

cities
changing
diabetes



AARHUS

Investing to reduce the burden of type 2 diabetes

Social impact bonds to help accelerate the implementation of effective health solutions in Aarhus, Denmark

December 2021



At a glance

“The most important takeaway from this development process is that it really pays off to invest time and resources in ensuring that everyone is on board from day one. Our ambition with this project has been to reduce the burden of diabetes by changing the way we talk about and manage prevention and care in everyday practice. You can only hope to achieve this if you ensure that the solution you develop reflects the vision, knowledge and perceptions held by the people who work with these matters every day.”

Otto Ohrt, Director of Public Health,
City of Aarhus



The business case for secondary prevention is solid

Prevention of type 2 diabetes-related complications constitutes an attractive investment case from an individual, social and economic perspective – even in a population with an elevated risk of poor health.

Creating an investment case calls for a range of competences

Developing an investable project is a demanding process that requires a combination of project managers, health experts, economists and people capable of building trust and relations, including frontline staff and leaders.

An inclusive process is instrumental for success

Mutual trust and co-ownership constitute the best possible platform for creating a solution that adds value to all parties.

Aarhus, Denmark



Total population of **350,000**
(287,000 adults)



10,000 adults
with type 2 diabetes (diagnosed)



45 million US dollars
spent on type 2 diabetes care
annually

Note: USD 45 million is approximately DKK 296m or EUR 40m

A new model for acting on diabetes complications

Aarhus is Denmark's second-largest city and has a population of approximately 350,000, of whom 287,000 are adults over the age of 18.¹

Since 2000, the number of people living with type 2 diabetes has tripled in the city. The disease currently impacts 3.5% of the adult population, which equates to about 10,000 citizens – a figure that is expected to increase to 18,000 by 2030 (Figure 1).²

The costs associated with providing adequate care are high. The City of Aarhus currently spends 45 million US dollars on type 2 diabetes care annually, and this figure is predicted to rise sharply in the years to come. The increase in the number of people living with type 2 diabetes who develop serious complications is expected to drive the surge in costs. Poorly controlled diabetes can lead to a range of complications, including eye problems, cardiovascular disease, nerve damage (neuropathy) and kidney failure.³ These complications, as well as the high prevalence of comorbidities (other diseases found in the same individuals that are sometimes related to or exacerbated by diabetes), reduce the quality of life

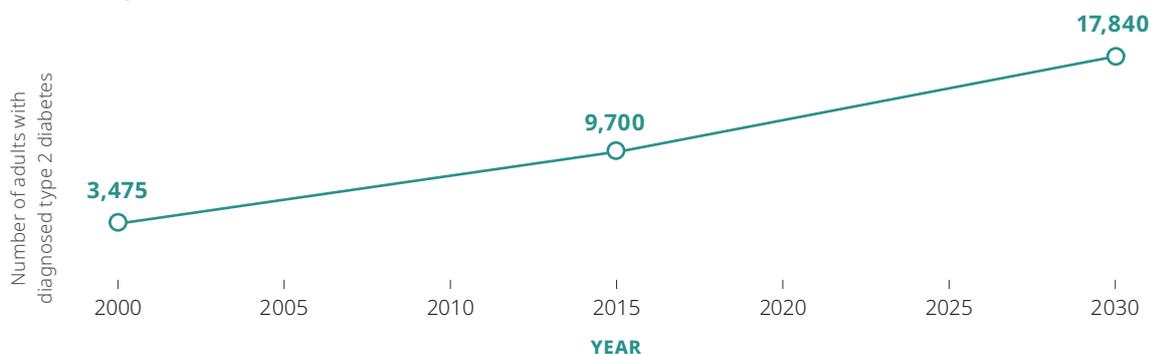
of people living with type 2 diabetes.³ As a result, the cost of treatment and care can be exorbitant, especially in nursing homes and residential care facilities.

A cross-sector partnership

To reduce the negative impact of type 2 diabetes on those affected by the disease and the associated costs, the City of Aarhus engaged in a cross-sector partnership with Steno Diabetes Center Aarhus and the National Social Investment Fund. The partnership, aimed at developing a social impact bond, enabled the City of Aarhus to offer vulnerable people with type 2 diabetes access to an intensive patient-centred programme designed to reduce the risk of developing serious diabetes-related complications.

Based on an inclusive development process characterised by mutual trust and respect, the process led to the signing of Denmark's first social impact bond within the healthcare sector. The programme will directly benefit 450 vulnerable citizens living with type 2 diabetes and, at the same time, provide the municipality and investors with an economic return.

