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LEARNINGS OF THE DANISH LIGHTHOUSE LIFE SCIENCE

- PRACTICAL INSIGHTS FROM A MULTI STAKEHOLDER COLLABORATION

Nordic Healthcare Group

Danish Life Science Cluster

Lundbeck

novo nordisk

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- Practical Insights from a Multi stakeholder Collaboration



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Additional information and the report is available at
www.erhvervsfyrtaarnlifescience.dk

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EXECUTIVE SUMMARY

The Danish Lighthouse Life Science (LLS) is a pioneering multi-stakeholder, multi-sector collaboration model that unites health and economic growth within a single strategic framework. Established in 2022, LLS set out to tackle Noncommunicable diseases (NCD's)[1] —particularly obesity and mental disorders—while mitigating health inequitable[2] and fostering economic growth, especially for small and medium-sized enterprises (SMEs). During the period 2022–2023, LLS delivered concrete short-term results in the prevention and early detection of overweight and obesity, while also establishing a robust framework to tackle the deeper structural challenges that contribute to health inequity. By merging technological innovation, community[3] engagement, and interdisciplinary collaboration, LLS has demonstrated that health improvements and economic growth can progress hand in hand, ultimately benefiting both individual citizens and society at large.

Technology and Communities as Catalysts for Health Equity

A key insight from LLS is the powerful effect of blending technological solutions with strong community support to promote health equity. Technology enables the scaling of interventions and individualized approaches, but it turned out to be the active involvement of communities — such as workplaces, schools, and local organizations — that ensured a wide reach, particularly among marginalized groups.

- **Gamification**: Interactive digital games co-developed with technology firms fostered healthy eating habits and physical activities among children and adolescents, engaging them in playful competitions that helped embed healthy behaviors in their daily routines.
- **Self-Monitoring:** Health promotion apps and digital tools offered in workplaces and schools provided employees, students, and teachers with user-friendly platforms to track progress, set goals, and receive feedback—ultimately supporting long-term behavior change.
- **Digital Health Platforms:** Online and mobile platforms served as virtual community spaces, where participants could access health information, share experiences, and motivate each other. These forums helped build a sense of shared responsibility and support, ensuring technology did not widen inequities.

This combined approach empowered individuals to make lifestyle changes in their day-to-day environments, reinforcing healthy habits through shared resources, collective motivation, and real-world applications.

Prevention and Early Detection as Structural Challenges

LLS has recognized that tackling NCD's require more than just individual interventions. It demanded a coherent, structural strategy spanning educational institutions, workplaces, and healthcare systems. By collaborating with a variety of actors, LLS worked to integrate health solutions into people's routines, making early interventions more likely and potentially mitigating future healthcare costs.

- **Inspiration for a Healthier Life at the Workplace:** A program introduced nutritional coaching, regular weigh-ins, and daily exercise routines. Participants reported weight reductions

[1]Noncommunicable diseases (NCDs), also known as chronic diseases, tend to be of long duration and are the result of a combination of genetic, physiological, environmental and behavioural factors. The main types of NCDs are cardiovascular diseases (such as heart attacks and stroke), cancers, chronic respiratory diseases (such as chronic obstructive pulmonary disease and asthma) and diabetes. WHO, 16.11.2024.

[2]Health inequities are systematic differences in the health status of different population groups. These inequities have significant social and economic costs both to individuals and societies. WHO, 16.11.24.

[3]Communities are defined as both a feeling of belonging and a set of relationships among people. They are formed to meet shared needs and are characterized by trust, shared experiences, and a sense of identity. For more, see: Stanford Social Innovation Review, "What Is Community Anyway?", 16.11.2024.

of between 5-10%, suggesting that targeted workplace initiatives could effectively drive lifestyle changes.

- **Movement, Healthy Weight and Wellbeing,** an Offer for Pregnant Women: This project focused on early-stage prevention by supporting pregnant women with personalized activity plans, healthy meal guidance, and peer group conversations to maintain both mental and physical well-being.

These initiatives showed that collectively addressing structural factors — such as time constraints, economic barriers, and cultural perceptions — was critical to securing sustainable health benefits.

Reducing Stigma and Increasing Inclusion

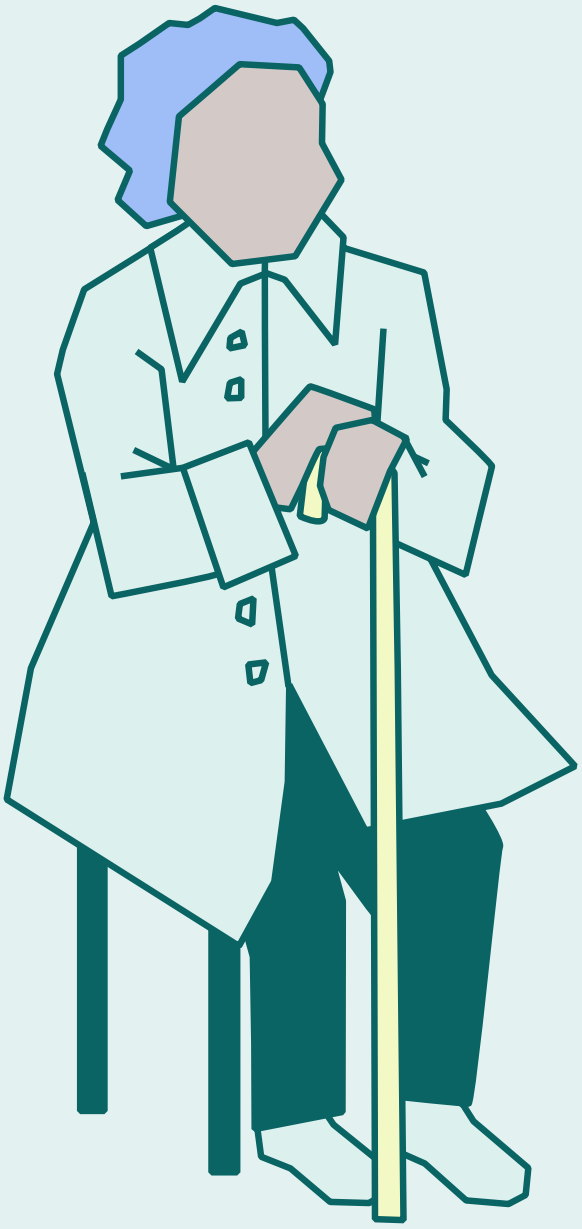
Reducing stigma, particularly around obesity, was a central theme in LLS. Projects used appreciative conversational models and value-based language to lower participation barriers and encourage open dialogue on sensitive health topics. This inclusive approach placed emphasis on individual strengths and aspirations, rather than medical diagnoses. Additionally, cultural inclusion efforts were employed to ensure that diverse socio-economic groups could fully benefit from LLS offerings.

- **The Health and Well-being at Work (STAR):** By focusing on mental health and resilience, STAR reduced stigma around discussing psychological challenges in the workplace. Early evaluations indicated a 30% increase in reported well-being among participants.

Multi-Stakeholder and Multi-Sector Collaboration for Economic Growth and Innovation

LLS initiative brings together a broad network of public institutions, private companies, knowledge institutions, and civil organizations, enabling a unique environment where collaboration accelerates both economic growth and health innovation. A central feature of this environment is the Growth Platform — a guidance and support structure for SMEs. Here, SMEs can qualify their ideas in close collaboration with end users, share resources, and

"WE REACH FURTHER TOGETHER"



test solutions in real-world healthcare contexts from the earliest stages of development. By pooling diverse competencies and fostering demand-driven courses, the Growth Platform eliminates many typical hurdles SMEs face when attempting to navigate research, design, and validation processes on their own. Instead of competing for limited resources, participating SMEs can work side by side to refine their concepts, strengthen market readiness, and ultimately contribute to a thriving Danish life science ecosystem.

Financing Models and the Road to Internationalization

An important component of LLS involves facilitating access to risk capital for SMEs, bridging the funding gaps that often hamper novel health technologies. Through LLS-supported financing models, many SMEs have secured proof-of-concept validation in clinical settings, which then has attracted further investment and spurred market introductions beyond Denmark. For example, the digital health platform Emento have established a subsidiary in Germany and have signed a contract with a leading university hospital — an expansion largely driven by evidence gathered through local pilot projects. Similarly, SENS Innovation has leveraged LLS support to accelerate product development and boost sales, crediting the initiative for creating trust and smoothing the path to market readiness.

Overall, 42 projects under Healthy Weight from 2022 to 2023 have benefited from LLS's structural and financial support, advancing an average of two steps on the initiative's growth model from proof of need to proof of scale. Notably, 25% of the participating SMEs have already scaled their solutions, indicating a strong path to broader market impact. Furthermore, 79% of these companies have rated LLS's influence on their development and growth as either "excellent" or "very positive." By spotlighting the global relevance of digital health innovations — especially those targeting obesity and mental health — LLS has enhanced both the national and international competitiveness of Danish life science ventures.

Future Perspectives and Scaling

While LLS has achieved notable results in both health outcomes and innovation, the evaluation indicates the need for longer implementation timelines to fully realize economic benefits such as job creation. Systematic data collection also emerges as a priority for accurately assessing the partnership's sustained impact.

Moving forward, the following recommendations arise:

Long-Term Follow-Up: Maintain support systems for participants to ensure lasting health gains and identify areas needing additional resources.

Targeted Recruitment: Develop strategic outreach to marginalized groups to further reduce health inequities.

Technological Innovation: Continue to invest in and evolve digital platforms, using iterative feedback loops to refine user experience and efficacy.

Enhanced Collaboration: Strengthen public-private partnerships to push innovations from pilot projects to everyday practice, both nationally and internationally.

By 2024, LLS has established a strong foundation for a future were health and economic growth work together. The experiences and lessons learned underscore the core principle that "we reach further together," illustrating how purposeful collaboration can simultaneously address complex health challenges and spur sustainable economic growth in the life science sector.



BRIEF DESCRIPTION OF THE THREE EVALUATION SECTIONS

Evaluation of the Collaboration Platform
This section analyses the multi stakeholder collaboration platform at the heart of Lighthouse Life Science. It focuses on the strategic partnership's role in promoting innovation and economic growth by uniting public institutions, private companies and research environments. The document details how technological solutions, combined with social communities, have supported the development of sustainable health initiatives that reduce health inequalities and create growth opportunities.

Evaluation of the Pilot Projects
This section presents the results of various pilot projects conducted under the Lighthouse Life Science Project. It describes concrete health improvements, including weight loss, enhanced mental well-being and increased physical activity. It also examines how different technological interventions such as self-monitoring and gamification engaged participants in their health journey. The success of these projects has been significantly driven by multi-stakeholder cooperation between public and private actors.

Evaluation of the Growth Potential of the SME Segment
This section examines how participation in Lighthouse Life Science has impacted growth and innovation in Danish SMEs. It analyses how public-private partnerships and venture capital have strengthened SMEs position in both national and international markets. The document also highlights the need for longer implementation cycles to fully realize the growth potential.

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EVALUATION OF THE COLLABORATION PLATFORM

Image from the project 'Healthy Movement, Healthy Weight'. The partners are Steno Diabetes Center, Center for Clinical Research and Prevention, SENS Innovation, Etal.Aps, Brevetti AI-, and The Metabolism Center, University of Copenhagen

INTRODUCTION

Globally, and in Denmark, health systems face several pressing challenges that require new, innovative solutions. With an ever-increasing number of people struggling with chronic conditions such as obesity and mental disorders, the need for cross-sector collaboration is greater than ever. In this context, the Danish Lighthouse Life Science was initiated as a strategic vision to address chronic diseases, promote health equity and support economic growth. Moreover, the ambition of the Lighthouse Life Sciences is to strengthen Denmark's position as an international driver in life science.

The challenges of healthy weight and mental disorders are large and complex - over 50% of Danes struggle with overweight or obesity - obesity has a major impact on several chronic diseases. Danes are also challenged by mental illness – 25% of sick days are due to mental challenges. Likewise, there is also a great inequality within these health challenges. (Kessing et al., 2023; The Danish Health Authority, 2023)

Lighthouse Life Science is initiated with the clear mission to foster transformative innovations through multi stakeholder partnerships spanning both the public and private sector. This multi-sector and multi-stakeholder effort combines technologies, communities and evidence-based approaches. The goal is to ensure that health solutions are not only accessible to resourceful citizens but also reach marginalized groups in society.

APPROACH TO TRANSFORMATIVE INNOVATION AND PARTNERSHIPS

In the establishment and building of the Lighthouse partnership, different approaches have been used. In particular, the following approaches have provided inspiration in promoting collaboration across different sectors:

- **Network management approach:** By building and managing relationships, this approach ensures that diverse perspectives and resources are integrated, enhancing the collective ability to innovate and solve complex public problems. (Klijn & Koppenjan, 2016)
- **Social capital and infrastructure:** Building social capital through weak ties is essential to expand the reach and effectiveness of Public Private Partnerships (PPPs). These connections bring in new ideas and resources outside the immediate network, fostering creativity and innovation that can be harnessed within the partnership. (Lin, 2001)
- **Political stakeholder management and compromise:** Effective stakeholder management is essential to maintain the balance of PPPs. By managing political interests and ensuring trade-offs, this approach aligns different objectives and fosters a collaborative environment where joint innovation efforts can thrive. (Sørensen & Torfing, 2007)
- **Loosely coupled organizations:** Loosely coupled organizations provide the flexibility needed for PPPs to innovate. By allowing independent entities to experiment, this approach supports the integration of different innovations, strengthening the overall partnership and its ability to respond to challenges. (Weick, 1976, 1995)
- **Iterative approach to innovation:** The iterative approach supports the adaptability and resilience of PPPs. By emphasizing continuous learning and experimentation, it allows partnerships to evolve over time, ensuring that innovation is responsive to changing needs and contexts. This ongoing commitment strengthens the trust and flexibility of the partnership so that it can better withstand and adapt to challenges. (Ansell & Gash, 2008)
- **Managing complexity through relationships:** Managing complexity through relationships is key to the success of PPPs. By focusing on the dynamic and emergent nature of relationships, this approach enables partnerships to navigate uncertainty and drive innovation in non-linear, adaptive ways. (Stacey, 2001)

The experience from establishing the governance of the Danish Lighthouse Life Science shows that using these theoretical approaches continuously, and as needed, is essential for success. Continuous

learning has highlighted the need for a mindset where partnerships aim for a common goal while accommodating individual interests. Maintaining a focus on learning, adapting, and managing different interests is essential for fostering a trusting and safe collaborative environment. Specifically, bilateral and group dialogues are necessary for aligning common overall goals and creating value for both individuals and the community in the governance. Balancing these aspects requires governance managers to adopt an approach that includes continuous adjustments and relational competencies at strategic, tactical, and operational levels.

The onboarding process is important for stakeholders to understand their contributions and benefits, ensuring a clear alignment of expectations in joining the network of partners. Transparency, honest communication, and open processes are vital, as noted in recommendation no. five from the University of Copenhagen's evaluation:

> *Create time and space for continuous adaptation, alignment of expectations and transparency in decision-making processes, as these are important prerequisites for participation* (recommendation no. five in (The Danish Lighthouse Life Science Whitepaper (2023). p.18).

GOVERNANCE

Governance of the Lighthouse Life Science includes a consortium with the highest political level in Denmark, being mayors, regional chairmen, rectors of universities, pension companies and CEOs of leading companies.

To facilitate effective coordination among the diverse stakeholders, a Steering Committee was established. This committee holds the central responsibility for orchestrating a broad spectrum of activities. These activities range from overseeing specific pilot projects to managing services offered through a platform called the Growth Platform in close collaboration with Business House Copenhagen (which will be detailed later in this report). The Steering Committee ensures that efforts are aligned, and strategic objectives are met effectively. The governance structure of the Lighthouse Life Science initiative is depicted in Figure 1.

THE PHASES AND THEMES OF THE LIGHTHOUSE

Lighthouse Life Science has a long-term vision towards 2030. Receiving support from the Ministry of Industry, Business and Financial Affairs, supplemented by additional co-financing primarily in the form of hours from private and public actors. Two grants have been received as funding.

