight or

encourage behaviours to prevent mental health crises and minimize unsupervised breakdowns.

Personalised treatments and personalised medicine have the potential to tailor medical decisions, practices, interventions and/or products to the individual patient, based on his or her predicted response or risk of disease. In such a world, pharmacies could customize the minimum needed dose to bring the most effective treatment to every patient. Further, the treatment gap between well-educated or self-verbalizing citizens, and low-income or immigrant population groups could be bridged.

The benefits of telehealth and decentralised monitoring are many: It is more convenient to the patient, who in addition spends less time away from work, eliminates travel time, and is able to receive care out-of-hours. Moreover, the time gained from telemedicine eases the burden for children, parents, and employers and thus eventually also on public finances. The time saved by staying home instead of going to the hospital or the doctor's office leads to environmental benefits as well, and the doctors' time is spent more efficiently.

In a fully decentralized clinical trial, subject recruitment, delivery and administration of study medication, and acquisition of trial outcomes data all proceed without involving in-person contact between the study team and the patient or subject. The decentralised clinical trials potentially have a democratising effect on research, while including a wide range of the population and making research more available with a minimum of interference in everyday life.



The healthcare sector accounts to one of the most emissions-intensive service sectors worldwide. Sustainability is becoming an increasingly important business case for the public but also the private health sector. The Nordic region is already at the forefront of the green transition and aims to “become the most sustainable and integrated region” in the world by 2030. A large focus therefore lays on achieving carbon neutrality, increasing sustainable production and consumption, enhancing knowledge and innovation and also drive international co-operation.

The Future of Healthcare

Three main areas need special attention in order to advance the healthcare of the future:

1. Data and Digitalisation
2. Technology
3. Behavioural Sciences

Data and Digitalisation

In the future of healthcare data are implicit. Everyone’s data are shared through wearables, between care providers and pharmacies. The Nordic countries benefit from the shared values as trust, fairness, equality, openness, responsibility, and self-cultivation.¹⁸⁴

Personal medicine is integrated into practice at pharmacies and hospitals, improving individual treatment and preventive care. Time and place are close to being unimportant as data are shared between sectors and across borders, allowing patients to be treated everywhere in the Nordic countries.

The gain is a much better flow from diagnosing over treating to recovering as a patient, since all relevant data are accessible to all relevant people in the process, allowing them to act appropriately. Chronicle diseases are discovered and treated preventively, and treatment is way more convenient than what is the case today.

This calls of course for a high level of data security and privacy, and there is a high risk of companies exploiting and monetising these data. Another pain is the personal experience of and rhetoric about being healthy and being sick. If everyone knows everything about one’s health, then everyone is sick. Everyone has something that could be treated, but should it? Who is to be the judge of, when it is appropriate to intervention? How does one avoid stigma, when it is up to each and every one to take care of one’s own care and wellbeing?

Technology

In the future of healthcare, new technologies are developed rapidly. Regulations are not as strict as of today, allowing SMEs to develop ready-for-market technologies, while failing or scaling fast.



The development of new technologies makes measurements, diagnostics, reports, and operations both easier, cheaper, and more precise. The automation of many procedures further makes processes more convenient to healthcare personnel and frees up time for face-to-face-contact with patient or other tasks that calls for human skills.

It is of high importance not to compromise safety and testing while lowering the number of regulations, though. A not so regulated market may lead to anarchy or untrusty systems or allowing competition between developers to get out of hand.

Another issue is where to place the bill. Medical technologies are expensive to develop, acquire, and use. How does one make sure that this does not create a bigger gap in access to treatment and preventive care between high-income and low-income citizens?

Behavioural Sciences

The future of healthcare requires new roles amongst healthcare personnel. They should see themselves as preventers instead of treaters. As caregivers instead of system maintainers. The roles of the patients will be changed too. Citizens are no longer patients, as health becomes a lifestyle and not a matter of re-establishing status quo after an accident or a disease.