Figure 1: Historic and projected type 2 diabetes prevalence in the city of Aarhus, 2000–2030



Note: Data from 2018 and onwards are based on estimates for the average national growth rate.

Sources: "Danskernes Sundhed," Sundhedsudvikling i Danmark frem til 2030" and own calculations.

The care conundrum

From an economic standpoint, better care often leads to a perplexing dilemma: on the one hand, good healthcare enables those with chronic illnesses to live longer. On the other, it means that people with chronic diseases require care for a longer period. The longer a patient lives with a chronic illness, the more expensive their care becomes, and the higher the cost for society. This highlights the importance of preventing disease complications and maximising the number of years people live free from illness or disability.

“The increased demand for public service offerings caused by the surge in type 2 diabetes prevalence represents a huge challenge for a municipality like Aarhus from a human and economic perspective. The need for innovative solutions that can help bend the curve is real and urgent.”

Jette Skive, Alderman, Health and Care,
City of Aarhus

Unmasking inequalities

The rise in the number of people living with diabetes coincides with a surge in health inequality – a fact that stands in stark contrast to City of Aarhus’s vision of creating an equal, healthy and thriving city.

The various social groups are not equally affected by diabetes and other chronic diseases. For example, unemployed people who have no

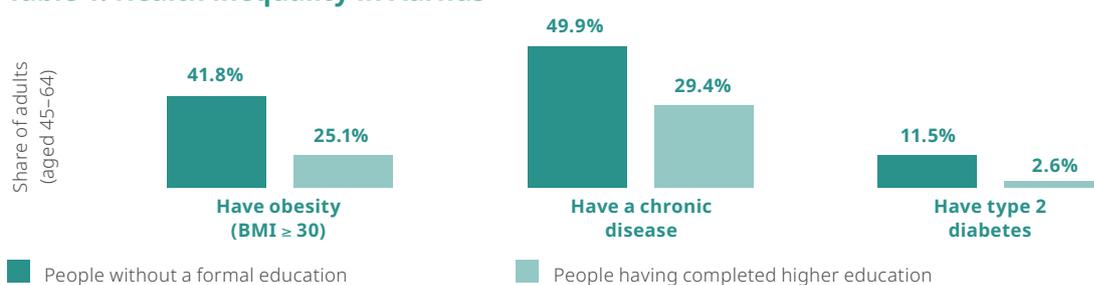
or low levels of formal education often live a life characterised by unhealthy habits, such as smoking and sedentary behaviour. In contrast, those with employment and a formal education often live healthier, more active lives.⁴

Consequently, the unemployed and people with no or low levels of education are more likely to develop lifestyle-related conditions such as type 2 diabetes, cardiovascular disease, and obesity (Table 1). In addition, research shows that these individuals are less likely to manage their conditions effectively because they are often dealing with multiple challenges at the same time (financial, social or personal) or lack the time, competences or resources needed to live a healthy life. These factors also mean that they are more prone to developing serious disease complications that decrease their quality of life and increase the demand for more intensive care.

“Type 2 diabetes and other non-communicable diseases are much more prevalent among people without a job or an education than among the general population. Similarly, the risk of developing complications due to the disease is also higher among this group. Therefore, an effective strategy for defeating type 2 diabetes and its complications calls for an explicit focus on people in exposed positions.”

Anneli Sandbæk, Professor & Head of Unit,
Steno Diabetes Center Aarhus

Table 1: Health inequality in Aarhus³



Source: Danskernessundhed.dk

Data are for the Central Denmark Region, which includes Aarhus.

A bold new approach

To reduce the number of people living with diabetes and health inequity, which constitute major challenges to the city's social cohesion, the City of Aarhus developed and launched an ambitious Diabetes Action Plan in 2018 (Figure 2).¹

The plan was developed using an inclusive process involving a broad range of stakeholders. It was anchored in three core principles related to the prevention and management of type 2 diabetes:

1. **Citizens at the centre:** All initiatives had to deviate from individual needs and resources and focus on health inequity and family-based interventions.
2. **Prevention and early intervention:** Citizens had to be encouraged to follow a healthy lifestyle. Any diabetes-related risks and complications had to be effectively identified and managed.
3. **Coordinated efforts:** The city had to develop a systematic approach to ensure that citizens benefit from a coordinated, cross-sectoral effort involving general practitioners, hospitals and all relevant departments within the municipality.

"In Aarhus, we've been trying to defeat type 2 diabetes for many years. Our efforts have made a positive difference, but they haven't been sufficient to bend the curve, and the challenge keeps growing. We see the launch of a coherent strategy, with an enhanced focus on partnerships, as instrumental for the battle ahead."