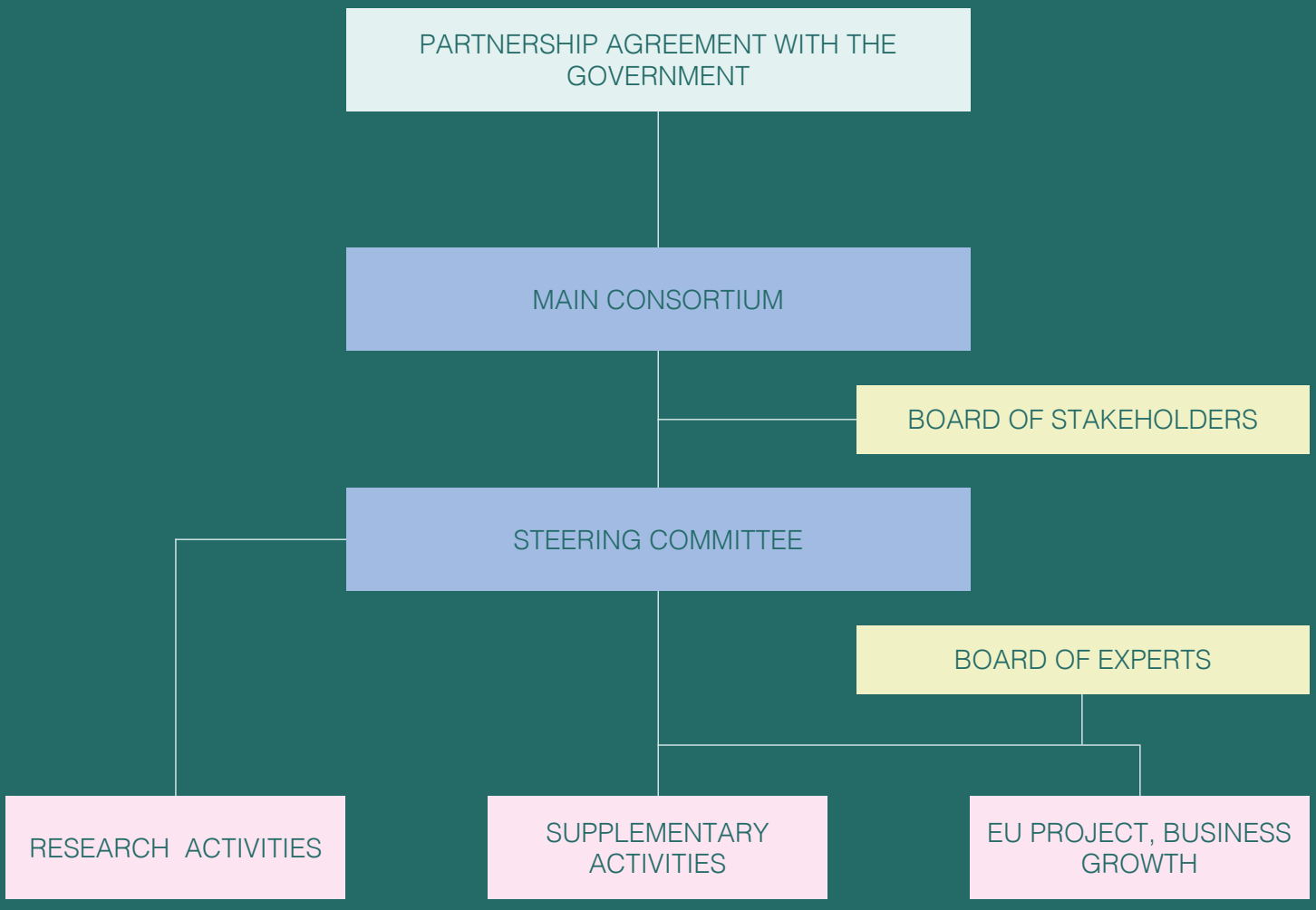
The first grant was awarded in the period 2022 – 2023 with a focus on pilot projects within healthy weight and for the establishment of the knowledge and guidance function, the Growth Platform. The second grant was awarded in 2023 and is running until 2026 with a focus on mental health. This will be further elaborated in the section "The second focus in Lighthouse Life Science – Mental Health. Figure 2 illustrates the phases of Lighthouse Life Science, related to the two grants and the long-term vision.

The funding in the individual grants for the EU partnerships is shown below, they follow the current guidelines for partnerships under the Regional and Social Fund and Decentralized Business Development Funds.

- Lighthouse Life Science – Healthy Weight
  - Total public Funding: EUR 11.036.370
  - Total co-financing in terms of hours: EUR 2.412.166
- Lighthouse Life Science – Mental Health - Budget
  - Total public Funding: EUR 9.753.040
  - Total co-financing primarily in terms of hours: EUR 5.594.185

The private funding indicates a high level of engagement, as the partners who participated have not received 100% funding in relation to their time spent on partnerships and activities.

Figure 1: The governance structure of the strategic partnership for health equity, Lighthouse Life Science.



Novo Nordisk Foundation: **25,75 million EUR** for the research projects.

Governmental grants: **21,15 million EUR** for the public private partnerships and innovation projects. Additional self-financed: **8,28 million EUR.**

FOCUS ON HEALTHY WEIGHT

The issue of noncommunicable diseases is rising in the world and in Denmark. An example is the proportion of people with obesity in Denmark (BMI ≥ 30 kg/m2) has increased from 13.6% in 2010 to 18.7% in 2023. And it is expected that the proportion of adults in Denmark with obesity will increase to approximately 33% in 2040. This is illustrated graphically in Figure 3.

(The health of the Danes - The National Health Profile: Mid-term survey, Danish Health Authority, 2023; The proportion of Danes with overweight, projected to 2040, National Institute of Public Health, 2024).

There is also a great inequity within overweight and obesity. The partners therefore wanted the target group to be broad - they wanted to look at new ways to solve the challenge on a more structural level both at an earlier stage, but also at a community level - such as pregnancy, school, after-school care, leisure activities, families, workplace and the health service.

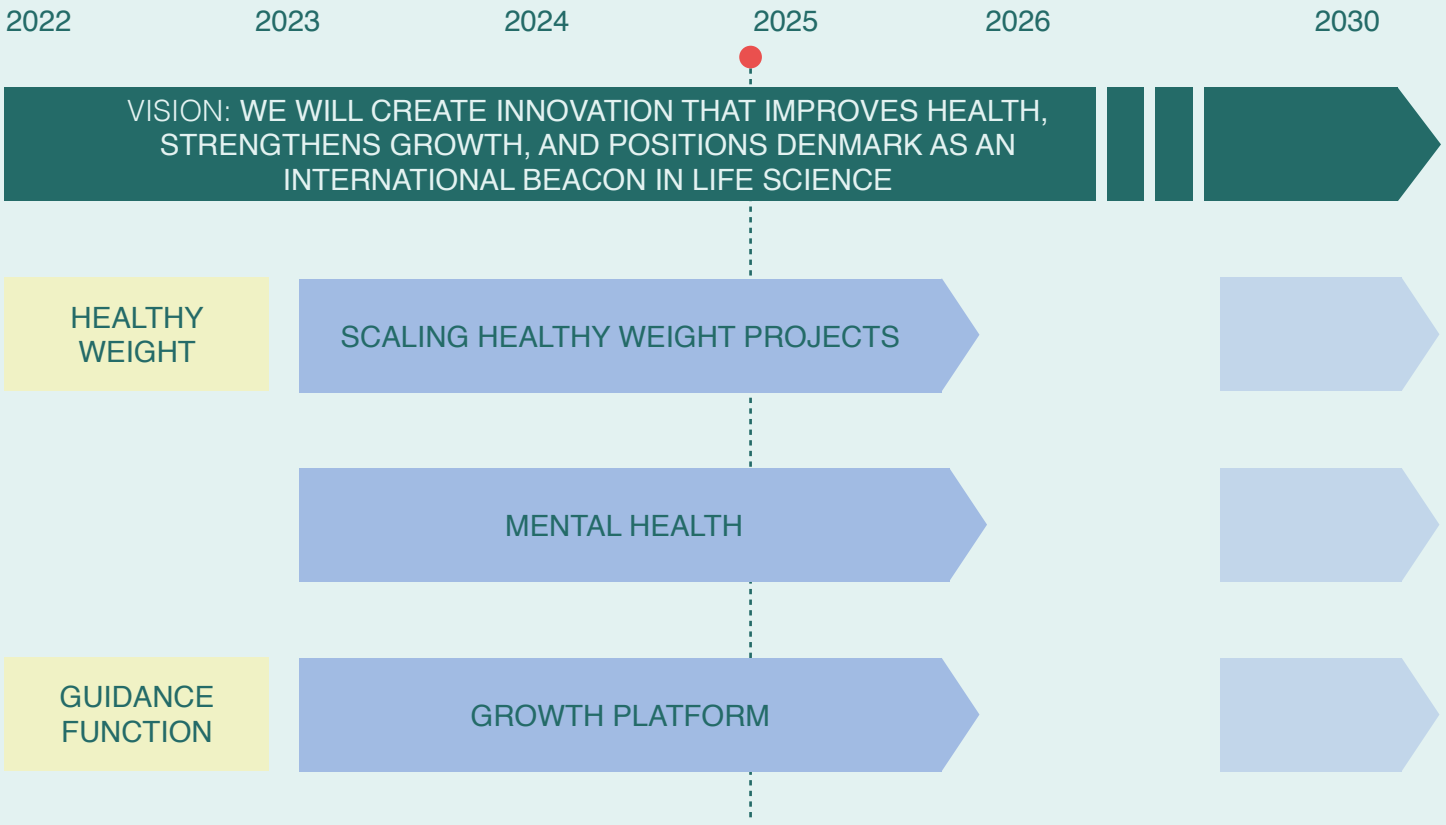
The strategic partnership chose obesity as the first focus, because of its scope, its complexity and the need for multi stakeholder, multi sectoral approach to turn the tide.

THE SECOND FOCUS IN LIGHTHOUSE LIFE SCIENCE – MENTAL HEALTH

While healthy weight in 2022-2023 was in process, the Main Consortium (Figure 1) decided that the second focus in the Lighthouse should be Mental Health (Figure 2).

To further strengthen the potential for realizing the vision of the second focus, new activities were initiated based on a new political agreement in psychiatry established in 2022. The Psychiatry Plan is a national health strategy for the next 10 years (SST, 2022). The plan is ambitious, and the

Figure 2: Overview of the two phases of the Lighthouse Life Science grants



partnerships are committed to assist in finding innovative solutions to help with this huge societal challenge within three specific key areas of mental health, see figure 4.

The purpose of linking pilot projects and activities to a national health policy and agenda was the greater potential for implementation and scaling as well as a greater opportunity for more long-term financing of the initiatives that show potential for value – both in health outputs and supporting economic growth.

It is essential for success that there is a political alignment combined with addressing concrete issues and practical needs through close interaction with employees and citizens in both the public and private sector.

The initial focus on healthy weight within the Lighthouse has laid the groundwork for extending this approach to the second focus in mental health. After addressing mental health, there will be a new health focus for the upcoming third phase, signifying political readiness to incorporate the Lighthouse into a national strategy.

In the next section, learning and experiences that have been gained in connection with Lighthouse Life Science – Healthy Weight in the period from 2022 – 2023 are described.

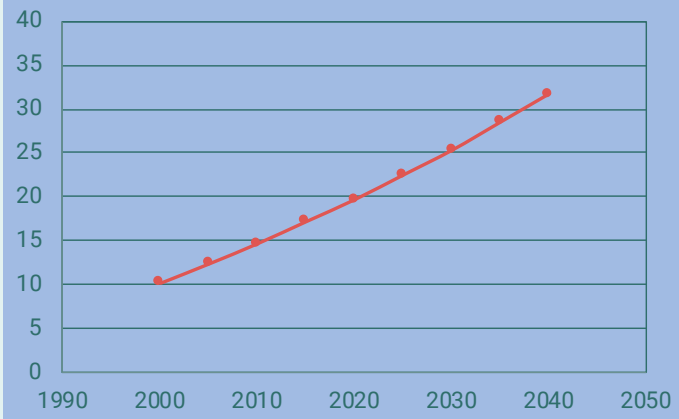
HEALTHY WEIGHT EXPERIENCES

THE PILOT PROJECTS, 2022-2023

The strategic partnership in the Lighthouse has succeeded in implementing coordinated efforts on prevention, early detection and health management of obesity (figure 4) that do not only focus on the goals of the individual projects but also have a common vision of reducing inequality in health. By pooling knowledge, competencies and resources, and by leveraging a unified platform, the partnerships facilitate that the projects worked towards the same overall goals, increasing the likelihood of achieving long-term structural improvements combined with economic growth potentials.

In contrast to traditional project collaborations, the strategic partnership shown in figure 1 has been able to create a coordinated effort that works across sectors and brings together resources from different actors. This has laid the foundation

Figure 3: The projection shows that the proportion of adults in Denmark with obesity is expected to increase.





Source: Data on the prevalence of severe obesity in Denmark is drawn from Tolstrup et al. (2024), which provides projections based on national health surveys.

Figure 4: The concept, which consists of prevention, early detection and health management of healthy weight and mental health

	PREVENTION	IDENTIFICATION	MANAGEMENT
HEALTHY WEIGHT	A healthy start to life and inspiration for a healthier life	Identification of high-risk groups and targeted identification of high risk groups	Research project on multidisciplinary management
MENTAL HEALTH	Building an easily accessible offer in the municipalities for children and young people	Information and destigmatization efforts	Strengthened effort for people with severe mental disorders








for longer-term missions to increase health equity through prevention, early detection, and health management of obesity in a holistic perspective, where technology, community, and social capital work together to reduce health inequality and promote a more inclusive health culture focusing on health equity.

What distinguishes the Lighthouse Life Science projects from traditional health programs is the ability of the strategic partnership to bring together a wide range of actors under a common framework, which has created a coordinated effort on promoting health and economic growth. This has enabled structural innovation that extends beyond individual projects and creates synergies between public institutions, private actors and research environments.

One of the main differences found between a strategic partnership and a project collaboration is the opportunity to integrate and share knowledge across the projects. The strategic partnership, shown in figure 1, serves as a collaboration platform where learning from the individual projects is collected and used to inform future initiatives. This approach requires a different way of working, which is based more on network management by building and strengthening relationships with different perspectives and resources, that are integrated to jointly innovate and solve the complex challenges (Erik Hans Klijn and Joop Koppenjan). The collaboration platform has shown unique value by being an agile solution to complex challenges within health equity and obesity.

GROWTH PLATFORM AS AN ACCELERATOR FOR DEVELOPMENT AND GROWTH

The growth platform plays a significant role in supporting the needs of SMEs from idea to scale.

In the period from 2022 – 2023, 347 participating companies were registered in the activities on the growth platform, including open knowledge sharing and branding activities. More than 154 unique companies have participated in knowledge and guidance activities, and of these, 26 companies have participated in courses with introductions on how to export solutions to other markets.

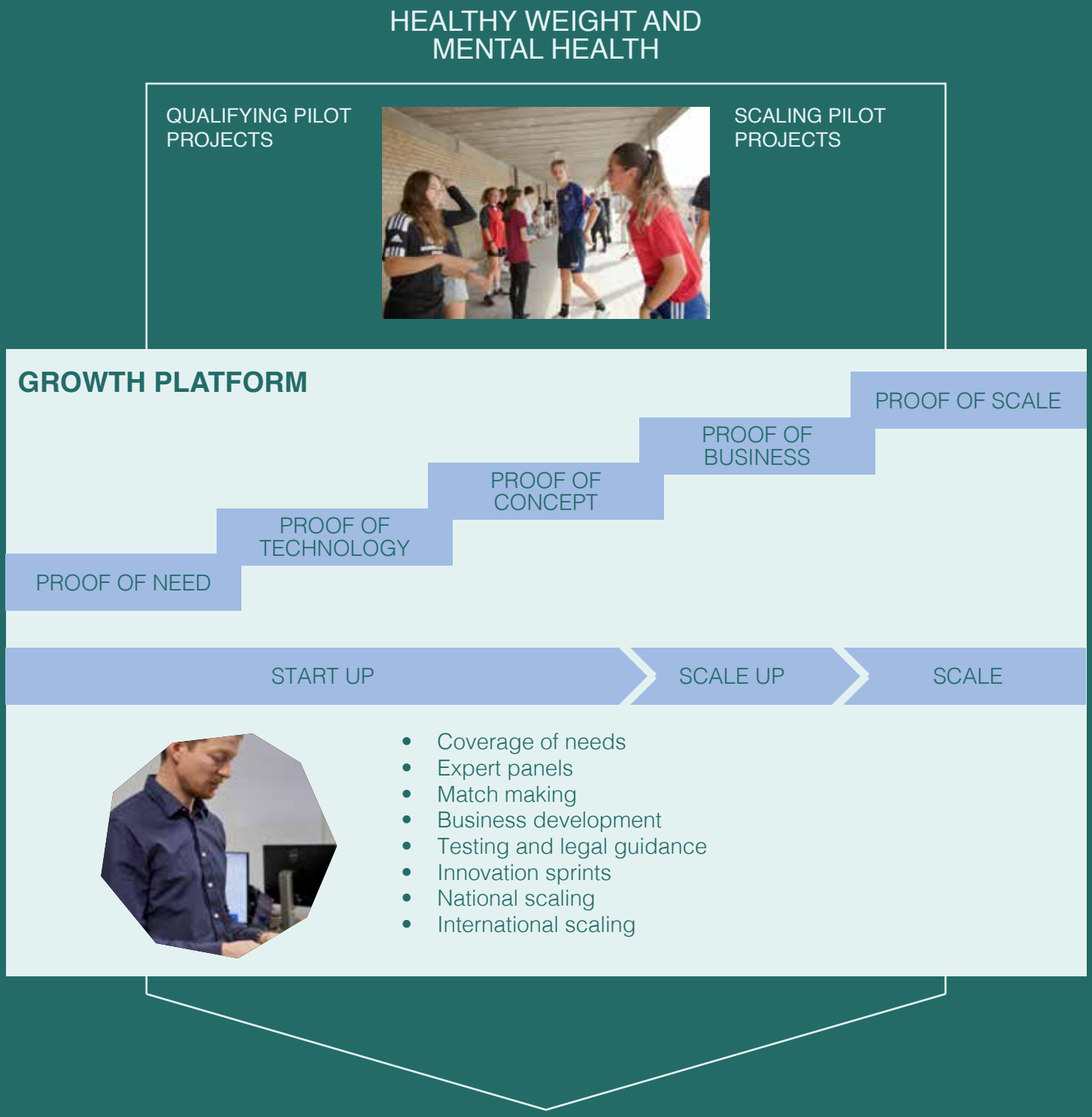
The growth platform offers guidance for SMEs in connection with qualifying their ideas and concepts in close collaboration with the users right from the start. The concept for the growth platform is shown in Figure 5. The purpose of the growth platform is to provide offers for SMEs in one place. Instead of competing, SMEs collaborate to create demand-driven courses in a strengthened format, leveraging multi-competence collaboration.