In such a future, people are responsible for tracking and reporting their own health. Wearables are serious aids as they allow people to take proactive care of their own health and wellbeing and ease the burden of healthcare

professionals. In this scenario, the sustainable self-carer is rewarded for his or her efforts, while necessary support is still provided to those who need it.¹⁸⁵

The obvious gain of this scenario is to keep more people out of the hospitals and "actually pushing the number of years you live well before you start having ailments is a really important step and requires a stronger focus on preventive health".¹⁸⁶ Focusing on prolonging the time where no treatments are needed also eases the burden on the doctors and nurses, it reduces the spread of bacteria among patients, and it reduces the levels of pollution and emissions due to e.g., transportation, human and technological activity, and use of materials in hospitals.

Physicians, pharmacist, doctors, and nurses could be working together more holistically. Sharing progress, history, and other data with each other to focus on the overall wellbeing of the citizen in question. Physical and mental health is equally assessed in every point of contact and focus in on how to improve life instead of preventing death. Also "university hospitals have woken up and want to use the data for other purposes rather than research: patient analytics and flow, with the focus on preventive medicine and to meet the requirements of the health and social care reform".¹⁸⁷

But it is not only health personnel, who are working together. Healthcare professionals and citizens work together as well. Citizens help healthcare professionals through high-quality self-diagnosing and treatment. In such a future it is not only okay to see the doctor on an average basis – it is expected.



"If we had a bigger focus on preventive health, health care gets cheaper. For instance, you catch cancer 6 months earlier, then the treatment is so much cheaper. It's a mentality shift that is needed".¹⁸⁸ Also, "if we start to think about that we are not waiting for the persons to come to the hospital and then do something about it, and start to think about how we can take care of them at home or at their workplace or somewhere else... We will talk about what kind of diseases we have in the society quite differently".¹⁸⁹ A shift in the perception of healthcare, sickness, health, well-being, personal responsibility etc. is a huge obstacle to overcome as it requires lots of resources in the healthcare system, which is already overloaded now.

There is also the risk of stigma. What if one is heavy, ill or unhealthy or make bad decisions about one's own health? This scenario could be putting too much pressure on individuals, but also on health personnel. For instance, who is to blame if treatment goes wrong or illness is not discovered in time? Is death even acceptable in such a future?

Steps Towards Vision 2050

If all of this is achieved by 2030, we can imagine we will have transformed by 2040 to a net zero preventive care system. This could be the foundation for the Vision 2050 as described in Nordic Health 2030.¹⁹⁰

In 2050 data use is a question of improving life quality, rather than securing privacy and anonymity. Data are safely shared across borders, and the democratisation of data leads to free and equal access to sustainable quality healthcare opportunities for all.

The individual in 2050 is met with a much more holistic approach, as the healthcare system now takes into account personal preferences, personalised medicine, and a more complex understanding of co-morbidities, for instance. The context of healthcare, therefore, is much broader than the specific disease in question.

Individuals use lifestyle and healthcare apps to a broad extent, which has boosted preventive



Photo by Claire Nolan on Unsplash



mental and physical care in 2050. Technologies such as AI, VR, and AR further pave the way for more individualised and precise treatment, benefitting both patients and healthcare professionals, who can provide and receive healthcare from all over the world.

The Vision 2050 is an ambitious vision, requiring big changes in today's healthcare. Some of the first steps towards achieving this vision are shifting the balance in GDP. In Denmark, around ten percent of GDP is spent on sickcare whilst only 0,3 percent is spent on preventive care. These priorities will have to be flipped around, if a truly preventive healthcare system is to be achieved.

The approach to and use of data is another area that requires large scale changes. There is a need for innovation in how to share and store health data to achieve safely stored, anonymised data

that can be shared between relevant stakeholders. Blockchain is a promising technology to improve this area by securing a flexible, but closed data sharing system.

Another issue of data is how to share and access data across sectors and borders. The legal framework surrounding data needs to be more flexible without compromising the individual's right to own her or his data, and without having companies monetising the data. A Nordic collaboration could be leading the way in creating a platform with global access to individual's health data that allows individual's and healthcare professionals to achieve the best possible care from anywhere in the world.