Sussie Østerby, Head of Public Health, Aarhus West, City of Aarhus

The action plan involved a broad range of initiatives aimed at all citizens, focusing on vulnerable groups such as the elderly, minorities and people living with existing health conditions.

A cornerstone of the City of Aarhus's public health strategy was strengthening its partnership with citizens, paying close attention to their everyday lives. This strategy meant that citizens' needs could be met with the right interventions, minimising the need for healthcare services.

Figure 2: The city's diabetes action plan¹



The city set crystal-clear objectives:

1. Ensure fewer citizens develop type 2 diabetes
2. Decrease the level of health inequality, specifically in relation to type 2 diabetes
3. Ensure more citizens with type 2 diabetes live healthier and longer lives

Did you know that the monetary value of **delaying** the development of **severe diabetes-related complications for just five years is 367,000 DKK (55,544 USD)** for a person who is already experiencing minor complications?

Encouraging healthy living has been a pillar of the municipality's public health strategy for years. Most of the initiatives included in the plan were not new, but various new strategies were implemented. The initiatives were based on best practices devised over years of developing and delivering rigorous, effective health services. The municipality further ensured that the various efforts were coordinated, to unlock the synergies associated with a holistic approach.

Breaking free from an ineffective funding cycle

Even though the action plan represents a significant leap forward in creating a healthy, liveable and equal city for all, the municipality also acknowledges that these initiatives alone are insufficient to significantly impact the rising prevalence of type 2 diabetes. To reduce the type 2 diabetes burden, there is a need for large-scale investments in long-term prevention programmes that can effectively prevent or, at least, delay the onset of diabetes and its complications. Long-term interventions are difficult to deliver for a municipality bound by short-term budgetary constraints and a lack of operational agility. This represents a frustrating reality, given the fact that analyses from the City of Aarhus, the Danish government and the World Health Organization (WHO) show that the business case for investing in effective prevention programmes is attractive when viewed as a long-term, societal investment.

Even if investing in prevention often constitutes an attractive opportunity when evaluated at national level, inappropriate incentive structures often make it difficult to unlock these opportunities in practice.

In Denmark, municipalities are responsible for social and community care. This includes welfare allowances (eg disability pensions) as well as residential

care, elderly care and care for mentally or physically disabled individuals. In addition, municipalities are responsible for ensuring that local communities have access to healthy environments, activities and facilities that promote well-being and prevent disease.

The regions, in turn, govern primary and secondary healthcare services provided by general practitioners (GPs), hospitals and specialists in private practice. Public hospitals and local community mental health centres are owned and operated by the regions, and they are responsible for reimbursing private-practice GPs.

A municipality that invests in a prevention programme will, therefore, fail to harness the total value generated by the programme, given that some of the benefits are transferred to other public, regional and national authorities.

"It's our ambition to make citizens more self-reliant by designing our healthcare services in a way that accommodates the needs and preferences of each individual. The use of data is instrumental for delivering solutions that aren't only tailored to individual needs and preferences but also cost-effective to ensure that our delivery model is financially sustainable."

Hosea Dutschke, Managing Director, Health and Care, City of Aarhus



Investment fund used to support social impact bonds

To stimulate investments in prevention and early intervention to reduce the long-term demand for healthcare, the Government of Denmark established a National Social Investment Fund (Den Sociale Investeringsfond) in December 2018. Similar institutions in Finland and the United Kingdom inspired the design of the investment fund, which is aimed at developing, promoting and supporting social impact bonds. It is an innovative partnership model whereby an investor agrees to finance a relevant social intervention (Figure 3). In exchange for the investment, the funder receives a commitment from a public authority to receive payment if the intervention leads to a change in one or more well-defined indicators (eg improvements in the patient population's long-term blood glucose levels).