Likewise, SMEs are supported and guided in public-private collaborations in the innovation process through design, development and testing of solutions in clinical practice up to market maturation and introduction to export markets. This has accelerated the process of maturing solutions for certification, implementation, sales, and scaling. This approach enables SMEs to develop without having to follow each step of the process (Proof of Need, Proof of Technology, Proof of Concept, Proof and Business/Value, Proof of Scale), tailoring the journey to meet their specific needs and accelerating their development. The growth model is illustrated in Figure 5.

For more information on learning and experiences in realizing the growth potential, please read section “Evaluating the growth potential”.



Figure 5: The concept, the Growth Platform, which guides the SME segment throughout the development process with a view to achieving faster and more qualified results from idea to scale



LIGHTHOUSE LIFE SCIENCE – INTERNATIONAL OUTREACH

From 2022 to 2024, Lighthouse Life Science has established a significant international outreach program. The initiative has engaged with delegations and decision-makers from 22 different countries, showcasing Denmark's expertise in developing health solutions and fostering collaboration between public and private entities, graphic illustrated in figure 6.

Key aspects of Lighthouse Life Science's international outreach include:

- **Global Engagement**
  The Lighthouse has hosted 34 distinct events or visits, including 14 international delegations to Denmark from diverse nations such as Brazil, Canada, China, Finland, France, Germany, Israel, Italy, Norway, Portugal, Serbia, Singapore, Spain and the United States of America. These engagements have allowed for knowledge exchange and the promotion of Denmark's life science ecosystem.
- **Multilateral Collaborations**
  The Lighthouse has participated in six international conferences and events, including the Health Tech Summit Conference, Nordic Life Science Days Conference, Tour de Health and the Sustainability Summit in New York City. These platforms have provided opportunities to showcase Danish innovations on a global stage.
- **Strategic Partnerships**
  The Lighthouse has engaged with key international stakeholders, including the EU Commission, foreign embassies, and government representatives from various countries. Of the 34 engagements, five were Danish outreach events to other countries, helping foster potential collaborations and promote Denmark's life science sector internationally.
- **Knowledge Dissemination and Export Promotion**
  Through four roundtable discussions, six conferences, and multiple delegations, the Lighthouse has shared insights on topics such as tackling chronic diseases, building health resilience, and driving innovation in the life sciences sector. Additionally, the Lighthouse has been involved in life science export promotion events, such as the 'Pioneering Public-Private Partnerships within Life Sciences' initiative in Italy. The largest single outreach event, Tour de Health '24, involved 13 countries with Danish health representation.

By actively engaging with international partners and showcasing Denmark's unique approach to life science innovation, Lighthouse Life Science is positioning Denmark as a global player in PPPs and health solutions. The activities in the Lighthouse have steadily increased, with nine events/visits/activities in 2022, 14 in 2023, and 11 planned for 2024, demonstrating growing international interest in Denmark's life science expertise.



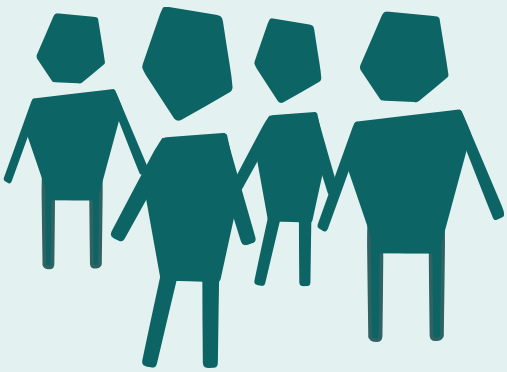
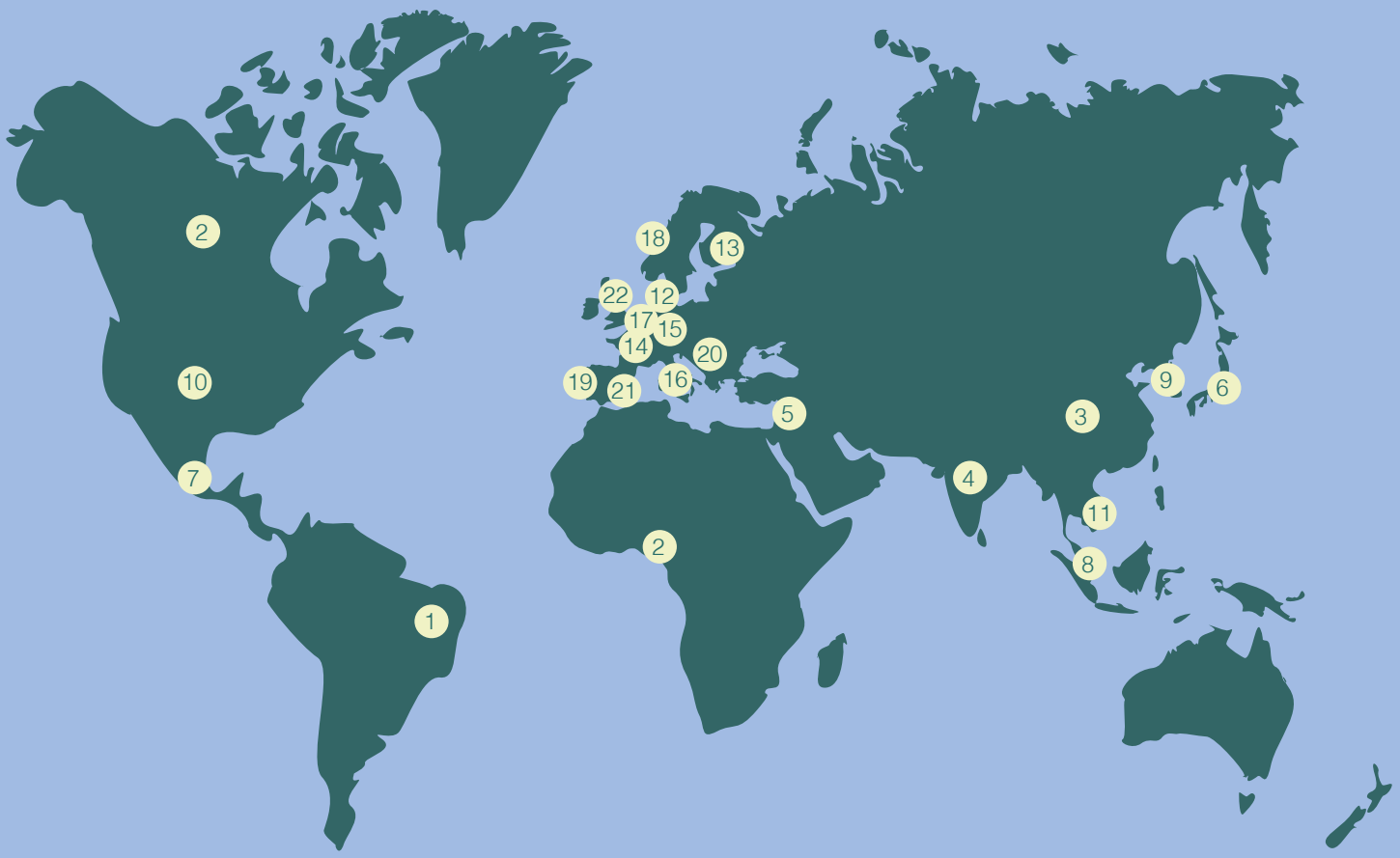


Figure 6: Illustrates the Lighthouse international reach so far, and the dedication to sharing knowledge about the Lighthouse work in public private life science partnerships



1. Brazil
2. Canada
3. China
4. India
5. Israel
6. Japan
7. Mexico
8. Singapore
9. South Korea
10. USA
11. Vietnam
12. Denmark
13. Finland
14. France
15. Germany
16. Italy
17. Luxembourg
18. Norway
19. Portugal
20. Serbia
21. Spain
22. United Kingdom

HEALTHY WEIGHT LEARNINGS

MULTI-STAKEHOLDER COLLABORATION MODEL – A CATALYST FOR INNOVATION

The increasing challenges of chronic diseases in society necessitates an agile and holistic effort that can handle the complex health and economic consequences that chronic diseases and health inequality create. Traditional efforts have not produced the necessary results, complex challenges must be worked on in strategic, long-term partnerships. Therefore, the strategic partnership under the Lighthouse Life Science initiative has created a framework where work is done across sectors to ensure faster learning, innovation and implementation. By combining public and private resources with research-based knowledge, it has been possible to develop and test innovative health solutions quickly and efficiently. The partnership has created a dynamic model that both delivers rapid indications of potential for health and economic growth while providing the basis for long-term structural change.

One of the most significant differences between the Lighthouse Life Science projects and previous health projects is the multi-stakeholder collaboration model, which has created a unique framework for faster innovation and implementation of health solutions. Unlike many traditional health projects, which are often isolated within either the private or public sector, these pilot projects have been rooted in collaboration between public institutions, private companies and research institutions. This has made it possible to test and adapt health intervention in a more agile and flexible way. Figure 7 shows the transition from driving innovation and transformation within siloed organizations to be engaging in cross-sectoral collaborations using iterative project models and network structures to achieve more impact and change.

It has been critical to get a long-term commitment from the partnership to drive the complex and nonlinear innovations needed for transformation.

Traditional linear thinking is not applicable to solving complex, long-term missions. The network structure allows the partners to use their resources in a collective way and thereby create a greater dynamic where the different interests, perspectives and competencies come into play for a common goal and direction. It contains a mindset of “we get the furthest together”, which is also supported by Henry Ford:

> ***“Coming together is the beginning. Keeping together is progress. Working together is success.” - Henry Ford***

Another aspect that distinguishes these projects is the focus on short-term interventions, which were used as a first step in longer-term strategies. In many other projects, there are typically longer and more extensive interventions that do not necessarily test concepts in smaller, modular formats. These short-term pilot projects have shown that it is possible to achieve meaningful health improvements in a relatively short period of time and that these improvements can be scaled up.

The partnership’s multi-stakeholder cooperation model shows a path for faster innovation in the field of health. By combining knowledge and resources from public institutions, private companies and research environments, it has been possible to create an agile model that can quickly test and

Figure 7: The approach to working in a different way from linear and traditional models to more iterative and networked models



FROM:
Driving innovation and transformation within **siloed organizations**, utilizing **linear project models** and waterfall planning with l**imited success**.



TO:
Engaging in **cross-sectional collaboration**, utilizing **iterative project models** and network structures reaching **more impact and change.**

adapt health strategies in practice. This model has shown examples of possibilities to develop health-improving measures that can be quickly implemented and adapted as needed.

THE DILEMMA BETWEEN QUICK WINS AND LONG-TERM CHANGE

One of the biggest challenges the partnership has had to navigate is the balance between quick results and the need for deep, long-term change. Short-term interventions, such as health promotion activities in schools, have been shown to have early indications of effects, but these initiatives are only the beginning. To ensure lasting improvements in health, it is necessary to create structural changes that address the underlying causes of overweight and inequality in health.

This dilemma is further compounded by the political desire for quick results, which often contrasts with longer-term strategic objectives. The partnership model has therefore required a careful balance, where short-term interventions serve as the foundation for the long-term goals of reducing obesity in a sustainable way. The pilot projects were not only aimed at early detection and intervention but were also intended to support longer-term structural changes. This created a professional dilemma and how the need for short-term results could be balanced with the ambitions of a long-term societal change.

Long-term commitment and transformative innovations are essential for the realization of the vision. The pilot projects have been a test environment for new health-promoting technologies and social models that have the potential to create lasting changes in health behavior and economic growth. It emphasizes the importance of these non-linear innovation processes being necessary to address complex health problems that cannot be solved with traditional linear models.

COMMUNITIES AS A CATALYST FOR BEHAVIORAL CHANGE

Focusing on communities as a central health strategy has proven effective. Where many previous health projects have focused on individual solutions, the pilot projects have shown indications of communities as a catalyst for behavioral change. The projects have shown that integrating participants into community-oriented activities has had a profound impact on health behavior. This element is particularly important as research has shown how social capital can play a central role in health (Putnam 2000). By focusing on communities, as part of the solution, these projects have created new opportunities to integrate social support into health strategies, which differs from many traditional health projects that focus primarily on individual solutions. By integrating social capital into health solutions, it has been possible to create a positive dynamic where mental well-being and physical health are improved through community support. This has also paved the way for broader participation in health initiatives. Achieving a long-term transformation at a societal level requires that several political administrations jointly decide who should take responsibility for working with this agenda and to better support prevention by involving other social structures, such as the workplaces and schools, in future health strategies.



A LASTING TRANSFORMATION: REDUCING STIGMA AND PROMOTING HEALTH EQUITY

The dilemma between the need to address obesity while avoiding further stigma is a key element in this process. On the one hand, obesity is recognized as a societal challenge that requires increased attention and effort; on the other hand, the subject is associated with considerable taboo, which often leads to resistance to articulating it directly, especially in public and political spaces (Puhl & Heuer, 2010).

This dilemma has characterized the work of the partnership from the beginning, as the participants had to find a way to deal with the topic without exacerbating the existing social stigma. In many health-promoting projects, there is a risk that the individuals who are to be helped will also be identified as deviant, which can result in increased marginalization.

The partnership's approach has therefore been to focus on structural changes aimed at reducing stigma by introducing solutions that include the entire target group rather than isolating the particularly vulnerable. As an example, in the pilot project of PULSE it was decided to offer health-promoting activities to all students in a school rather than only to those who suffered from obesity. This decision was driven by the desire to avoid singling out vulnerable individuals and instead promote a sense of community about health (Puhl & Heuer, 2010).



Image from the project eHood. The project targets vulnerable youth (ages 13-18), aiming to enhance well-being, healthy weight, and life skills through a 20-week program centered around gaming and social activities. The partners of the project are Høje Taastrup, Tårnby, and Hvidovre Municipalities, Sincera, Impactly, and the Center of Clinical Research and Prevention

CONCLUSION: PARTNERSHIPS AS A CATALYST FOR HEALTH AND GROWTH

The conclusion is clear: partnerships are crucial in creating solutions to address health challenges and promote economic growth. The most successful partnerships create shared value, navigate uncertainties together, and adapt strategies to evolving circumstances. Challenges do exist, necessitating persistent efforts, ongoing evaluation, and a commitment to learning from both successes and setbacks.

The partnership model has been, and continues to be, fundamental to the success of the Lighthouse, bringing together diverse stakeholders who might not have collaborated otherwise. It is characterized by robust decision-making power at both political and tactical levels and provides a neutral platform for collaboration. The partnership fosters motivation and commitment among participants, while encouraging ongoing knowledge sharing and mutual learning across the projects involved.

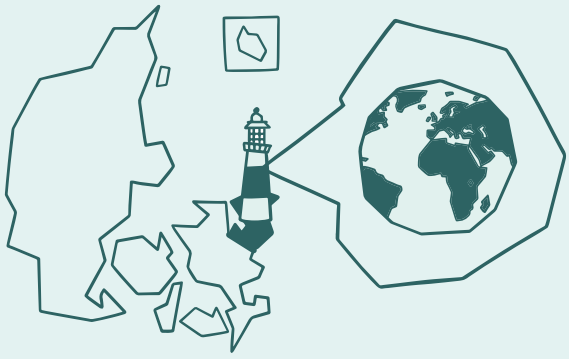
Establishing deep mutual trust within partnerships is essential, as cooperation hinges on relationships rather than transactions. Long-lasting and successful partnerships prioritize long-term relationships over short-term benefits, effectively managing organizational behaviors, power dynamics, and cultural differences between partners to build resilience and flexibility in collaboration.

The evaluation of Lighthouse Life Science and its multi-stakeholder collaboration model reveals that strategic partnerships play a pivotal role in tackling complex health challenges such as obesity and mental disorders. The partnership supports a multidisciplinary approach to health promotion and promotes economic growth, particularly for SME's by integrating innovation and practices across sectors. Modular and flexible short-term interventions have yielded rapid results while laying the groundwork for long-term structural changes. Lighthouse Life Science demonstrates that combining public and private actors can create effective solutions that enhance both health and economic growth, ensuring a more equitable healthcare approach.

The experience from 2022-2023 shows that health disparities can be reduced by applying a holistic approach centered on technological innovation, communities, and evidence-based health strategies. Coordinated efforts between public, private, and civil society actors have created a collaborative platform where all parties work toward common goals. This integration of competencies and resources has increased the potential for sustainable health improvements that transcend the objectives of individual projects.

A critical success factor of Lighthouse Life Science is its ability to mobilize resources across sectors, create shared value, and adapt to changes over time. It is evident that partnerships require sustained commitment and a willingness to learn from mistakes and continuously adjust the course. This process is iterative and demands constant reflection and adaptation.

In summary, the strategic partnership under Lighthouse Life Science has illustrated that complex health challenges like obesity can be addressed through agile, inclusive, and multi-sectoral efforts. By integrating health and economic growth, the partnership has created an innovative model that achieves short-term gains while pursuing long-term goals of structural health improvements and social equity. This collaborative model should be integral to future health policies to ensure lasting improvements in both health and economic growth.



PERSPECTIVE: FUTURE OF PARTNERSHIPS FROM LEARNING TO ACTION

There remains significant untapped potential in enhancing the methodologies and models that govern partnership efficacy. Future research should focus on elucidating the social, economic, and environmental benefits of partnerships, alongside exploring how technological advancements can bolster more integrated cooperation frameworks. Moreover, investigating how diversity within partnerships can serve as a pivotal strength to foster inclusive and innovative solutions is paramount. This paves the way for a comprehensive dialogue regarding the evolving role of partnerships in an increasingly globalized and complex landscape. Essentially, there is a pressing need to delve deeper into developing partnerships that are sustainable and transformative on a global stage.