If these three areas are addressed, the road to a truly preventive healthcare system is paved.



SIMULATION CASE EIGHT

Qinematic

QINEMATIC
HUMAN MOVEMENT ANALYSIS

Qinematic license software to service providers, educate health and fitness professionals, and provide scan and advisory services directly to individuals, companies and insurers. The company, consisting of four employees, uses their Movment service to optimise human movement in order to help them avoid pain and improve their quality of life.

The Movment service is enabled by a suite of software that records, tests, and reports human movement. Health and fitness professionals can use 3D scans to test function and then push exercises to a client's mobile phone. The exercise programs target specific needs of individuals, and the online portal offers a visualisation of a digital self together with other fitness and health services.



Stockholm, Sweden

Current Scenario – Working with Health Data

Qinematic's goal is to use 3D scans to detect discrepancies in movements or movement patterns at an early stage and with little effort.

Health data i.e. the scans play a central role in this. They use the data that they collect independently from their tests and scans to be able to treat or anticipate and thus prevent injuries via the movement patterns of people, e.g. the mobility of a knee. They feed the data into an algorithm that analyses it and recognises schemata if necessary.

Their mission is to change the current perspective in the Nordic health sector from sick care to preventive care. The current hurdle and general problem are the availability of data. Furthermore, due to the lack of access to data, Qinematic, like many other start-ups in preventive healthcare, is dependent on generating data on its own, which limits the development potential of start-ups in particular. However, data is the key component in validating the effectiveness of their product.

Glenn Bilby (CEO) wants to ensure a handling of human health that is similar to the maintenance of cars. He envisages annual examinations, like with cars, or 3D scans, which would help to generate a large data set at first, but in a further step to record individual as well as overall social problems and to be able to guarantee adequate treatments. Currently, scans carried out in laboratories are very cost-intensive at an estimated €800 per scan but could be reduced to around €13 by local physiotherapists. This discrepancy in price would be an additional incentive for the integration of such scans into annual check-ups. By shifting the focus from sick to preventive care, an increase in spending on preventive care could greatly decrease the general spending in the health care sector, which would open up the potential for more innovation spending.

Simulation – Effects of a Realised Vision 2030

In a realised Vision 2030, Qinematic would be strongly affected by the changes to the Nordic healthcare sector. Their business model, which currently spends a lot of energy on aggregating data and, in the next step, validating their product, would thus change its focus. Qinematic could turn primarily to researching data sets and developing algorithms. Furthermore, the widespread availability of 3D scans would be a great service to health care. Problems with movements could be detected at a young age and many costs due to injuries and treatments could be saved in the long run. In particular, there is a lot of potential in their innovative capabilities as they would also contribute to a more sustainable healthcare sector and more cooperation in the Nordics.

■ Effects on Product Development and Innovative Capabilities

Glenn Bilby envisions that people can be scanned at many points (i.e., gyms, doctors, or in public) without a barrier because if millions were scanned every day, there would be adequate data to make appropriate and good diagnoses. One of the central prevailing problems is the data situation. Because even in the studies on which most of the evidence for treatments rests, there is a poor starting position in terms of data. Qinematic's CEO puts it this way: "You can't diagnose people and diseases accurately if you are only cherry-picking populations based on 50 participants at a time". This could potentially result in anecdotal evidence, Glenn stresses. Further, guidelines and studies are based on too small populations to be valid and reliable.

- He refers to the Netherlands, which already has a lot of data as they document everything. If the data would be accessible Qinematic would be able to realise special cohorts of people which would provide an empirical basis for adequate treatment. More precisely, what affects individuals and what are the outliers. Consequently, they could measure what treatment is required for a subset of people. Ultimately this would result in the creation of precision medicine.