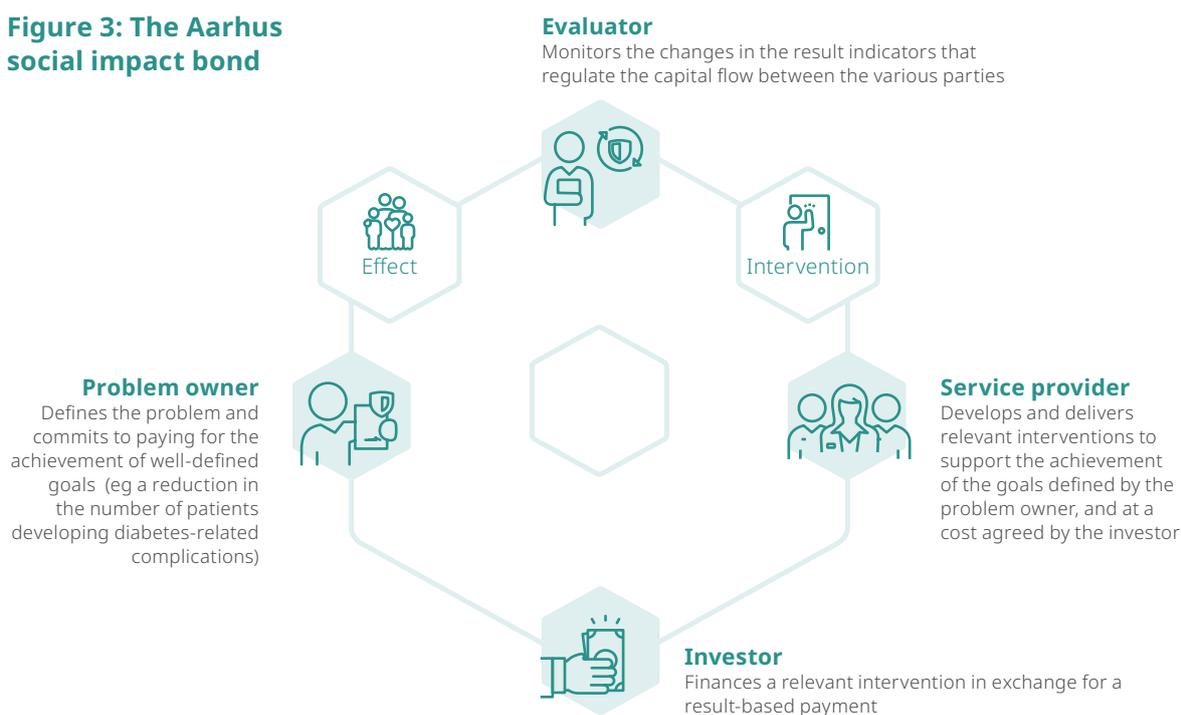
The indicators are defined by the authority and approved by the investor. The expected payment

from the authority covers the costs associated with the development and implementation of the intervention and includes a small risk premium to compensate the investor for the risk associated with not receiving a payment if the intervention fails.

“Social impact bonds are forming an innovative partnership model that can help us address some of our most challenging societal problems, which call for long-term interventions and cross-cutting efforts. We’re currently exploring how to leverage the model within different areas, and the fight against type 2 diabetes seems to provide a promising platform for putting the model in use.”

Camilla Bjerre Damgaard,
Head of the National Social Investment Fund

Figure 3: The Aarhus social impact bond



Social impact bonds aim to remove the financial and organisational constraints that hamper the viability of promising initiatives. Examples include diabetes prevention programmes that are financially viable but hard to realise, initiatives where the short-term costs outweigh the short-term benefits and projects that call for cross-cutting efforts that current governance structures support. A social impact bond can make it easier to design and deliver an effective intervention because the payment model is based on an agreement focused on outputs rather than inputs. The partnership model also assures the relevant

stakeholders that the intervention will generate value that exceeds the costs, as the public authorities' payments are directly linked to the predefined result indicators. In this way, the model delivers impactful interventions which benefit the citizens at the same time as freeing up economic resources.

Ultimately, introducing a social impact model means that the City of Aarhus can offer more people with type 2 diabetes access to better healthcare solutions.



A marriage of ideas

The establishment of the National Social Investment Fund coincided with the launch of the city's Diabetes Action Plan, paving the way for an alliance ready to use social impact bonds to change the city's type 2 diabetes trajectory.

This alliance involved three groups with distinct roles, responsibilities and resources:

The problem owner

The City of Aarhus

- **Role and responsibilities:** Responsible for the overall design and delivery of the intervention, including selecting target groups, specifying result indicators and paying for the intervention if the programme positively impacts the pre-determined indicators.
- **Resources:** In-depth understanding of the target groups, practical experience from previous projects, analytical competences and economic resources to support the development of the investment case and pay for results if the programme leads to a positive change.

The expert

Steno Diabetes Center Aarhus,
Aarhus University Hospital (the region)

- **Role and responsibilities:** Responsible for supporting the design of an effective intervention and for conducting an expert assessment of the expected impact on participants' health.

- **Resources:** A deep understanding of diabetes and how the disease develops with and without the relevant prevention and care measures.

The investor

The National Social Investment Fund and the Council for Social Investment in Aarhus

- **Role and responsibilities:** Responsible for co-financing the development of the investment case and subsequently funding the implementation of the intervention, bearing the financial risk.
- **Resources:** Access to funding, the ability to take on financial risk and specialised expertise in transforming a well-defined intervention into a successful project.