To fortify the future of initiatives like Lighthouse Life Science, a more robust system for data collection and evaluation is imperative. This will ensure that progress and outcomes are meticulously tracked. Furthermore, establishing sustainable and long-term financing models is critical to maintaining ongoing development and innovation.

Maintaining trust among partners and a steadfast commitment to transformational goals are vital to sustaining the momentum generated. Continuous competency development among participants is essential to achieve the overarching objectives of enhanced public health and economic growth.

Future-oriented partnerships must continue to advocate for community-centric health strategies that diminish stigma and foster inclusion. The positive impact of communities as catalysts for behavioral change and health promotion, as demonstrated by the partnership, underscores the need to integrate more social structures such as schools, workplaces, and local networks into future efforts.

In summary, the integration of health promotion and economic growth through strategic partnerships offers a viable solution to contemporary challenges and presents a vision for addressing complex global health challenges in the future.



EVALUATION OF THE PILOT PROJECTS



Image from the project 'Pulse' that integrates daily high-intensity physical training for grades 6-9 to enhance health, well-being, and learning readiness. Partners are University College Copenhagen, Hvidovre Municipality, Just Human, and Iqniter

INTRODUCTION

The global healthcare sector is grappling with significant challenges that call for sustainable, innovative solutions. With a growing number of individuals facing chronic conditions like obesity and mental health issues, there is an urgent need for a collaborative effort blending health promotion, technological advancements, and supports economic growth. This is the premise behind the Danish Lighthouse Life Science, a strategic initiative aimed at promoting health equity, stimulating economic growth, and reinforcing Denmark's position as a global driver in life sciences.

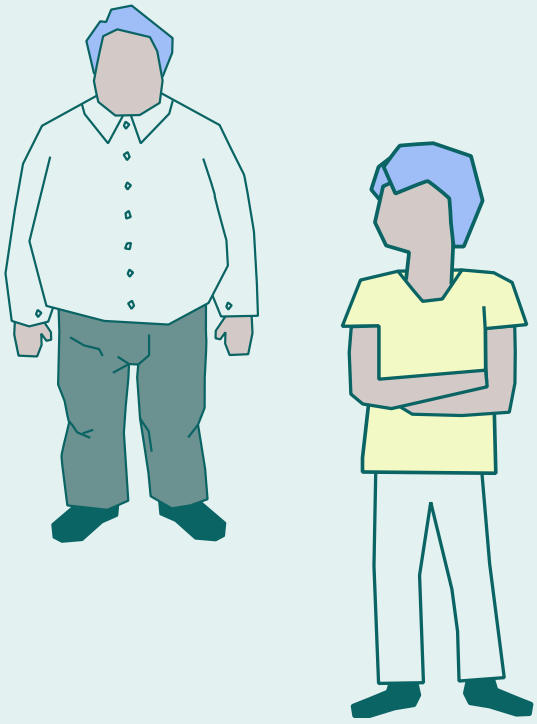
Lighthouse Life Science was launched with a clear mission: to drive transformative innovations through partnerships that span both public and private sectors. The aim is to ensure health-promoting solutions reaching not only those with sufficient resources but also marginalized segments of society. This multi-sector collaboration leverages technology, communities, and evidence-based approaches to tackle pervasive health issues such as obesity and mental health, while also supporting the economic growth potential of SMEs.

This document presents an evaluation of the pilot projects under Lighthouse Life Science in its first phase (2022-2023). It examines how these projects have contributed to both health improvement and economic growth, focusing on how technological innovation and multi-stakeholder collaboration have established a platform for scalable health solutions. The pilot projects are designed to address complex health challenges by utilizing digital tools and community-based interventions. This aligns with the Lighthouse's mission to create long-lasting solutions through prevention, early detection, and health management, evident in efforts to reduce obesity and improve mental well-being through workplace initiatives.

The document is structured as follows:

- Multi-stakeholder Collaboration: Analyzes how public and private entities have partnered to develop and implement health strategies.
- Technological Innovation and Communities: Evaluates the use of technology and communities in promoting health.
- Future Perspectives and Scaling: Discusses how insights from the pilot projects can be scaled and integrated into future health strategies.

Through this analysis, it will be clear how the pilot projects have paved the way to achieve the Lighthouse's vision by creating sustainable health solutions grounded in both technology and communities.



AN EVALUATION OF THE PILOT PROJECTS

A MODEL FOR HEALTH PROMOTION AND SUPPORT OF ECONOMIC GROWTH

The pilot projects under the Danish Lighthouse Life Science (2022 – 2023) were carried out within a short-term period to test new health strategies, with the three focus areas of prevention, early detection and health management. The overall purpose of the pilot projects was to improve the health and well-being of different population groups by combining digital solutions, communities and collaborations across sectors. The expectation was that innovative approaches could offer a solution to some of the increasing health challenges in society and increase health equity combined with creating economic growth in SME's. This included a focus on issues such as obesity, mental challenges and lack of physical activity in a way that was both measurable, and in the long term scalable.

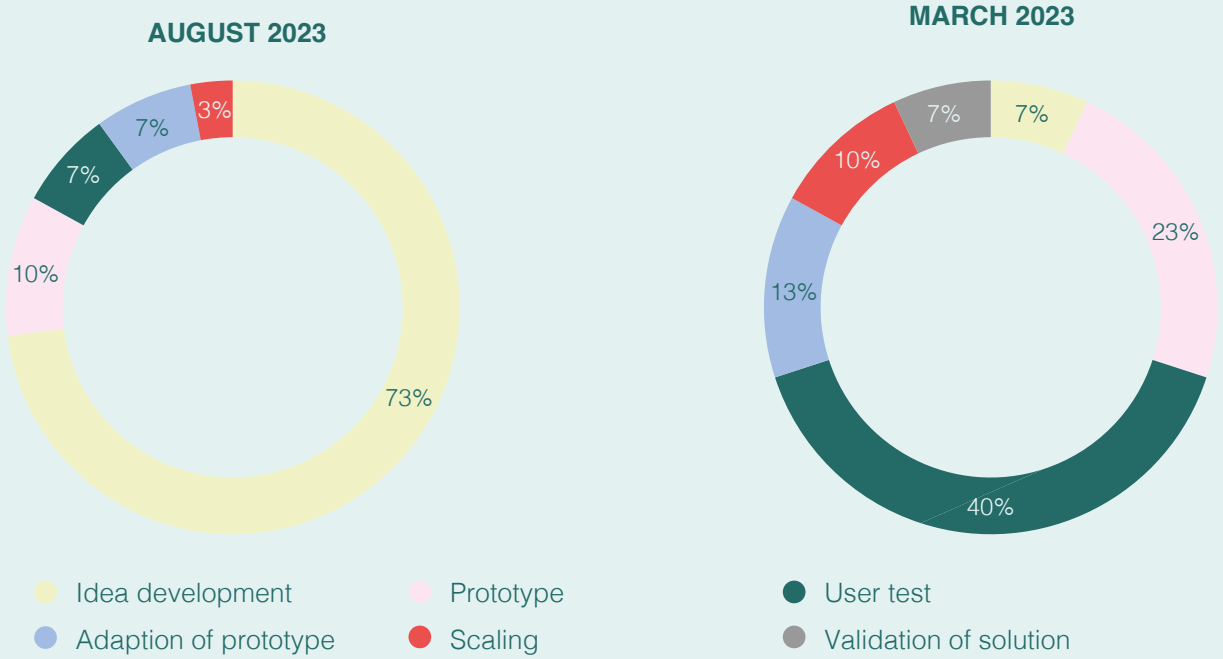
The pilot projects' experimental framework provided an opportunity to test new health-promoting technologies in a real context, with a view to a potential scaling to larger population groups. Lighthouse Life Science was and still is based on the hypothesis that the combination of technology and communities will strengthen individuals' motivation for their own health, and at the same time reduce social barriers such as stigma. This is supported by the strategic partnership, including the main consortium and in the steering committee, which has ensured strategic direction and effective implementation.

Information about the overall collaboration model for the strategic partnership for equity in health, Lighthouse Life Science, can be found in the section: Evaluation of the collaboration platform.

DIFFERENCE FROM TRADITIONAL PROJECT FORMS

The pilot projects differ from traditional project forms by their modular structure, agile implementation and their strong multi-stakeholder collaboration as well as a greater focus on user involvement. These pilots have been able to experiment faster and adapt the interventions in real-time based on the early results.

Figure 8: Illustrates the Lighthouse international reach so far, and the dedication to sharing knowledge about the Lighthouse work in public private life science partnerships



An evaluation of the pilot projects is illustrated in Figure 8. The figure shows that 73% of the companies at the start of the project were in the idea development phase, while only 7% were at the end of the project. Conversely, 7% were in the process of user testing at the beginning of the process, while it was 40% at the end of the project.

The figures document a clear acceleration of the development process. One reason for this was the limited short period of time to implement the pilot projects, which increased the project partners' focus another was the risk-willing financing that made it possible to establish cooperation across relevant partners.

The advantage of phased projects is that assessment can be made along the way and lead to evaluation of whether the project has potential for further development, or the project should be adapted to increase the possibility of adaptations, or it should be stopped.

Risk-willing funding for the pilot projects was an advantage and supported both early innovation projects and more implementation-ready projects in development, testing and evaluation in collaborations between SMEs, employers in the form of municipalities, regions and large companies, as well as researchers from universities and university colleges.

Nine pilot projects with funding of over four million EUR have been carried out on the development of widely different concepts or solutions for the prevention and early detection of overweight and obesity, including courses with young gamers, offers for overweight pregnant women and projects in large workplaces with a focus on weight loss and better well-being. This analysis contains learning and knowledge from eight pilot projects. One pilot project is still ongoing and therefore not included in this analysis. Two pilot projects have research publications on the way, of which one is available (Co-designing a weight-neutral health intervention in Denmark: a protocol paper) and the other is estimated released mid 2025. Further information on the individual pilot projects can be found on www.erhvervsfyrtårnlifescience.dk/pilot-projects.

At the same time, two research projects in the interdisciplinary health management of obesity, LightCOM, have been carried out with funding of EUR 24 million from the Novo Nordisk Foundation. LightCOM is still ongoing and is about developing and testing new health management programs that target people with obesity. The goal is to improve health and quality of life through solutions that contribute to lasting change. The pilot projects are illustrated at the website as exemplified in Figure 9.



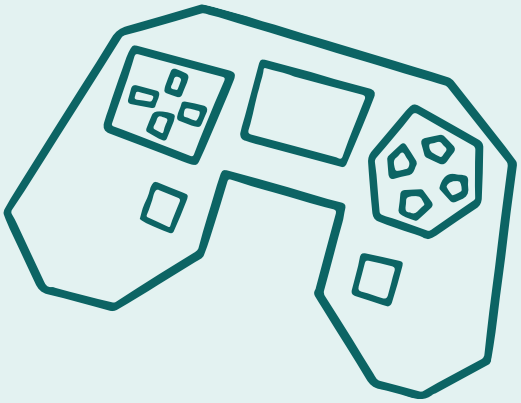


Figure 9: Overview of pilot projects included in this analysis. More information about the individual pilot projects can be found at www.erhvervsfyrtårnlifescience.dk/pilot-projects.





PREVENTION

Prevention in children and adolescents using gamification and digital solutions that support movement as well as digital guidance for mothers with obesity during pregnancy:

- Healthy pregnancy and digital course guide
- EHOOD – a project on physical activity and gaming for vulnerable young people
- Healthy children – technology-based intervention with VR/AR in education
- PULS in schools

Prevention of obesity with a holistic approach through digital guidance, healthier behaviour through shopping and monitoring of movement in everyday life:

- Inspiration for healthier life





IDENTIFICATION

Prevention and detection in connection with using the workplace as a health arena to create greater potential for communities combined with individualized guidance and reduce stigma around being obese:

- Health and well-being in large workplaces
- Healthy weight – conversation interventions for weight loss in the workplace

Detection of adults at risk of obesity using registry data, accelerometer measurement of physical activity and development of an algorithm for a better response to the individual citizen in relation to diabetes:

- Healthy movement for healthy weight – development of algorithm with data sensor to motivate increased exercise

ACHIEVED GOALS FOR THE PILOT PROJECTS

The pilots have managed to achieve several of their short-term goals, but there are significant barriers to achieving the full impact, especially in terms of scalability, stigma and long-term health improvements.

One of the projects, Inspiration for a Healthier Life, has had more than 400 participants completing the intervention and a methodological approach that indicates health effects have been achieved in the form of weight loss, fewer sick days and an increased number of steps daily. However, with the proviso that it has been a relatively short intervention period of nine months.

Another example is that during the short project period, positive, qualitative effects were experienced from the participants on having greater acceptance and understanding of their own body and more insight into their own health. This is supported by the following quotes:

> *"Life isn't perfect, and I don't have to be perfect. I must accept that my body looks the way it does and all the good it has done. My supervisor has taught me that"*
> - Nanna, 39 years old

> *"I have learned to know my hunger, and that I should not always feel overfull, and that I can easily "manage" with 80% satiety, this is a factor I will at least take with me after the end of the project"*
> - Kasper, 46 years old

According to a report from the Danish Health Authority, the results are supported by the fact that there is evidence that the best results are achieved by combining diet, physical activity and behavioral therapy, which was the case in Inspiration for a Healthier Life (SST, 2018).

The pilot projects have achieved the following short-term objectives:

- Indications of measurable health improvements through technological innovation and community-based models, including weight loss as well as increased physical movement and increased well-being
- It is shown how behavioral change can be achieved by reaching out to both broad populations and socially marginalized individuals
- Technological innovation, such as self-monitoring, have given citizens better control over their health and Community models have provided the necessary social support to sustain health improvements
- Learning about gamification for e.g. increased movement in children and young people through play and new communities have been obtained

SHORT-TERM GOALS PROVIDE LONG-TERM COMMITMENT AND TRANSFORMATION

In terms of health, the projects have created short-term improvements, especially in the form of weight loss and improved mental well-being. Technological innovation and community-based models have been instrumental in these outcomes.

Although the short project periods enabled rapid learning and adaptation, the results indicate that longer-term interventions are necessary to achieve sustainable health effects. Previous studies (Franz et al., 2020; Faulkner et al., 2014) support that even short-term interventions can generate significant health improvements, but sustainable outcomes require longer time horizons and sustained motivation. Such an approach can be strengthened using community-oriented conversation models, where language that promotes inclusion and community is used as a strategic method to improve participant engagement and long-term retention.

Figure 10 shows indications in health-related and economic potential values from six pilot projects that have available evaluations. It is emphasized that these are indications, as the pilot projects have been carried out at an early stage and with a focus on assessing whether the concept has potential for further studies with a view to creating health and economic potentials in the long term.

Challenges such as stigma and difficulties in recruiting marginalized groups may have limited some projects' outreach to the most vulnerable citizens. Nevertheless, overall observations indicate that multiple target groups were engaged across the pilot projects. One benefit of coordinating these pilots under a single steering committee is that, despite recruitment hurdles in individual projects, shared insights confirmed the importance of tailoring recruitment approaches for individuals with obesity according to the specific target group and context.

In particular, the projects indicate that short-term interventions can be used as the first step in a long-term strategy to better acquire learning and knowledge about what works and what needs to be focused on. The knowledge gained shows that indications of rapid health gains in areas such as obesity and mental well-being can create momentum for long-term health promotion. By combining these rapid interventions with a social agenda targeted at socially vulnerable citizens, the projects have created a framework for reducing health inequalities. This is supported by Marmot, who points out that social determinants play a significant role in creating health equity, and the pilot projects have demonstrated how these factors can be addressed through community-based approaches (Marmot, 2005). Prochaska et al. support this approach, where early successes can create the necessary motivation and confidence to sustain health behavior change. This means that interventions in short project periods not only create indications of health benefits, but act as a catalyst for longer-term outcomes if followed up with structural support, sustained follow-up and prioritization (Prochaska et al., 2008).

For citizens, these early indications can have a psychological significance, as they reinforce the belief that changes in lifestyle and health behaviors can lead to measurable improvements. However, it is crucial to underline that while the pilot projects have shown initial successes, sustained improvements require long-term support, which has not yet been validated in these projects. Therefore, some of the pilot projects in the established collaborations continue with additional funding to investigate the potentials more closely and obtain data to illustrate the sustainable effect of the interventions.

Figure 10: Overview of indications in the field of health and economics in the pilot projects. *Based on a methodological evaluation of more than 400 participants who completed the intervention

VISION: WE WANT TO CREATE INNOVATION THAT IMPROVES HEALTH, STRENGTHENS ECONOMIC GROWTH AND POSITIONS DENMARK AS AN INTERNATIONAL LIGHTHOUSE WITHIN LIFE SCIENCE.