The barrier in the availability of health data slows our process of development down

■ Effects on Sustainability

In terms of sustainability, Glenn sees a change of dogma as inevitable. He explains that we have fallen far behind on issues like remote diagnosis. It would be much easier and less costly to diagnose people from home instead of sending them to a doctor or having them travel long distances for specialists, which discriminates against people in remote regions in particular. Glenn summarises this as "We are moving patients around like we are parcels around". By diagnosing from home, you could reduce the cost of transportation and time, as well as the psychological stress of planning and travelling to a specialist clinic. Further, I cut costs of personal, leads to quicker treatments and ultimately less time sick resulting in improving the general quality of life. However, further changes in regulation are required to adequately pay for digital consultations.

■ Effects on Nordic Collaboration

The general availability of data that Vision 2030 would enable naturally leads more collaboration in the Nordics. The current focus of generating data would thus be on research. Studies in this field currently follow the waterfall principle. The process goes through several stages, starting with the commissioning of a study in cooperation with a university, collecting and analysing the data, involving a partner and finally publishing a paper. In this process, however, innovation is usually left behind, as the focus of a university is research and not the design of products, as Glenn complains. Glenn Bilby (CEO) sees this as an opportunity cost

because generally "technology is advancing slower than innovation".

In collaborations they would like to do studies on total knee replacements, total hip replacements, ACL injuries in football players of which there are 600k in Sweden alone and fall and balance studies affecting 30% of the people over 60. Collaborations would also reveal similarities in movement patterns and corresponding injuries that have not been linked before. This better data would lead to better and more specific treatments. Glenn summarises this with "Where are the correlations between independent factors that allow us to think deeper about precision medicine?".

We are skateboarding uphill, where we should be going down the motorway on a motorbike taking all the exits of different illnesses taking care that is required right now.

4 Afterword

The preceding chapters detail the process through which workshops, interviews, and simulation cases with a combined participation more than 200 experts, as well research and analysis combines to demonstrate the use-case for a realised Vision 2030 for shared Nordic health data.

The vision details that "by 2030, the Nordics will be the most sustainable and integrated health region in the world, providing the best possible personalized health care for all its citizens."¹⁹¹ The developments needed to realise the vision involves both hospitals, universities, and other public actors, as well as companies of all sizes in the private sector. In its realisation, it will lead to significant sustainable development and innovation in terms of products, operations, and legal frameworks alike, across the entire Nordic region.

The comprehensive use-case has been created to make the expected outcomes of the realised Vision 2030 tangible, as it pertains to companies and other stakeholders both public and private. The preceding chapters outline a combination of deep ideational processes and wide analyses, showing the potentials for innovation, improved health, increased exports and integrated sustainability, among other parameters.

The goal of the project has been to provide examples of how the realised vision of shared data contributes directly to constituting the ideal future of Nordic healthcare. As this report hopefully shows, this goal is successful, insofar as the learnings of the use-case contribute to creating a full business case for shared data in the Nordics to guide decision making on the subject.

Emerging from the data and research are seven key themes that summarise the complex cornerstones of a sustainable development of the Nordic health space. The seven themes are:

1. Improving Interoperability
2. Mental Health and Well-Being
3. Personalised Treatments
4. Telehealth and Decentralised Monitoring
5. Decentralised Clinical Trials
6. Sustainability Data Measurement and Transparency
7. Transition to Preventive Care

All in all, the full range of project activities and analyses serves to further develop the Vision 2030, providing nuance to key goals and the projected pathway there. It is shown that through sharing health data a 2030 scenario can be reached where systems, devices and regions are interoperable and collaboration amongst Nordic countries is easily possible, mental health in the Nordics is largely improved, tailored treatments and medicines are developed, remote care and decentralised monitoring are a widely used standard, treatment development is accelerated through wider access to data, environmental impact data of treatments and products is taken into account and health issues are diagnosed earlier or even prevented. Moving towards the best possible future of healthcare is a complex and very rewarding process, supported by the efforts of this and similar projects.