In addition to these core role players, a facilitator (NDC/Dalberg) and a group of supportive partners, including representatives from other municipalities, Steno Diabetes Centers in other regions of Denmark and the international Cities Changing Diabetes programme supported the process. The facilitator's key role was to drive constructive dialogue between the core partners and assist them in developing the investment case by providing expert advice based on experience. The other supportive partners' primary function was to support the development of a more robust, scalable solution – for example, by providing access to unique data points and economic modelling tools.



An inclusive development process

Phase 1 – Creating a shared vision

The purpose of the first phase of the project was to create a shared understanding of the opportunities and challenges associated with designing and implementing diabetes prevention programmes anchored in social impact bonds.

A half-day seminar kick-started the process at Aarhus City Hall. Relevant stakeholders were invited to help shape the project with their knowledge and expertise, creating a more nuanced understanding of the opportunity landscape. The participants also helped to ensure that the development process adequately addressed all relevant concerns.

The first seminar provided an overview of the alliance members' collective knowledge, capabilities and resources. Subsequently, the group developed a roadmap for an effective intervention and a solid investment case.

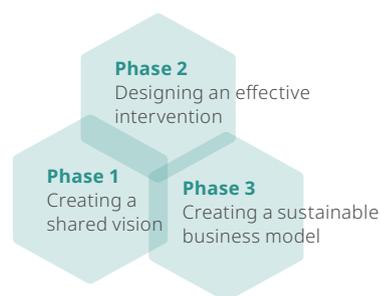
The stakeholders decided to develop the investment model around an intervention in Aarhus West, an area with an above-average number of citizens living with type 2 diabetes who are at increased risk of complications. Ultimately, however, the new investment project was not limited to this area. Instead, it targeted people at increased risk of developing diabetes complications across the city.

“In Aarhus, inclusion is a fundamental design parameter for any process that seeks to create a solution that is truly transformative and sustainable. We simply need to activate all good ideas to create and promote collective ownership to succeed.”

Hosea Dutschke, Managing Director, Health and Care, City of Aarhus

Figure 4: A three-phase approach

The development of the investment case was divided into three partly overlapping phases:



Phase 2 – Designing an effective intervention

After the initial kick-off meeting, two supportive workstreams were initiated:

- The purpose of the first workstream was to conduct a literature review to map out opportunities – both with regard to tools and remedies that could inspire the development of effective interventions and in terms of organisational structures, payment mechanisms and so on that could inform the creation of an attractive investment case. To ensure a neutral perspective on opportunities and challenges and reduce the municipality's work burden, the research task was assigned to NDC/Dalberg, whose social investment experts served as development process facilitators.
- The second workstream focused on designing the intervention, based on insights from the initial research process (conducted to develop the city's Diabetes Action Plan) and a systematic review of local experiences, knowledge and resources. Responsibility for developing solutions was assigned to a small task group that constituted city representatives

and diabetes experts from Steno Diabetes Center Aarhus. An internal project coordinator reporting directly to the Head of Health Services was appointed to ensure that an inclusive development process, based on the highest level of co-creation and co-ownership, was put in place. The project coordinator and facilitator shared the responsibility for leading the development process.

“A solid understanding of best practices and existing programmes is an essential ingredient in the development of the next generation of health solutions. Why invest resources in developing your own solution rather than using these resources to improve and implement solutions already developed by others if they meet your needs?”

Hosea Dutschke, Managing Director, Health and Care, City of Aarhus

the expected health outcome supported the assessment (Figure 5). The potential outcome was predicted by diabetes experts and influenced by a literature review of the economic burden of diabetes, both in terms of direct costs associated with care and indirect costs linked to a loss of productivity.

“Even though we have a very solid understanding of how to prevent and manage type 2 diabetes, it’s often difficult to estimate the expected effect of a given intervention. To do so, you need to have an in-depth understanding of the disease, the target group and the context in which the intervention is to be delivered. However, if you manage to engage the right people, you will indeed be able to come up with a qualified estimate for the likely impact.”