PARTICIPATION ENGAGEMENT AND SATISFACTION

- increased satisfaction and motivation for participating in interventions
- increased motivation for lifestyle changes*



PHYSICAL ACTIVITY AND HEALTH

- improving physical activity*
- reduction in BMI and weight*
- increase in self-rated health
- improved sleep quality



MENTAL WELL-BEING AND MOTIVATION

- reduction of stress and loneliness
- improved quality of life*



HEALTH AND FINANCIAL SAVINGS

- financial savings and cost-effectiveness*
- reduction in sickness absence*

IMPLEMENTATION OF THE PILOT PROJECTS AND SHORT-TERM GOALS

The Danish Lighthouse Life Science pilot projects are successful in core areas, in terms of health improvements and multi-stakeholder cooperation. This is consistent with existing theories of social support and behavioral change, which emphasize that social networks and communities play a key role in sustaining long-lasting health change (Putnam, 2000; Bandura, 2004). In particular, the eHOOD project shows that the use of gaming elements creates strong feelings of community among young people, resulting in both physical and mental health benefits. An analysis from the Danish Health Authority also indicates that group-based interventions result in sustainable weight loss (SST 2018). This underlines the value of the insights gained and the need for further research in the area. Marmot and Wilkinson also emphasize that strong communities can reduce barriers such as social isolation and stigma (Marmot and Wilkinson, 2005).

Most of the pilot projects were carried out as planned within the relatively short timeframe made available. However, challenges such as stigma, recruitment and the short project period have limited the overall effect, especially in relation to long-term behavioral changes and weight loss. The assessment of the nine pilot projects is divided into the following subjective parameters, which contribute to the degree of success achieved compared to the expected success based on the individual pilot projects:

- **Multi-stakeholder collaboration – 90%** completion: One of the most prominent successes in the projects was the establishment of a strong multi-stakeholder and multi-sector collaborations between public organizations, private companies and knowledge institutions. The projects managed to coordinate and utilize resources across organizations effectively, which has been an essential component in achieving the short-term goals. One example is the Healthy Weight pilot project, in which Falck, University College Copenhagen and Liquid Minds collaborated to develop and implement innovative health conversations in workplaces. This collaboration has enabled the implementation and adjustment of initiatives along the way, so that the project's results were optimized.
- **Health improvements – 85%** completion: Several projects have obtained indications of health improvements among participants, e.g. PULS in School showed an increase in pupils' physical activity to an average of 52 minutes of daily movement, which is an improvement compared to the current school reform's legal requirement of an average of 45 minutes of daily movement. In 2022, it was estimated that only 50% of Danish schools meet the legal requirement of 45 minutes. It is therefore relevant to support the implementation, as it has shown significant improvements in the daily movement. Likewise, Inspiration for a Healthier Life reported weight loss and improved mental well-being among participants. In the pilot project Movement, healthy weight and well-being, a digital learning course for overweight pregnant women, more than 100 pregnant women received help from the application for a healthier pregnancy. Participants experienced healthy weight gain during pregnancy and increased mental well-being. However, systematic follow-up in the long term whether these improvements can be sustained over time was not retained in the project's time frame.
- **Technological implementation – 70%** completion: With technological interventions such as Virtual Reality (VR) and Augmented reality (AR), several projects experienced technological challenges, especially in educational contexts. The Healthy Children pilot project aimed to promote movement among school students through VR and AR technologies, but technical issues and a lack of training of teachers hampered full integration. This illustrates the importance of technical support and user education, which is a prerequisite for the full realization of the technology's potential. Several of the pilot projects used technology to monitor movement and behavior. This contributes to objective measurements that can support the subjective experience of the participants. In the pilot project Health and well-being at work (STAR), the employees were monitored, among other things, to distribute the level of activity more, so that all employees had both hard

physical work and breaks. The case confirms the Danish National Research Centre for the Working Environment's research on the working environment, showing that the combination of objective and subjective measurement can be used to plan working hours more optimally.

- **Recruitment and stigma – 65%** completion: Recruiting participants proved to be a challenge in several projects. For example, the Healthy Weight project was designed to reduce stigma around obesity through open workplace health interviews, but even with this approach, recruitment levels were lower than expected. Research by Puhl and Heuer shows that stigma surrounding obesity is a well-known barrier to participation in health interventions, making it clear that further efforts are needed to overcome social barriers (Puhl and Heuer, 2010). Similarly, several of the pilot projects showed that it was difficult to retain participants, for example, only 54% of participants completed the Inspiration for a Healthier Life pilot project.

ABILITY OF PILOT PROJECTS TO CONTINUE

In addition to assessing the pilot projects in terms of implementation, they were also assessed in terms of their ability to continue and further develop their solutions. The assessment of success includes criteria such as: pilot projects having received additional funding to continue the project, solutions implemented after the project period and/or publication of results as scientific articles that can further support indications of the health improvements that have emerged. It is estimated that the pilot projects had a success rate of 89% in 2023. This is illustrated in Figure 11.

Future publications that support the need for further research to create evidence in the long term are relevant, as there is still a need to generate new and more knowledge in the field of prevention and early detection of obesity and mental health problems in children, adolescents and adults.

INVOLVEMENT OF USERS IN THE PILOT PROJECTS

Over 3300 users were involved in the nine pilot projects. This illustrates a significant activity and broad interest, despite the short project period. Data are presented in Figure 11.

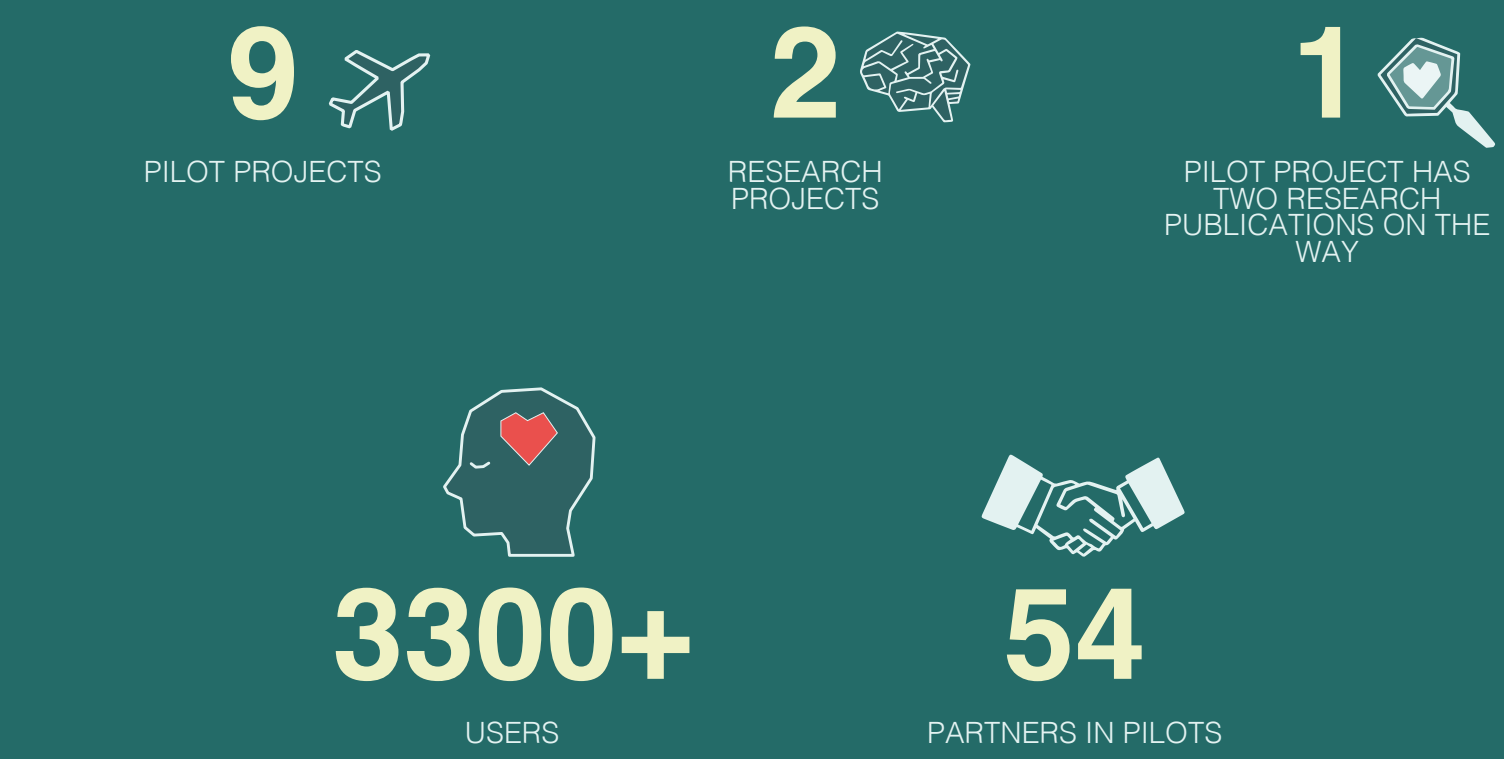
However, involvement of partners in the pilot projects proved to be more challenging than expected due to both time constraints and the complex and taboo nature of the subject, namely obesity. To address these challenges, a demand-driven approach was chosen, where interventions were adapted to different contexts with a focus on testing them in new, non-traditional arenas such as workplaces. This flexible approach allowed for a broader framework to promote health and health equity across different sectors.

The users who have been involved in the pilot projects represent a broad target group of participants. Therefore, knowledge gathered across the projects has contributed with unique insights in relation to recruitment:

- the need to focus more on how interventions can be adapted to target groups that experience stigma,
- how technological and community-based solutions can be further developed to engage a wider part of the population
- to recognize the complexity of the challenge and the importance of using a participatory, exploratory and user-driven process before identifying and describing solutions. This is supported by the following quote:

"When we talk about obesity, we know that there are three times as many people with obesity among the low-educated compared to the highly educated. The social gradient is extremely important here. We need to go much deeper into the substance to understand what causes social inequality in health. It requires a better understanding of what factors cause some people to overeat."
- Private

Figure 11: Overview of the indications of the success rate of the pilot projects in 2023



COLLABORATION AND MULTI-STAKEHOLDER EXPERIENCES – A MODEL FOR FUTURE PROJECTS

The collaboration encompassed a diverse spectrum of public, private and academic actors. A total of 54 partners from municipalities, regions and companies participated in the projects. Overall, this demonstrates the successful implementation of a holistic and demand-driven approach, which presents new opportunities for multi-stakeholder interventions.

The evaluations of the pilot projects highlights the strong collaboration as one of the key success factors creating a framework for efficient knowledge sharing and resource utilization. This cross-sectoral approach allowed for rapid learning and adjustment, allowing the pilots to adapt to unforeseen challenges along the way. These non-linear innovation processes are necessary to address complex health problems that cannot be solved by traditional linear models, which requires a long-term commitment that goes beyond concrete pilot projects. On the other hand, the pilot projects appear as short-term test beds for new health-promoting technologies and social models that have the potential to create lasting changes in health behavior and economic growth in the long term.

One of the most significant experiences from the pilot projects is how cross-sector collaborations have been a catalyst for innovation and learning. The projects have demonstrated that when solutions are developed and tested in a flexible collaborative environment, indications of health effects and growth potential can be obtained in a short time. This is supported by the following quote:

> *" Our participation (Just Human and University College Copenhagen) in the Lighthouse Life Science has been very important. We gathered a lot of valuable experience when we followed Langhøjskolen (specific public school). Based on this, we have received funding from the Danish Health Authority to spread PULS and support schools throughout Denmark in implementing more movement in the school day."*

Some of the pilot projects are cross-sectorial in cooperation between SMEs and large private companies. These private-private collaborations show that small companies are strengthened through collaboration with the large companies, and conversely, smaller companies contribute with innovation to large companies. It has thus been demonstrated that the collaboration models used foster innovation and adaptability, support the growth potential of the SME segment.

The multi-stakeholder collaboration is a key component of Lighthouse Life Science's success and shows the potential for future health initiatives that strive to combine technology, research and health strategies in a coordinated effort. Klijn and Koppenjan describe how complex health challenges are best solved through network-based collaboration across sectors (Klijn & Koppenjan, 2016).

The collaboration is implemented from the top governance of the Lighthouse to the individual project. This underpins that different competencies contribute to a dynamic, mutual understanding of each other at every level, which makes probable that there is greater potential to achieve further with better results within the same time.

Relationships and trust are crucial for a good collaboration. It will therefore be relevant to create more knowledge about how these elements can be strengthened more consciously from the start of a collaboration to create greater potential for transformations and effects in the long term.

COMMUNITIES AND STRUCTURAL APPROACHES AS DRIVERS OF HEALTH

One of the most significant insights from the Lighthouse Life Science pilot projects is the importance of shifting the focus from individual-oriented to community-based approaches. This structural innovation, which sees the community as a key engine for health promotion, represents a crucial development in health strategies. Rather than viewing health as an individual responsibility, the projects demonstrate how social networks, collective efforts, and institutional frameworks can create lasting and measurable improvements in both physical and mental health.

Traditionally, health interventions have often focused on changing behavior at the individual level. However, this approach has limited effect, as individual interventions rarely manage to overcome the social, cultural and structural barriers that affect health behavior. Instead, the pilot projects have shown that health promotion can be far more effective when it is organized around communities that support and motivate their members to change their habits.

Marmot and Wilkinson highlight that health inequalities can be reduced by focusing on the social settings in which people live, and the pilots confirmed this theory by showing how collective action can overcome some of the barriers that usually hinder health improvements. Instead of placing the responsibility for health solely on the individual, the projects supported the idea that health promotion should be rooted in communities that can motivate and support their members. This focus on communities as a driver of health promotion suggests that social determinants – such as working conditions, housing conditions, and social support – have a significant impact on individuals' health (Marmot and Wilkinson 2005). The pilot projects confirm that a collective effort where communities support the individual can be more effective than individual initiatives when it comes to creating lasting health improvements.

The pilot projects under the Lighthouse Life Science have been pioneers in promoting a structural approach to health, where health is seen as a shared responsibility that is promoted through both technological innovation and collective efforts. Across the evaluations, there are three themes for structural innovation that show a potential for value creation. The three themes are illustrated in Figure 6.

Figure 13 show the themes where adults in everyday life and people at work are put together into a theme: Everyday life and the workplace as an arena for health promotion.

Figure 13: Overview of three themes for structural innovation

1
CHILDREN AND YOUNG PEOPLE IN SCHOOL AND AFTER-SCHOOL CARE
Community and use of gaming/ technology can prevent overweight and poor well-being in children and young people

2
ADULTS IN EVERYDAY LIFE
Guidance via digital solutions support needs, competencies and resources to create healthy habits in adult citizens struggling with overweight

3
PEOPLE AT WORK
Focus on using the workspace as an arena for efforts to combat obesity and increased well-being





THEME 1: SCHOOL AND AFTER-SCHOOL CARE AS HEALTH-PROMOTING STRUCTURES

The pilot projects under the Lighthouse Life Science initiative illustrate the efficacy of structural approaches to health promotion, particularly within schools and after-school programs. These institutions play a pivotal role in children's lives, offering a unique opportunity to instill healthy habits through community-based strategies.

Gamification and Digital Learning

One notable project, "Healthy Children and Learning for Life via Gamification – VR and AR" integrated gamification into after-school care. By utilizing digital platforms, children engaged in physical activities through games, which increased their motivation and participation in health-promoting behaviors. This technological innovation created a playful learning environment, enhancing children's receptivity to health education.

Social Community and Collective Motivation

The social dynamic within schools further reinforced healthy behaviors. Children were not only motivated by digital games but also by their peers' support. This collective approach fostered a sense of belonging, making health a shared value among students. Competitions between classes, where students participated in various physical activities, exemplified how communal goals and peer support can drive health outcomes.

Healthy Weights

Integrating physical activity and health education into daily routines at schools and after-school programs has proven effective in obesity prevention. The social relationships formed around these activities encouraged children to maintain healthy habits. Structural factors, such as the supportive environment provided by schools, play a critical role in promoting long-term health improvements.

In summary, schools and after-school programs are ideal settings for health promotion. By embedding health initiatives into the daily lives of children through play, learning, and social support, these pilot projects have demonstrated the potential for lasting behavioral changes. This approach aligns with existing literature, which underscores the importance of social and structural determinants in health promotion and the reduction of health inequalities (Marmot, 2005; Putnam, 2000).

THEMES 2 AND 3: EVERYDAY LIFE AND WORKPLACES AS ARENAS FOR HEALTH PROMOTION

The workplace occupies a central role in the daily lives of many individuals, making it an ideal setting for health-promoting interventions.

Workplace Health Initiatives

The pilot projects have demonstrated that workplaces implementing targeted health initiatives could enhance employees' physical health, mental well-being, and overall working environment. By integrating collegial support, organizational commitment, and structural health measures, workplaces can create inclusive and supportive environments that foster both physical and mental health. This supports the notion that health is not merely an individual responsibility but a collective goal, where the workplace plays a pivotal role in promoting sustainable well-being and health.

Collective Health Goals

It is shown that shifting the focus from individual to collective health goals engages the entire workplace in a unified health agenda. This collective commitment creates a supportive atmosphere where employees encourage each other through shared responsibility and collegial support.

Social Ties and Networks

According to Putnam's theory of social capital, social ties and networks are crucial for individuals aiming to maintain healthy habits (Putnam, 2000).. In the projects employees reported increased motivation due to collegial support. For example, in the "Healthy Weight in the Workplace" initiative, participants highlighted how the social community and colleague support helped them sustain behavioral changes. This social dynamic reduced the stigma associated with health challenges and fostered an environment where employees felt more confident and motivated.

Language Use and Stigma

The pilot projects demonstrate that changing the language used in discussions about health can significantly reduce stigma. Obesity, often surrounded by negative stereotypes, can defer individuals from engaging in health initiatives. By adopting a new communication model that focused on quality of life and personal values rather than weight loss as a success criterion, the approach becomes more inclusive. This aligns with Puhl and Heuer's research, which highlights that stigma can hinder participation in weight loss programs, but an inclusive, value-based approach can enhance engagement and outcomes (Puhl & Heuer, 2010).