Photo by Samuel Raita on Unsplash

Appendix

Contributors, Interviews

Contributor Organisation	Contributor Name	Contributor Country
Astra Zeneca	Johanna Lindén	Sweden
Bio-Me	Morgen Isaksen	Norway
Brum	Ingi Björn Sigurðsson	Iceland
Business Finland	Pekka Ollikainen	Finland
Cerenion	Ilkka Juuso	Finland
Cognitio	Rósbjörg Jónsdóttir	Iceland
Floow2Healthcare	Lieke van Kerkhoven	Netherlands
Glucotratus	Pekka Mäkelä	Finland
Health Capital Helsinki	Juha Paakkola	Finland
Health Cluster	Thorkell Sigurlaugsson	Iceland
HealthTech Finland	Sandra Liede	Finland
Helsinki University Hospital	Pekka Kahri	Finland
Howdy	Rasmus Hartung	Denmark
Lean Entries	Heikki Pitkänen	Finland
LeoPharma	Bjarke Stærkind	Denmark
Ninchat	Ville Mujunen	Finland
Norway Health Tech	Magnus Lund-Vang	Norway
Oyster Venture Partners	Carl Weir	Denmark/UK
Qinematic	Glenn Bilby	Sweden
Region H	Krestine Mougard	Denmark
Region Halland	Magnus Lingman	Sweden
Sensotrend	Mikael Rinnetmäki	Finland
Shaarpec	Thomas Davidsson	Sweden
Tampere University Hospital	Niko Lönn	Finland
Teal Medical	Anders Lykkestrup	Denmark
University of AI and Machine Learning Germany	Oliver Essen	Germany
University of Helsinki	Tommi Mikkonen	Finland

Contributors, Workshop 1

Healthcare (public sector)

Contributor Organisation	Organisation Type	Contributor Country
Central Denmark Region	Public Institution/ Organization	Denmark
Centre for Sustainable Hospitals	Hospital	Denmark
Embassy of the Kingdom of the Netherlands	Public Institution/ Organization	Netherlands
Swedish Environmental Protection Agency / Naturvardsverket	Public Institution/ Organization	Sweden
Kimball Sustainable Healthcare	SME	USA
Klinikin	Hospital	Iceland
KTH Royal Institute of Technology	University	Sweden
MedTech4Health	Public Institution/ Organization	Sweden
Metropolia	University	Finland
Norway Healthtech	Non-for-profit	Norway
Örebro Universitet	University	Sweden
Predicell	SME	Finland
Puhti	SME	Finland
Region Stockholm	Public Institution/ Organization	Sweden
Senso trend	SME	Finland
Shieldme	SME	Norway
Scope	SME	Finland
Soenia	SME	Finland
TCC Casemix	SME	UK
Tervise Arengu Instituut	Public Institution/ Organization	Estonia
TEM	Non-for-profit	Norway
TEM	Non-for-profit	Sweden
Upgraded	Non-for-profit	Finland

Contributors, Workshop 2

Lifescience (private sector)

Contributor Organisation	Organisation Type	Contributor Country
Dattaca labs	SME	Iceland
Demant	Corporate	Denmark
Embassy of the Kingdom of the Netherlands	Public Institution/ Organization	Netherlands
KTH Royal Institute of Technology	University	Sweden
Metropolia	University	Finland
Sahlgrenska Science Park	Non-for-profit	Sweden
Studies&Me	SME	Denmark
TCC Casemix	SME	UK
Turku University Hospital / Varsinais-Suomen Sairaanhoidopiirin	Hospital	Finland
TEM	Non-for-profit	Sweden
University Health Network	Hospital	Canada
VocDec	SME	Estonia

Contributors, Workshop 3

Connected Industries (public and private)

Contributor Organisation	Organisation Type	Contributor Country
Brandmark	SME	Norway
Edify.ac	SME	UK
Fastus	SME	Iceland
Kerecis	SME	Iceland
Komed Health	SME	Germany
Lund University	University	Sweden
Norwegian Research Council	Public Institution/ Organization	Norway
Örebro Universitet	University	Sweden
Oslo University Hospital	Hospital	Norway
Patient Journey App	SME	Netherlands
Sahlgrenska Science Park	Non-for-profit	Sweden
SecApp	SME	Finland
Sony	Corporate	Sweden
The Trade Council Denmark	Public Institution/ Organization	Denmark
University Health Network	Hospital	Canada