Anneli Sandbæk, Professor & Head of Unit, Steno Diabetes Center Aarhus

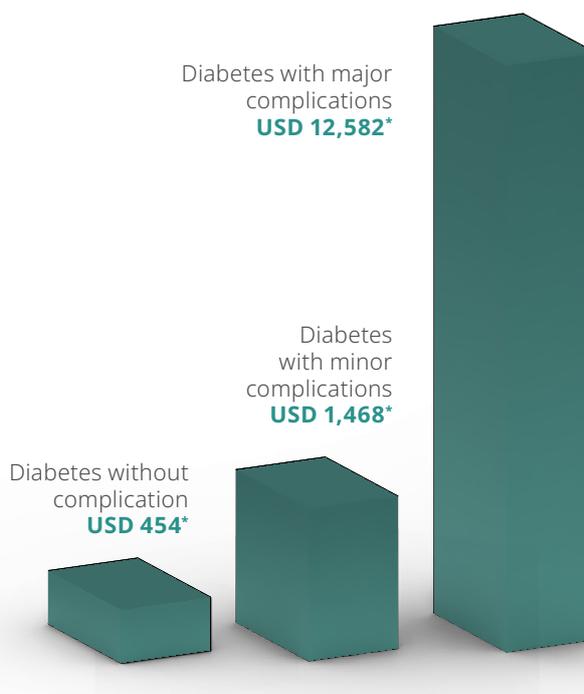
Phase 3 – Creating a sustainable business model

The development of the social intervention was accompanied by an exploration of the business case. The goal was to clarify the likely impact from a social, public health and financial perspective.

Experts from Steno Diabetes Center Aarhus assessed the expected impact on the disease trajectory of people living with type 2 diabetes. These experts were in close contact with city employees who had an in-depth understanding of the target group, including their motivation for participating in a development programme and its related activities and adhering to health professionals’ recommendations. Consequently, the likely health outcome was based on a triangulation approach combining insights from academic literature with insights from past projects (both internal and external) and a general understanding of the target group.

Based on this assessment, the city evaluated the economic impact of the intervention. As part of the process, they assessed the distribution of benefits across time and budget areas, such as healthcare and social. A simulation model exploring the likely disease trajectory among people who experienced

Figure 5: Costs per patient soar with complications



* Annual cost saving per person (USD) associated with preventing type 2 diabetes.

The final step in the development process was to create a payment mechanism that would unlock an attractive return for both the investor and the city. More specifically, the task involved the design of a payment mechanism that would fulfil two binding conditions:

City incentive: The expected value of a change in the result indicators that trigger a payment from the city to the investor always had to exceed the outcome payment.

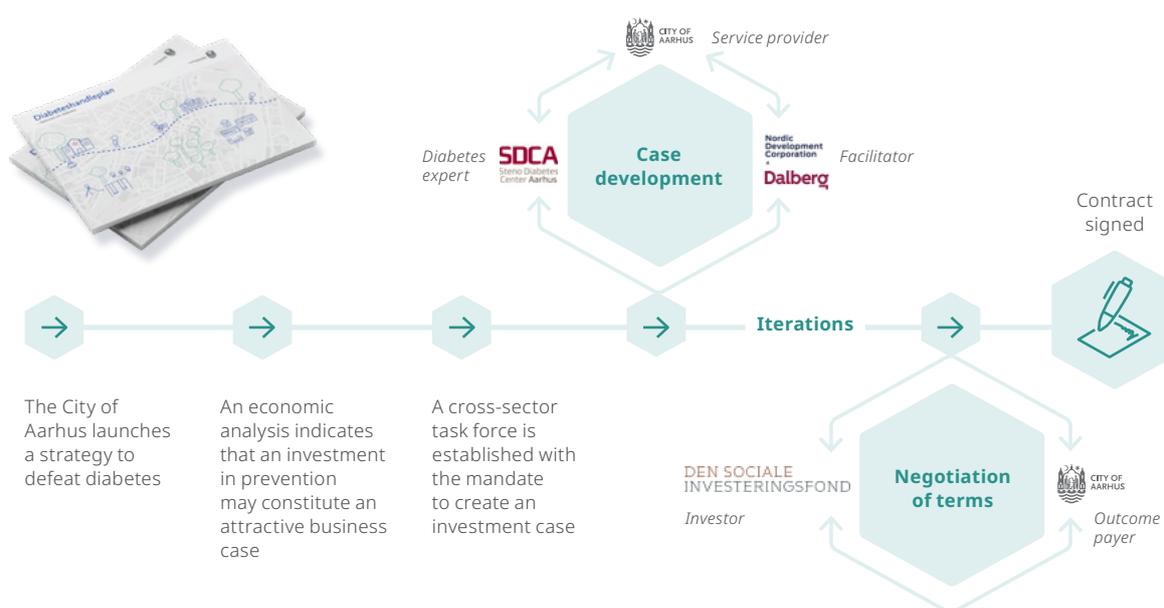
Investor incentive: The expected outcome payment always had to exceed the costs of financing the development and implementation of the intervention.