By shifting the conversation focus to personal values, the new model promoted openness and involvement, thereby increasing the likelihood of active participation in health programs. This model is crucial for future health strategies aimed at reducing stigma and fostering inclusive health promotion environments. According to Marmot and Wilkinson, addressing social determinants such as peer support and working conditions is vital for sustainable health improvements (Marmot & Wilkinson, 2005). The new communication model supported a values-based approach that facilitated behavioral change through an inclusive and supportive atmosphere.

The Role of Organizational Support in Health Promotion

The pilot projects underscore the significant role of management and organizational structures in promoting workplace health. Organizations that actively integrated health programs and allocated time and resources for employee participation saw better outcomes. Initiatives such as flexible working hours for physical activity and "walk-and-talk" meetings, which combined fresh air with exercise, were effective. Organizational commitment was essential for embedding health promotion within daily routines. Management support provided a framework that enabled employees to prioritize their health. These examples illustrate how organizational engagement can drive the creation of a health-centric workplace culture.

For sustained results, long-term health strategies that integrate health into the corporate culture are necessary. The pilot projects show that enduring commitment from both employees and management is key to lasting behavioral change. Organizations that embed health into their core values achieve not only short-term health improvements but also a deep-seated cultural transformation.

The projects also highlighted the importance of mental well-being alongside physical health. Collective health initiatives and the resulting social connections reduced isolation and enhanced overall well-being. Employees felt more motivated, less stigmatized, and more integrated into a supportive community. This emphasizes the broader understanding of health as a social issue, where relational aspects within the workplace are crucial. By focusing on collective health goals, workplaces can play a pivotal role in reducing stigma and fostering sustainable health improvements.

Recruitment and target groups

Despite the successes, technological barriers and low recruitment have limited the full potential of several projects. Nevertheless, the overall insight across the projects has shown that different target groups were still represented. This indicates the need for a deeper understanding of the specific needs and contexts of the target audience. For example, children can be motivated through play and learning, while employees in workplaces respond better to a communicative approach, where obesity is not just referred to as an individual problem, but rather as a common challenge that can be handled together. This can be supported using conversation models such as the appreciative conversation that creates safe and open relationships, both in professional and private contexts (Conversations in organizations, Hansen-Skovmoes and Rosenkvist, 2017). The conversation model emphasizes the importance of meaningful and value-creating conversations that not only acknowledge successes, but also problems and challenges in a constructive framework.

The low participation were especially among those with weight-related or mental challenges, who often experience stigma associated with health interventions (Puhl & Heuer, 2010). This shows a broader problem in health interventions, where stigma and social barriers prevent participation and retention. For example, the projects Healthy Weight at the Workplace and Inspiration for a Healthier Life showed positive health effects among

the participants who chose to participate, but the number of participants was lower than expected and several did not complete the interventions. This points to the need for a deeper understanding of the different target groups' contexts and special needs, which can help to increase motivation and readiness for behavioral change.

It is therefore crucial that recruitment strategies are adapted to the participants' life stage and specific motivations to improve both recruitment and retention in the interventions. For example, adult participants in the workplace can be motivated by focusing on the social dimension of health, where language use and communication are centered on inclusion and community, as opposed to a more individually oriented approach, which can be isolating or stigmatizing.

To ensure long-term effects, future interventions should focus on the integration of health strategies into participants' daily lives as well as the maintenance of motivation over time. This can be supported by conversation techniques such as the solution-focused conversation. The correlation between health strategies, language use, and social capital, as highlighted by Putnam, emphasizes that relationships and social ties increase the chances of success of health-related initiatives (Putnam, 2000).

Technological innovation as a catalyst for community and behavioral change

An important dimension of structural innovation in the pilot projects is the use of technology to facilitate and strengthen communities. Technological innovation was an integral part of the pilot projects and was used to support communities and motivate participants to maintain healthy behavioral patterns. Technological solutions such as gamification through play and learning, self-monitoring via applications or digital health platforms were used to create new forms of communities where participants could share their progress, receive feedback and feel supported across geographical distances.

The pilots showes that technology also has the potential to break geographical and social barriers and reach populations that would otherwise struggle to engage in health promotion initiatives. This integration of technology and community illustrates a hybrid approach in which technology acts as a catalyst for human interaction, rather than as a replacement for it. Mazzucato argues that technological innovation can be a catalyst for systemic change, especially when it is used to improve access to resources and strengthen communities (Mazzucato 2013). This was confirmed in the pilot projects, where the technology helped to create behavioral changes and improvements in health that would otherwise have been difficult to achieve through traditional, individual interventions alone. The technology gave participants control over their health and at the same time access to a supportive community, which amplified the effect of the interventions.

A concrete example of the role of technology in the projects was the use of applications where participants could follow their daily steps, diet and other health-related data combined with the possibility of guidance. These applications strengthened the sense of community and support by combining several elements.



Image from the project ‘Healthy Children and Learning for Life Trough Gamification - VR and AR’. Partners involved are Gladsaxe Municipality, Khora, and University of Copenhagen.



Image from the project ‘Movement, Healthy Weight, and Wellbeing – A Digital Learning Course for Overweight Pregnant Women’. Partners are Center of Clinical Research and Prevention, Raketfilm (FELT), Emento, and North Zealand Hospital

CONCLUSION: TECHNOLOGY, COMMUNITY AND MULTI-STAKEHOLDER COLLABORATION

The pilot projects in Lighthouse Life Science present indications of a great potential for future health strategies based on an integrated approach to health promotion. The pilots have shown that the combination of technological solutions, community-based models and multi-stakeholder collaboration can generate significant improvements in both physical and mental health in a short period of time. Weight loss increased physical activity, and improved mental well-being have been achieved by leveraging innovative technologies and creating collective health communities. This approach has not only resulted in measurable health improvements, but has also reduced stigma, which is one of the main barriers to effective participation in health interventions.

The pilot projects have managed to demonstrate that health should not be considered as an individual responsibility, but as a collective goal. By shifting the focus from individual-oriented to community-based approaches, the projects have emphasized the importance of social networks and support in sustaining long-lasting behavioral change. In both schools and workplaces, community-oriented initiatives have helped to create a culture where health becomes part of everyday life. The social aspect, combined with technological innovation such as gamification and digital platforms, has proven particularly effective in engaging participants of different age groups and socio-economic backgrounds, promoting inclusion.

A key aspect is the necessity of reducing stigma. The pilot projects have shown that when inclusive language is used that focuses on quality of life rather than weight loss as a success criterion, participants are more likely to feel motivated and engaged. This creates an open and safe framework where health can be articulated without fear of social exclusion or marginalization. The results therefore support the importance of creating supportive environments where the participants' health goals are supported by both technological solutions and communities.

For future health strategies, the evaluation points to the need of integrating health promotion into the structures that form part of people's daily lives, such as schools, workplaces and communities. The short-term interventions have been shown to be catalysts for health improvements, but to ensure lasting results, it is necessary to establish longer-term interventions that are supported by continuous follow-up, systematic data collection and management support. Technological innovation should continue to play a key role in these processes, but it must be accompanied by strategies aimed at reducing stigma and creating inclusive health initiatives that manage to engage marginalized groups.

The pilot projects have thus created a strong framework for how future health strategies can be structured. They have demonstrated that technological and community-based approaches have the potential to be scaled up and integrated into national health strategies.

The pilot projects have shown that health promotion must be an integral part of everyday life, supported by communities and technology. This is the way forward to create lasting improvements in both physical, mental and social health.

The multi-stakeholder collaboration is a key component of Lighthouse Life Science's success and shows the potential for future health initiatives that strive to combine technology, research and health strategies in a coordinated effort. Relationships and trust are crucial for a good collaboration. It will therefore be relevant to investigate the significance more closely and make a hypothesis about whether collaborations with a high degree of trust and a stronger relationship between the partners have a greater potential for success - and possibly better results at the same time?

By strengthening collaboration between the health sector, workplaces and schools, as well as leveraging technology to promote collective efforts,

it will be possible to reduce health inequalities and improve well-being across society. To realize the full potential, long-term sustainability and systematic follow-up are necessary.

In the long term, it will be crucial to build sustainable collaborative models that connect the health sector with other sectors of society to ensure that health promotion initiatives are firmly anchored in society and lead to sustained improvements in both physical and mental health.

The future of Lighthouse Life Science lies in expanding technological solutions, reducing stigma, improving recruitment of vulnerable groups and creating robust models for data collection. This will ensure that the projects have not only short-term, but also long-term effects.

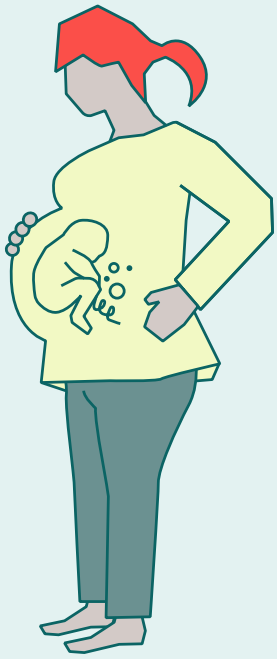
PERSPECTIVES: FUTURE HEALTH STRATEGIES

In a future policy perspective, it is crucial to anchor health promotion strategies in everyday structures, such as schools, workplaces and communities. Recent research indicates that social determinants such as education, income, and housing situation have a crucial impact on health outcomes (Braveman et al., 2017). A policy that integrates health as a structural component will therefore have a better chance of producing lasting results. Cooperation between the health sector, schools and workplaces should therefore be strengthened, with health promotion becoming an integral part of these arenas, as highlighted in the pilot projects. Marmot and Wilkinson (2005) emphasize that multi-stakeholder approaches that address social determinants are essential to increase health equity.

The technological dimension of health promotion should also continue to be prioritized, as digital innovation has proven to be an effective way to engage diverse populations and promote healthy habits (Firth et al., 2019). However, to ensure that technological solutions are scalable and accessible to everyone, there is a need for political support and regulation. Mazzucato highlights that the state plays an important role as a catalyst for innovation, and this role should be exploited to promote the use of health technologies in future health strategies (Mazzucato, 2013).

The stigma of overweight and mental health is found to be a significant barrier in several of the pilot projects, this is also supported by recent research. Pescosolido and Martin highlight that stigma can be reduced through social networks and supportive communities (Pescosolido and Martin, 2015), which supports the value-based approach used in the projects. This indicates that future interventions should focus on creating inclusive health strategies, where work is done to change language use and promote dialogue about health in a safe environment. Such an approach can both reduce stigma and promote participation among the most vulnerable groups in society.

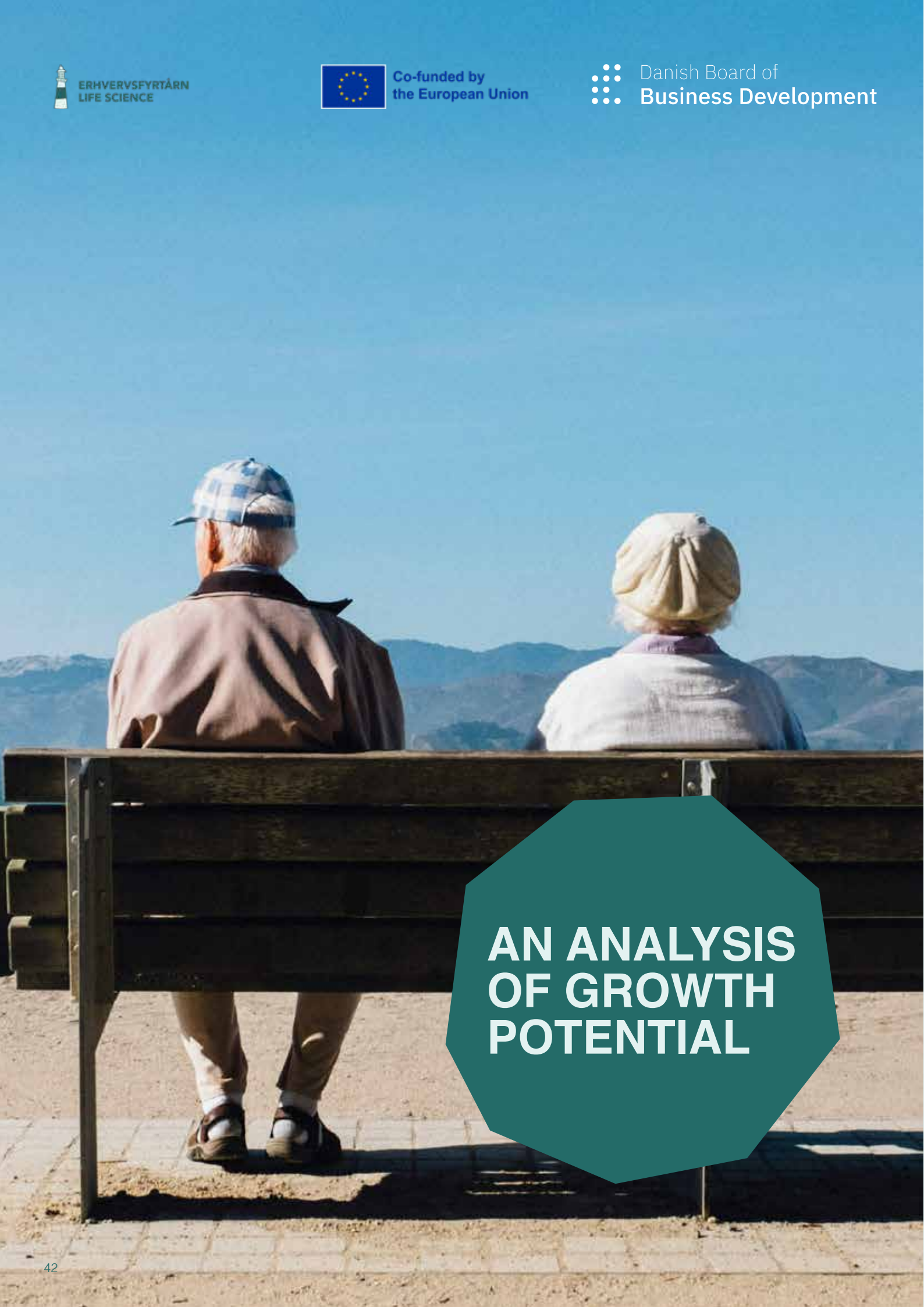
Long-term political commitment is essential to ensure that the positive results of the pilot projects can be maintained and expanded. As Powell et al. point out, cross-sectoral collaborations are an effective way to foster innovation and create sustainable health solutions (Powell et al., 2017). Future health strategies should therefore prioritize cross-sectoral cooperation to ensure that health promotion initiatives become an integral part of Danish society. This will not only improve health but also reduce the financial costs of chronic diseases such as obesity and mental health problems.



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AN ANALYSIS OF GROWTH POTENTIAL

INTRODUCTION

Small and medium-sized enterprises (SMEs) form the backbone of many national economies and are often the driving force of innovation, especially in sectors such as health technology. Lighthouse Life Science acts as a catalyst for economic growth and innovation in Danish SMEs by creating a collaborative environment with multi stakeholders like PPPs. By applying recent research into PPPs, innovation capital and internationalization, we can shed light on how the combined activities in the Lighthouse has created a solid platform for long-term economic growth.

The Lighthouse Life Science pilot projects (see section 2 for further information about the pilot projects) highlight how SMEs have achieved economic growth through their participation in the first phase 2022 – 2023. The available data show concrete results that can be put into perspective in relation to the future economic growth potential of SMEs. In addition, the growth platform has played a special role in creating success. The growth platform (see section 1 for further information about the Growth Platform) has supported and guided SMEs in PPPs throughout the innovation process from design, development and testing of solutions in clinical practice to market maturation and introduction to export markets. This has accelerated the process of maturing solutions for certification, implementation, sales, and scaling. Likewise, there have been opportunities to apply for risk-willing funds for development projects in the field of health equity.

This report is structured through a brief presentation of the financing of Lighthouse Life Science, followed by a description of the indications of economic growth potential in the Danish companies that have participated in pilot projects, development projects and activities through the Lighthouse. Finally, a conclusion on the importance for future economic growth finalizes the report.

FINANCING OF LIGHTHOUSE LIFE SCIENCE

The total funding for the two EU projects, focused on healthy weight and on mental health, is outlined below in accordance with the current guidelines for projects under the Regional and Social Fund and the Danish Decentralized Business Support Funds.

- **Lighthouse Life Science – Healthy Weight** (2022 – 2023)
    - Total public Funding: EUR 10.893.357
    - Total co-financing primary in terms of hours: EUR 2.241.128
- **Lighthouse Life Science – Mental Health** (Fall 2023 – 2026)
    - Total public funding: EUR 9.626.567
    - Total co-financing primary in terms of hours: EUR 5.594.185

The EUR 2.2 mill raised in co-financing illustrates a high level of engagement, as the participating partners have not received 100% funding in relation to their time spent on projects and activities. Figure 14, illustrates the total co-financing (disbursement of funds and co-financing in the form of hours) distributed among enterprises, state, regional, municipal and public-like organizations. Data is valid for Lighthouse Life Science in connection with reporting at the end of 2023.

Budget Distribution Among Companies and Organizations

Figure 14 demonstrates that various stakeholders have invested resources and time into the project. This co-financing reflects their commitment and engagement, as they have a vested interest in the project's success. By contributing their time and resources, these partners are not only supporting the project's goals but also sharing the responsibility and risks associated with it. Their involvement underscores the project's success in securing funds post-COVID-19, aimed at stimulating growth in businesses.