Contributor Organisation	Organisation Type	Contributor Country
Aallto	SME	Finland
Bewhiz	SME	Italy
Brainlab	SME	Sweden
Business Finland	Public Institution/ Organization	Finland
Health Capital Helsinki	SME	Finland
Medigoo	SME	Finland
Predicell	SME	Finland
Schneider Electric	Corporate	Sweden
TEM	Non-for-profit	Sweden

Contributors, Workshop 4

Healthcare (public sector)

Contributor Organisation	Organisation Type	Contributor Country
AlMed4U Oy	SME	Finland
Astra Zeneca	Corporate	Sweden
Benete	SME	Finland
Brandmark	SME	Norway
Business Finland	Public Institution/ Organization	Finland
Center for Bæredygtige Hospitaler	Hospital	Denmark
Glucotratus	SME	Finland
Innoconsult APS	SME	Denmark
Karolinska Institutet	University	Sweden
Lund University	University	Sweden
Munin Industries S.a.r.l.	SME	Luxembourg
Novartis	Corporate	Germany
Region H	Public Institution/ Organization	Denmark
Scope	SME	Finland
SecApp	SME	Finland
Sitra	Public Institution/ Organization	Finland
Soenia	SME	Finland
StepUp Health	SME	Denmark
Switzerland Global Enterprise, Trade Point Nordics	Public Institution/ Organization	Switzerland
TEM	Non-for-profit	Sweden

Contributor Organisation	Organisation Type	Contributor Country
The Norwegian Research Council	Public Institution/ Organization	Norway
Turku University Hospital	Hospital	Finland
University Health Network	University	Canada
University of Helsinki	University	Finland
Vistor	SME	Iceland

Contributors, Workshop 5

Lifescience (private sector)

Contributor Organisation	Organisation Type	Contributor Country
Ambu	Corporate	Denmark
Brandmark	SME	Norway
Business Finland	Public Institution/ Organization	Finland
Demant	Corporate	Denmark
Innoconsult APS	SME	Denmark
LeoPharma	Corporate	Denmark
Lund University	University	Sweden
Scientific Alliance Associate	SME	Denmark
TEM	Non-for-profit	Sweden
The Norwegian Research Council	Public Institution/ Organization	Norway
TrialNation	Non-for-profit	Denmark
University of Twente	University	Netherlands
Vistor	SME	Iceland

Contributors, Workshop 6

Connected Industries (public and private)

Contributor Organisation	Organisation Type	Contributor Country
Allied for Startups	Non-for-profit	Belgium
Ambu	Corporate	Denmark
BioLib	SME	Denmark
Brandmark	SME	Norway
Business Finland	Public Institution/ Organization	Finland
ECCA Nordic AB	SME	Sweden
Experiental HealthTech	SME	UK
Falck	Corporate	Denmark
Health Incubator Helsinki	SME	Finland
Information Services Group (ISG)	Corporate	Finland
Kiwok Nordic AB	SME	Sweden
KTH Royal Institute of Technology	University	Sweden
Lund University	University	Sweden
Metropolia University of Applied Sciences	University	Finland
Minbuza	Public Institution/ Organization	Netherlands
Patient Journey App	SME	Netherlands
Phonolyser	SME	Finland
Predicell	SME	Finland
Puhti	SME	Finland
Schneider Electric	Corporate	Sweden
Sony	Corporate	Sweden
Spinverse	SME	Finland
Strategies	SME	Finland
SwedenBIO	SME	Sweden
TrialNation	Non-for-profit	Denmark
TEM	Non-for-profit	Sweden
The Norwegian Research Council	Public Institution/ Organization	Norway
The Swedish Energy Agency	Public Institution/ Organization	Sweden
ULOCS	SME	Sweden
UN Global Pulse	SME	Finland
Women in Global Health Finland	Non-for-profit	Finland



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