The city's economic department led the development of the payment mechanism with support from the development process facilitator. The aim was to encourage buy-in from the key decision-makers while, at the same time, avoiding

any potential design biases. The process involved a review of payment structures applied in similar investment programmes in other countries and close dialogue with internal stakeholders and the Social Investment Fund Aarhus.

Besides meeting the two binding conditions listed above, the key challenge was to ensure that the mechanism was as transparent and straightforward as possible while providing both the city and the investor with the required level of certainty that their binding condition would be met. Several models were discussed and evaluated in an open and constructive process, including models that involved self-assessments of well-being, levels of productivity (earnings and unemployment) and use of specific public health services. After a thorough evaluation process, the alliance decided to use a simple solution based on only one result indicator: HbA1c, an individual's average blood glucose level measured over two to three months.

Figure 6: Development process



A novel deal is reached

After 18 months of analysis, meetings and constructive discussions, the alliance reached an agreement: The city would offer an intensive prevention programme to 450 citizens living with type 2 diabetes at risk of developing severe complications.

The solution was anchored in a partnership between GPs, Steno Diabetes Center Aarhus and the relevant city administration departments. Furthermore, it was based on implementing a mix of high-intensity and low-intensity modules over 12 months.

A tailored intervention

The most fundamental design parameter for the solution was that it had to be rooted in the needs and resources of each programme participant. The solution also had to be in line with the first core principle outlined in the city's Diabetes Action Plan. Therefore, each participant was privy to a tailored combination of individual and group-based interventions, including a bilateral conversation with relevant healthcare professionals to promote health literacy (Figure 8). These group-based training programmes aimed to encourage lifestyle changes and participation in various bridge-building activities to enhance the programme's long-term impact. In addition, it connected individuals to civil society organisations offering events and activities associated with a healthy lifestyle.

Figure 7: The intervention

Activating better health services for people living with diabetes.



Individual elements

Bilateral conversations with relevant healthcare professionals to increase health literacy and motivate citizens to implement and maintain a healthy, active lifestyle.



Group-based elements

Group-based courses aimed at building social ties between programme participants, for example cookery courses, training activities and patient education, including the establishment of a peer scheme.



Bridge-building courses

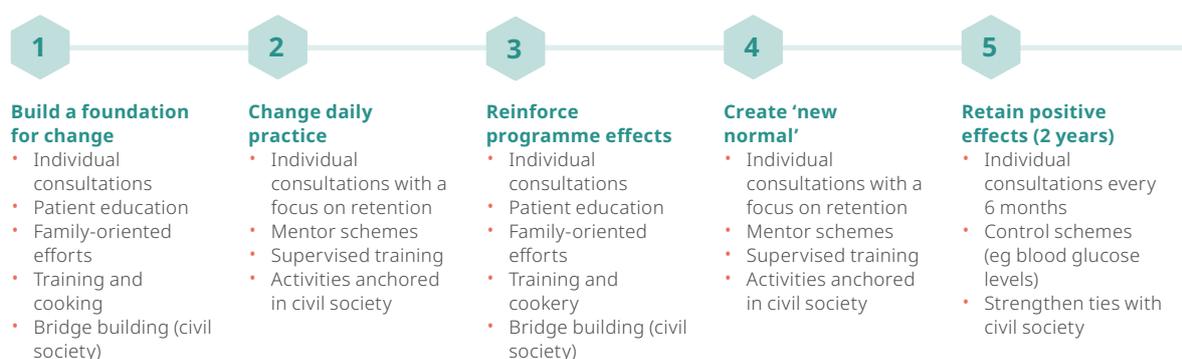
Practical support aimed at increasing the programme participants' desire to implement and maintain a healthy lifestyle, for example mentorship programmes, shopping support, and bridge-building activities.



Aftercare

Follow-up dialogue with programme participants to ensure they maintain a healthy lifestyle, including the launch of new initiatives in the event of relapse.