Furthermore, the data suggests that PPPs like Lighthouse Life Science are instrumental in securing risk capital for SMEs. This supports Mazzucato's

Figure 14: Distribution of the total budget among companies and organizations. Data is from Lighthouse Life Science – Healthy Weight, where the first grant was completed at the end of 2023

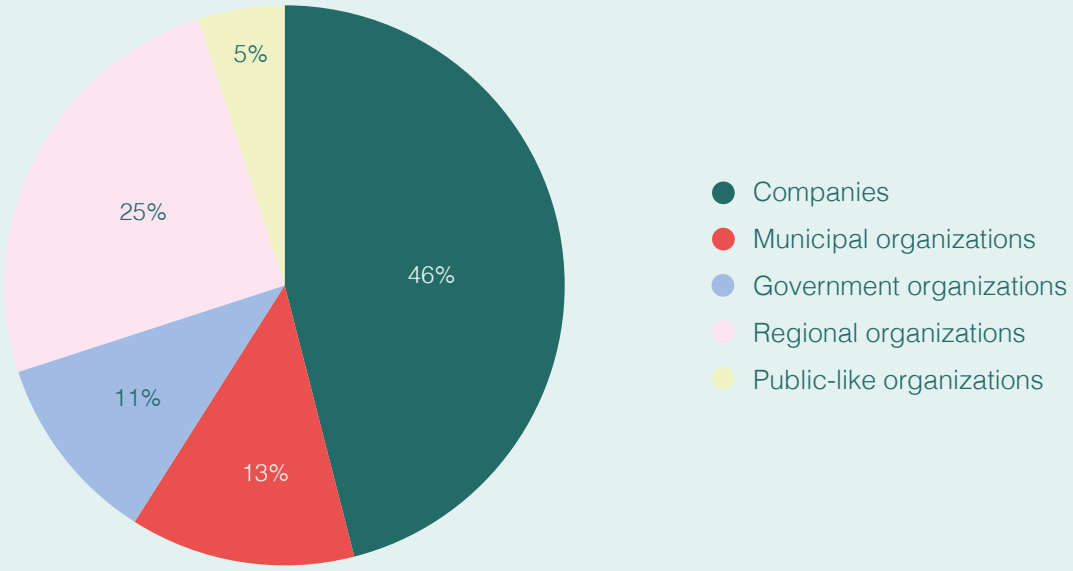


Table 1: Table showing the number and degree of fulfillment of impact targets related to data in connection with reporting to the Danish Business Authority at the end of 2023

Indicators for growth measured in the period 2022 - 2023	Realized indicators for growth	Expected indicators for growth	Performance in percentage
Number of enterprises in pilot projects and PPP projects	54	25	216
Number of companies participating in activities on the Growth Platform	315	100	315
Number of collaborations (pilot projects and PPP projects)	42	16	262
Number of new jobs	26	35	74
Number of companies attracted	3	3	100
Number of enterprise openings*	3	4	75

*The new companies have not yet established themselves with a VAT-number.

assertion that public support for innovation is vital for mitigating risks and advancing technological development in SMEs (Mazzucato, 2013). The financing models employed in the pilot projects have generated economic growth opportunities that extend beyond the initial project timeframe, enabling SMEs to expand both nationally and internationally.

FINANCING MODELS AND VENTURE CAPITAL

The evaluation of Lighthouse Life Science highlights the critical role of risk capital in fostering the growth of SMEs, particularly within the health innovation sector. Traditional financing methods often fall short, making it challenging for SMEs to progress from the concept phase to market readiness. PPPs, such as those exemplified by Lighthouse Life Science, provide indispensable support, allowing SMEs to secure additional funding and extend their reach internationally. In 2023, 33% of the pilot projects successfully obtained additional financing, underscoring the effectiveness of these partnerships in mitigating risks and attracting investments.

Studies by Mazzucato (2013) and Block et al. (2021) lend credence to the idea that public innovation funding acts as a catalyst, enabling SMEs to break into international markets. For instance, one of the pilot projects companies, Emento's successful establishment of a subsidiary in Germany, along with securing contracts with German university hospitals, demonstrates the scalability and export potential. These findings emphasize the crucial interplay between public and private support in driving innovation and market expansion for SMEs. Furthermore, Clausen et al. (2019) have shown that public innovation support can generate a "leverage effect", facilitating the international growth of SMEs. By receiving funding, SMEs can invest in their products and services, thereby enabling them to penetrate new markets. This theory is validated by the interest shown in the SMEs' concepts developed under Lighthouse Life Science.

INDICATIONS OF GROWTH POTENTIAL

Lighthouse Life Science has been implemented with outcomes exceeding several of the impact goals for the period from 2022 to 2023. Table 1 shows the impact targets, comparing the expected and realized values, along with a profit percentage that indicates the degree of fulfillment of each effect during this period.

The correlation between activities and outcomes confirms the relevance and efficacy of the pilot-projects. The data highlights the success of the growth platform, which has seen 315 participating companies engage in activities. This underscores the importance of offering guidance and support to meet company growth needs.

However, the target for new job creation has not been fully met. Feedback indicates that job creation is influenced by multiple factors, suggesting a need for better alignment between innovation activities and company growth phases. Future phases of Lighthouse Life Science will prioritize closer alignment between activities and growth phases, alongside more frequent and systematic data collection to assess intervention success accurately.

ACCELERATING DEVELOPMENT PROCESSES FOR SMES

The Lighthouse Life Science has collected data from the companies related to the dividends achieved. This data was collected at the end of the first grant at the end of 2023. Questionnaires on the companies' perceived benefits of participation were distributed to the 54 project partners. Of these, 43 companies (81%) responded, and the data are illustrated in Figure 15.

Data from 43 of the 54 project partners (81%) was collected in connection with the final report to the Danish Business Authority at the end of 2023.

Compared to the other seven Danish Business Lighthouses (COWI 2024), a significantly higher percentage of companies participating in the Lighthouse Life Science reported benefits in testing and market validation of ideas/products/services, as well as in extended collaboration and

Figure 15: Overview of the companies' perceived benefits of participating in Lighthouse Life Science

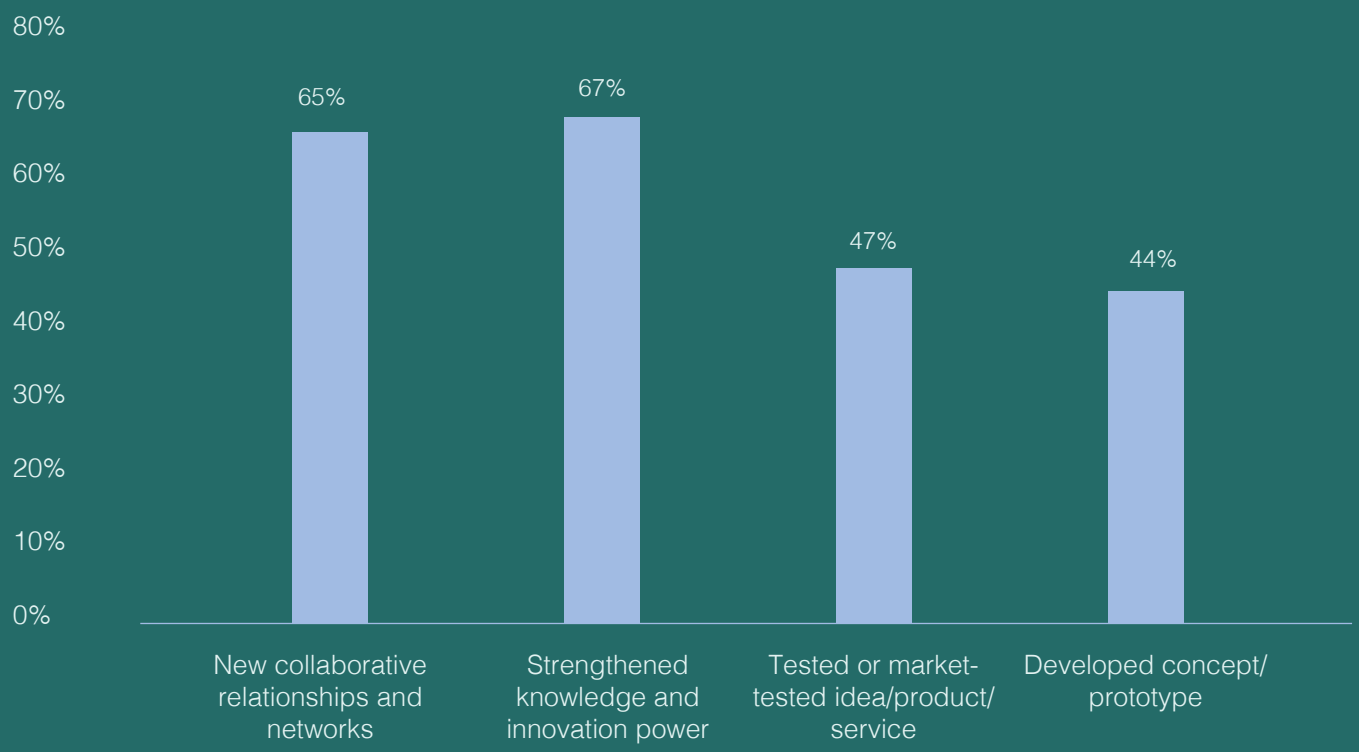
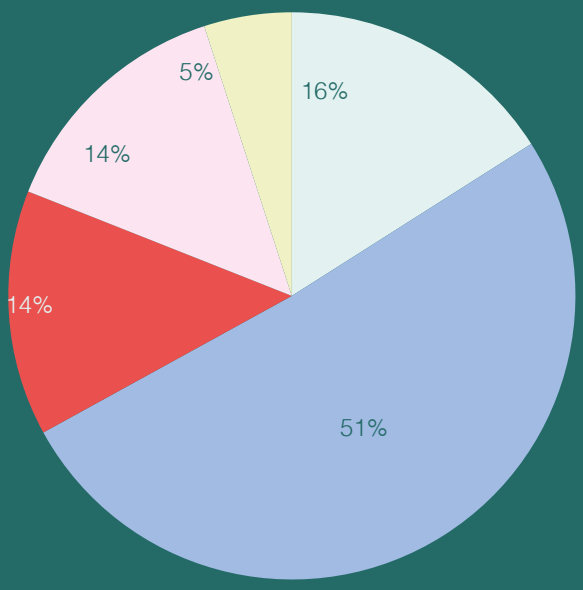


Figure 16: Overview of the companies' assessment of the extent to which Lighthouse Life Science has contributed to perceived benefits (Source: Data is from the report as of 31.12.2023, Lighthouse Life Science)



29 out of 43 companies (67%) believe that the Lighthouse Life Science has contributed a great extent or to very high degree to the benefits achieved

- To a very large extent
- To a large extent
- To some extent
- To a lesser extent
- Not at all

networking with other actors and sectors. This is aligned with the goal of initiating projects at an early stage (feasibility study and pilot phase) that test a concept/prototype in interaction with users, the public sector, knowledge institutions, other SMEs, and large companies. Recruitment of new employees is also high compared to other Business Lighthouses, consistent with the fact that more personnel have been employed in connection with the projects. This likely results from innovation and testing funds allotted to pilot projects in Lighthouse Life Science.

None of the companies reported strengthening their green transition, which reflects the lower prioritization of this area among SMEs in the healthcare sector. It is imperative to focus on how companies can better document and prioritize green initiatives. Future efforts should emphasize competence development and measurement tools for optimizations. Other parameters indicate that companies generally experience similar benefits across the seven other Business Lighthouses in Denmark.

Figure 16 illustrates that 67% of the companies experienced that the Lighthouse Life Science was important to a very large (16%) or large (51%) extent for the company's development and growth.

The data are supported by an SME in the quote below:

> *"Participation in the Lighthouse Life Science has been very important because new areas of application for the company are highlighted and established with really good evaluation, which we can then use for further documentation for potential new customers who demand evidence to move forward with our solution."*
> - Emento

In summary, the data indicates substantial benefits for participating SMEs, notably in collaboration, innovation power and go to market. This success underscores the importance of continued support and resources for innovation and development within the Lighthouse Life Science framework.

MATURITY OF THE PROJECTS

Development in the maturity of the pilot projects has also been assessed in the cross-disciplinary evaluation conducted by the Centre for Clinical Research and Prevention (Larsen & Mossman, 2023). It is clear from Figure 17 that the SMEs have experienced a significant acceleration in their development processes because of participation in the Lighthouse.

The analysis revealed that at the pilot-project's inception, 73% of participating SMEs were in the initial idea development phase, with a mere 7% in the final implementation stage. By the conclusion of the initiative, 40% of these SMEs had advanced to the user testing phase. This notable progression within a relatively short timeframe underscored the effectiveness of the pilot projects in expediting the transition from conceptualization to testing.

Such acceleration highlights the role of Lighthouse Life Science as a significant catalyst for innovation within the SME sector. The structured support provided through these projects enabled SMEs to streamline their technological and product development processes, thereby shortening the time to market. This is particularly vital for SMEs, which often face resource constraints that hinder their capacity for extensive development and testing of new health solutions.

These findings align with theoretical perspectives, such as those posited by Mazzucato, suggesting that PPPs are instrumental in accelerating technological innovation within small businesses (Mazzucato, 2013). Empirical data from the pilot projects affirm that with the appropriate backing and innovation ecosystem, SMEs can overcome developmental hurdles and achieve critical growth milestones more efficiently, which is essential in the dynamic healthcare sector.

Further details on the specific pilot projects are available on the Lighthouse Life Science website https://erhvervsfyrtårnlifescience.dk/pilot-projects/ and in section two "Evaluation of the pilot projects in Lighthouse Life Science 2022 to 2023".

Figure 17: The growth model used in Lighthouse Life Science

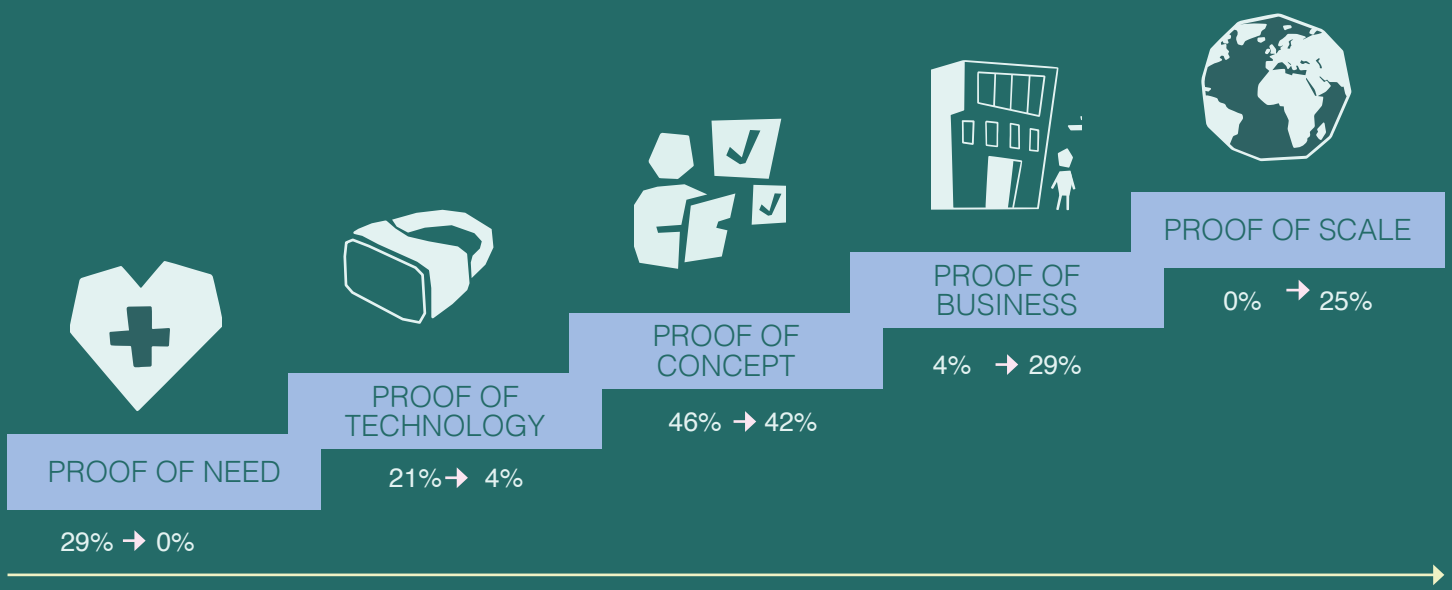
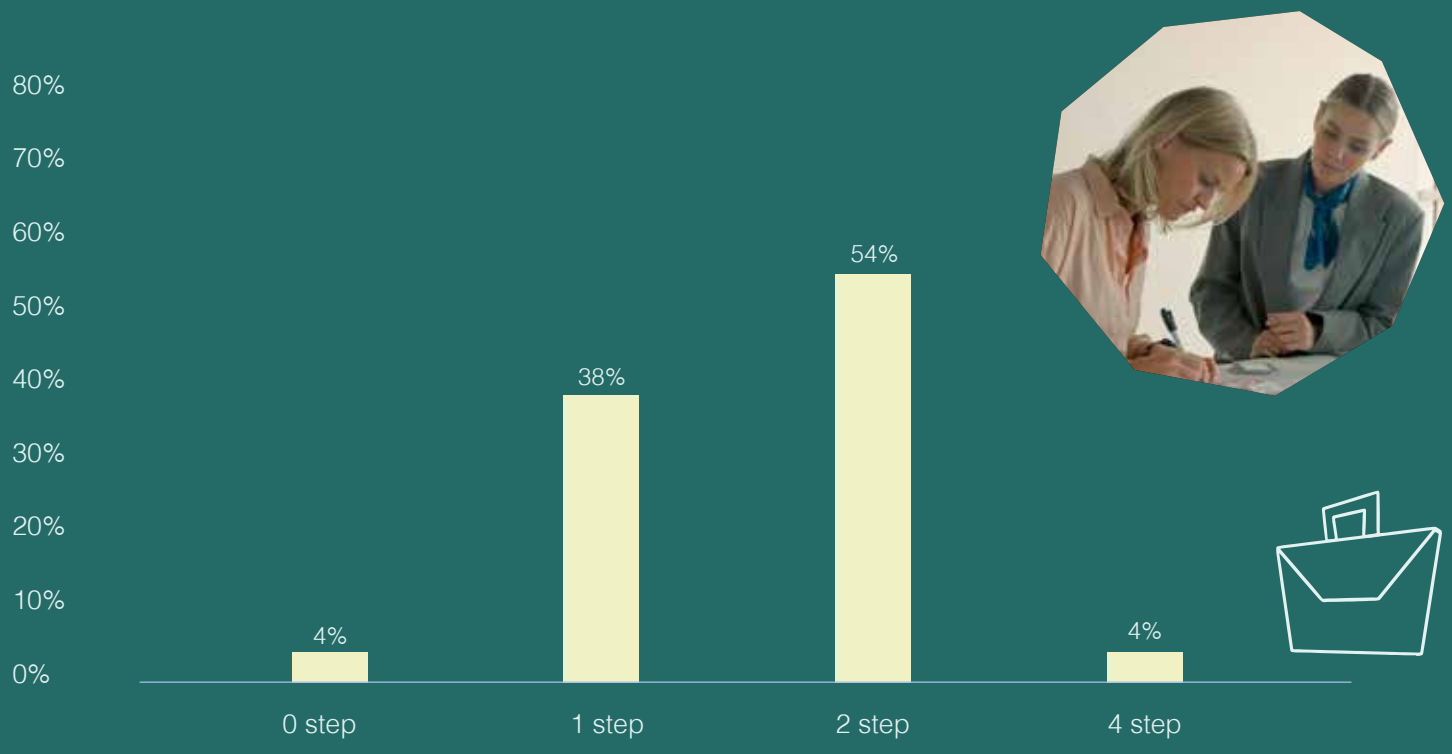


Figure 18: Number of steps projects have moved on the Growth Model



THE GROWTH MODEL IN LIGHTHOUSE LIFE SCIENCE

The Lighthouse Life Science growth model is an iterative evaluation framework, see Figure 17. From 2022 to 2023, the Lighthouse Life Science growth model engaged 54 companies across pilot and pooled projects and evaluated their journey.

This framework is created to enable SMEs to develop without following every step of the process and to tailor their journey to meet their specific needs and accelerate their development. The model spans phases from Proof of Need to Proof of Scale, ensuring that each stage is carefully assessed both as a checkpoint and as an opportunity for ongoing improvement. By integrating feedback loops, the growth model promotes sustainable health solutions addressing societal challenges, while allowing SMEs to refine their strategies in response to insights gathered throughout development in collaboration with the 'problem owner'.

As a model, it establishes clear, measurable benchmarks to evaluate SME progress and success throughout these stages. This includes key performance indicators like time-to-market, certification achievement, growth in market share, and export readiness.

- **Proof of Need: Identifying core health challenges**
  The first stage, Proof of Need, is essential for validating the demand for a solution, ensuring it addresses significant, unmet health needs. This phase relies on data and formative evaluation to assess gaps in healthcare and verify that the proposed solution aligns with market demand and willingness to invest. In the Lighthouse Life Science context, this stage pinpoints specific areas where innovation can make a real difference.
- **Proof of Technology: Verifying technical feasibility**
  In the Proof of Technology phase, projects develop and test prototypes, with formative evaluation assessing technical viability in controlled environments. Here, potential technical challenges are identified and addressed early on, reducing future risks. Summative evaluation is used to confirm that the technology can perform as intended, laying a solid foundation for real-world application.
- **Proof of Concept: Testing practical application**
  The Proof of Concept phase brings the solution into real-world contexts, where data and formative evaluation assesses its adaptability and efficacy across diverse conditions in practice. This stage includes pilot testing and data analysis to ensure the solution effectively addresses the identified need and what it requires to be used in daily operations, with summative evaluation confirming its impact. Lighthouse Life Science leverages its collaborative, multi-stakeholder network to support rigorous testing, ensuring the solution's relevance and readiness for broader application.
- **Proof of Business: Establishing market potential**
  The focus shifts in the Proof of Business phase to commercial viability, using formative evaluation to develop and refine business models, funding strategies, and revenue channels. Summative evaluation then verifies market readiness, ensuring the solution's potential for financial sustainability while continuing to address health challenges in a broader context than the proof of concept at one organization. This stage empowers SMEs to build competitive, market-ready solutions.
- **Proof of Scale: Preparing for national and international scaling**
  The Proof of Scale phase refines established viability for broader deployment, spanning domestic and international markets. Formative evaluation identifies how solutions can adapt to different healthcare infrastructures, larger user populations, and new regulatory frameworks. Summative evaluation confirms the solution's performance at scale, ensuring consistent quality and measurable health outcomes across diverse contexts. Lighthouse Life Science supports SMEs in navigating these challenges by providing guidance on regulatory compliance, forging strategic partnerships, and crafting go-to-market strategies. By reaching the Proof of Scale, SMEs demonstrate their capacity to deliver impactful health technologies to new regions, fueling both public health improvements

and commercial growth.

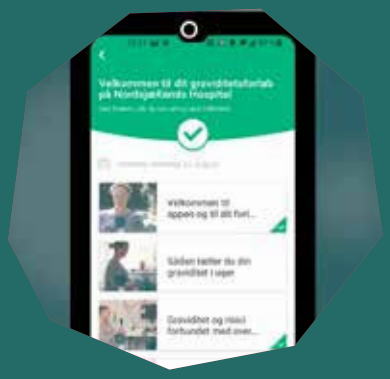
One specific example is the company Emento, which through the implementation of the pilot project: Movement, healthy weight and well-being – a digital learning course for overweight pregnant women, increased two steps in the growth model, from Proof of Concept to Proof of Scale. Emento´s growth stages are shown in Figure 19.

Emento is scaled both nationally and internationally. Nationally, the project has been scaled to a larger target group, and a researcher has been hired to gather knowledge with a focus on evidence. Internationally, Emento has set up a subsidiary in Germany and obtained their first contract with a German university hospital. That the pilot project was carried out in collaboration with a knowledge institution responsible for the evaluation is one of the reasons for Emento's potential for growth.

Another SME, SENS Innovation, participated in a pilot project and has scaled their solution. SENS Innovation experienced the participation in the Lighthouse Life Science as an accelerator in their development.

"We also greatly appreciate the trust and great help the lighthouse project has been in getting our business idea and product development on the wings. The projects under the auspices of the lighthouse have both created concrete increased sales of existing products and a foundation for the development of a new innovative product with great expectations for the future."
- SENS Innovation

Figure 19: The growth development of the company, Emento, shows a development from Proof of Concept to Proof of Scale in connection with participating in the Lighthouse Life Science.



March 2023
Digital counseling for pregnant women and mothers, and test in a new hospital.

September 2024
Established a subsidiary company in Germany. Obtained the first German contracts, including a contract with a University Hospital.

PROOF OF NEED
PROOF OF TECHNOLOGY
PROOF OF CONCEPT
PROOF OF BUSINESS
PROOF OF SCALE

PUBLIC-PRIVATE PARTNERSHIPS AS CATALYST FOR INNOVATION

An essential element of the success of the Lighthouse Life Science initiative is its ability to act as a catalyst for innovation through PPPs. These collaborations enabled the exchange of knowledge, resources, and technology between public entities, such as universities, municipalities, hospitals, and SMEs, which frequently lack access to such resources. In recent years, PPPs have proven to be a valuable mechanism for fostering innovation, particularly in the health sector. Chesbrough's concept of open innovation underscores the necessity of cross-sector collaboration to create a dynamic innovation ecosystem where knowledge and resources are shared freely (Chesbrough, 2020).

SMEs have highlighted that collaboration with public actors provided them with unique insights and access to target groups and data that would usually be difficult to obtain. One SME representative noted:

> *"It's great to get such a deep look into practice. It's quite unique and difficult to get as a private company normally."*
> - Company

This access allowed SMEs to test and validate their products in real-world contexts, which is critical in the healthcare sector, where evidence-based solutions are required before new products can be brought to market. Knowledge institutions working with SMEs observed that collaboration was characterized by faster decision-making processes, increasing the flexibility and agility of innovation processes. A researcher observed:

> *"We work with those who sit at the top of these companies and who also help to do the work, which is a completely different way of working."*
> *- Knowledge institution*

Public actors noted that collaboration with private companies provided them with technical expertise they lacked. This is particularly important for developing digital solutions, where private entities have a technological edge. A public representative stated:

> *"Having private companies on board means that we can deliver a product of higher quality than if we had to start from scratch."*
> *- Public institution*

This demonstrates how private sector expertise raised the technical standard of projects, making public solutions more efficient and functional — showing how collaboration between public and private entities can create superior solutions than working individually. On the other hand, quicker adaptation and decision-making often challenge larger public sector organizations with more complex decision-making processes which makes it necessary to continuously adjust expectations.

Hagedoorn et al. (2018) emphasize that PPPs enhance innovation speed and process efficiency, particularly in high-tech sectors. This is highly relevant for healthcare, where the development time for new technologies is lengthy due to strict regulations and testing requirements. The Lighthouse Life Science initiative allowed SMEs to shorten this timeframe by integrating testing and market readiness early in the development process, crucial for competing in national and international markets. For instance, the growth platform offered courses on understanding the public sector, medical device regulations (MDR), and continuous optimization of valuation through interaction with users and decision-makers both public and private. A MDR guide was developed to assist companies and public actors throughout the development process of a solution classified as a medical device. www.rigshospitalet.dk/innovation/ydelser/

The mission of the Lighthouse Life Science initiative was from the start to enhance multi-sector and multi stakeholder collaboration. This was operationalized through a collaborative model connecting SMEs with larger public entities via innovation projects where new health technologies and solutions were tested in practice. Klijn and Koppenjans highlight the effectiveness of close collaboration throughout

the innovation process (Klijn and Koppenjans, 2016). 54 SMEs participated in pilot and PPPs from 2022 to 2023, achieving faster market entry than traditional methods.

However, despite the scaling potential for the companies, none of the projects reached the implementation phase by the end of the evaluation, highlighting the need for more time dedicated to implementation and a long-term plan for testing and scaling prototypes. This requires extended financing models to support promising projects that show potential for both health and economic growth.

STRATEGIC PARTNERSHIPS AND THE ROLE OF SMES IN HEALTH

An important perspective is the significance of strategic partnerships between SMEs and larger companies. Data from the Lighthouse demonstrate that such collaborations are crucial for the development of SMEs and their ability to test solutions on a larger scale. For example, larger companies provids SMEs with access to markets, networks, and resources that will otherwise be difficult to obtain.

Collaboration between small and large companies emerge as a significant growth factor in modern innovation ecosystems. According to Ritala et al. (2021), SMEs often act as innovation engines, but their success depends on their integration into larger innovation networks, where large companies serve as anchors. Within Lighthouse Life Science, this dynamic was evident. SMEs collaborating with larger companies are able to test their solutions more extensively and leverage the market networks of these larger entities. Brown and Mason (2019) support this by highlighting that strategic partnerships offer not only funding but also essential knowledge and expertise, accelerating the innovation cycle.

For SMEs within the Lighthouse, such partnerships were invaluable. They helped overcome challenges in product development and internationalization by providing access to the expertise and customer bases of larger companies. This collaboration created a fertile environment for SME growth, allowing them to achieve new developmental milestones, and enabling SMEs to test solutions in larger markets and with broader user groups. This bolstered product development and increased the chances of successful implementation.

The cooperation models demonstrate how SMEs can act as innovation engines in the healthcare sector when integrated into the networks and infrastructure of larger companies. Supported by Klijn and Koppenjans (2016) emphasizing the importance of cross-sectoral collaborations in fostering innovation.

INTERNATIONALIZATION AND EXPORT POTENTIAL

Internationalization has been identified as a critical element for growth, particularly in the healthcare sector, where solutions have global applicability. SMEs often face significant challenges in accessing international markets, primarily due to limited resources and networks. Johanson and Vahlne (1977) and Clausen, Korneliussen, and Madsen (2019) argue that companies are hesitant to internationalize because of substantial investment needs and high uncertainty. Lighthouse Life Science initiative addressed this issue by offering courses on the growth platform and pilot projects that prepared Danish SMEs for export—an essential pathway to sustainable growth.

Through PPPs, such as those facilitated by Lighthouse Life Science, participating SMEs are shown to be better positioned to navigate these challenges. For example, pilot projects like Movement, healthy weight and well-being – a digital learning course for overweight pregnant women, successfully tested and market-readied technologies with global relevance. SMEs from these projects, including Liva Healthcare and Emento, have made notable progress in the UK and German markets, respectively. Mazzucato (2013) highlights that PPPs can create export opportunities by positioning new technologies and solutions within international markets. This is particularly pertinent in Denmark, where the ambition to be a global leader in health innovation necessitates the capacity for SMEs to scale their solutions internationally.

CONCLUSION – IMPORTANCE FOR FUTURE GROWTH

The Lighthouse Life Science initiative has demonstrated significant growth potential for SMEs through their participation in pilot projects. The accelerated development, increased access to finance, and successful cooperation models have provided evidence that the participating SMEs are well-positioned for future growth. While these findings stem from the participating SMEs, they also demonstrate the broader influence SMEs enterprises can exert in shaping healthcare innovation. By leveraging new partnerships, resources, and insights, SMEs are primed to address pressing health challenges on both domestic and international fronts. In doing so, they not only pave the way for their own long-term success but also contribute to the advancement of global health solutions.

The gathered data indicate that Lighthouse Life Science has acted as a catalyst for growth and innovation among Danish SMEs in the healthcare sector. Strategic PPPs, venture capital, and innovation platforms notably have enhanced the innovation capacity of the SMEs and their market maturation process. This is corroborated by both quantitative and qualitative data, showing substantial progress in the development and testing of new technologies and solutions.

Participation in the Lighthouse Life Science pilot projects have accelerated the innovation cycle, facilitating a rapid transition from Proof of Concept to Proof of Scale. Approximately 33% of the pilot projects secured additional funding directly because of their participation in the Lighthouse, supporting theories that public innovation support acts as a lever for further public and private investment.

The financing model of Lighthouse Life Science, combining venture capital and public funds, reduced the financial risks associated with health innovation and facilitated faster market maturation. Notably, SMEs such as Emento and SENS Innovation have secured international contracts and established foreign subsidiaries, highlighting the initiative's impact on both national and international levels.

Multi stakeholder collaboration between public and private entities have emerged as a critical factor in developing and testing new solutions as PPPs provided SMEs with vital resources, including clinical testing environments, user data, and direct feedback from end-users, enabling faster decision-making and agile innovation.

However, challenges remain in realizing the full growth potential. For instance, the creation of new jobs did not meet the expected targets, suggesting that a longer implementation period would be necessary to fully translate innovation projects into economic growth and employment. Future initiatives should focus on systematic and structured data collection, to accurately estimate long-term growth potential.

Overall, the analysis concludes that Lighthouse Life Science has created significant growth opportunities for SMEs in the healthcare sector by fostering innovation through PPPs, venture capital, and a focused innovation environment. The approach of integrating national health innovation ambitions with concrete development and export strategies strengthen Denmark's position as an international player and leader in health innovation and life science. Continued focus on implementation and data-driven decision-making will be crucial to realizing the full growth potential in the coming years.

PERSPECTIVES: CATALYST FOR GLOBAL HEALTH INNOVATION

Lighthouse Life Science represents a step forward for Danish SMEs in the health technology sector. The insights gained from this project can serve as a future model for innovation-driven growth initiatives across various sectors. The project demonstrates that a targeted approach combining financial support with strategic partnerships and accelerated innovation processes can yield substantial benefits for SMEs, which can positively impact the Danish economy.

This development aligns with international research trends emphasizing the need for agile and multi stakeholder collaboration models to address challenges in complex, technology-intensive sectors such as health. Recent studies highlight the crucial role of public institutions in sharing risk and fostering innovation, particularly at early development stages (Mazzucato, 2013, Chesbrough, 2020). Such collaboration is essential for creating dynamic innovation ecosystems where companies of varying sizes can collectively develop technological solutions with broad societal benefits. The experiences from Lighthouse Life Science can thus not only guide future innovation projects in Denmark but also inspire similar initiatives globally.

Internationally, Denmark can leverage its strengths in health technology, and Lighthouse Life Science can help consolidate its position as a key player in future health innovation. To sustain this momentum, it is essential to expand the results through continued investment in research, development, and internationalization, paving the way for new export opportunities and global partnerships.

This perspective underscores the necessity of future expansion of multi stakeholder and cross sectoral partnerships as strategic tools for addressing complex societal challenges and fostering sustained growth and innovation. Lighthouse Life Science exemplifies how such partnerships can facilitate a symbiosis between technological development, economic growth, and societal value.



Read more at
www.erhvervsfyrtaarnetlifescience.dk

Image on the next page is from the project ‘Movement, Healthy Weight, and Wellbeing – A Digital Learning Course for Overweight Pregnant Women’.

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