Figure 8: The programme

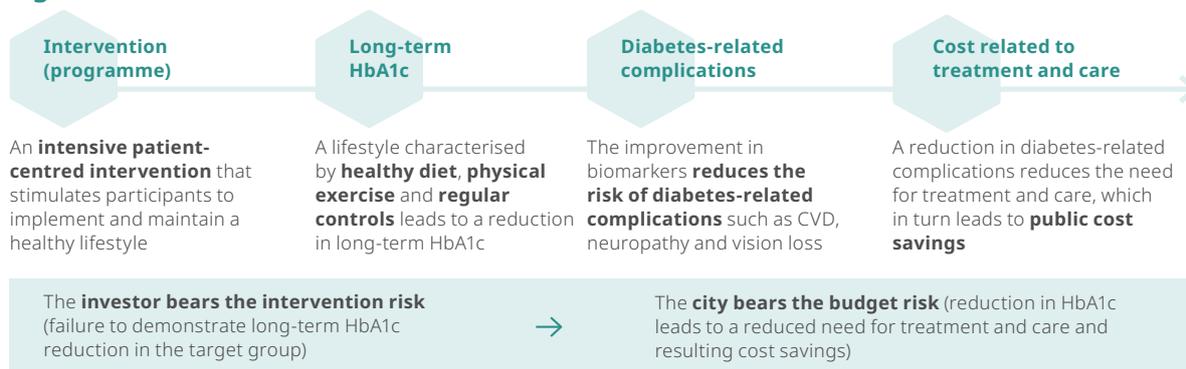


Pinpointing the motivating mechanism

The partnership agreement between the city and the investor was based on a clear distribution of roles and responsibilities. Notably, the investor was responsible for funding the intervention that might lead to the expected health outcome in the form of a reduction in participants' HbA1c levels. If the intervention did not lead to the expected decrease

in HbA1c levels, the investor did not receive a payment that outweighed the cost, potentially incurring a substantial loss. The city carries the budget risk if reductions in HbA1c are achieved. But this would result in a lower number of citizens developing serious diabetes-related complications, which would translate into long-term savings for the city.

Figure 9: Effect chain



Triggering payment: defined targets

The payment mechanism was based on two elements linked to the same underlying result indicator: HbA1c. The first element, an assessment of whether an individual manages to reduce their HbA1c level by at least 8.5%, was evaluated three times over three years. The second element was a collective assessment of the aggregate change in the target group's HbA1c levels, evaluated at the end of the three-year investment period.

The alliance chose to use a combined payment mechanism that took both individual and collective assessments into account to balance city and investor interests (Figure 10). A model based

entirely on individual assessment would have failed to ensure that the outcome payments from the municipality would be outweighed by a cost saving, as a decrease in HbA1c levels in one individual might be offset by an increase in another. Similarly, a model entirely based on collective assessment would expose the investor to a risk of not receiving any payment if an increase in one subgroup offset a decrease in another section of the target group. An example would be a general increase in the HbA1c level, which could be attributed to non-programme-related circumstances. A combination of an individual and collective component, therefore, represented a compromise.

Figure 10: HbA1c levels targets

		Year 1	Year 2	Year 3
Contract Prevention of type 2 diabetes complications  DEN SOCIALE INVESTERINGSFOND	Individual success HbA1c reduced by at least 8.5%	USD 9,540	USD 6,814	USD 5,301
	Collective success (target population) Aggregate change in HbA1c	No payment	No payment	USD 984 per point

Note: 100 DKK is equal to approximately 16 USD or 13 EUR

Beyond Aarhus

The journey from inception to execution has been long and filled with experiences and lessons that will help shape the local implementation of the intervention for others who wish to carry out a similar development process.

The most important learning was that it is possible to use innovative financing models as a lever to accelerate the roll-out of a programme that can reduce the risk of developing diabetes-related complications or delay the development of such complications. For example, creating an investment model for primary prevention (avoiding the development of diabetes or a central risk factor such as obesity) could be inspired by the same core principles. However, a slightly different business model may be required, as the link between intervention and cost savings is characterised by a higher degree of uncertainty.

The investment case for prevention is widely recognised, but the road from idea to investment can be challenging on many levels. Experience shows that investment logic tends to be much easier to appreciate in a theoretical setting than in a practical one, where short-term budgetary constraints and organisational 'silo thinking' often hamper the process. However, the Aarhus initiative has revealed that developing an investment project has several benefits. These include increased transparency regarding the cost and benefits of specific interventions, improved understanding of 'cause and effect' chains, and the establishment of new cross-cutting partnerships and collaborative flows.

A key learning from the Aarhus project was that adopting an open and truly inclusive development process is instrumental to success. An open and engaging approach fosters an inspiring ideation process. It also supports the creation of trust and mutual ownership, which ultimately help to ensure that the development process leads to positive change in practice.

"The development process has generated a value that has the potential to exceed the value of the investment project itself. Notably, the project has strengthened our ties to our partners in the region and beyond by creating a platform for collaboration and knowledge sharing, which is crucial for our ability to handle complex challenges such as type 2 diabetes. In addition, the project has provided us with access to a new, powerful tool in terms of social impact bonds, which we can use to address these challenges. We're now exploring how to leverage these assets in our pursuit to create an equal, healthy and thriving city."

Otto Ohrt, Director, Public Health,
City of Aarhus

References

1. Aarhus Kommune. *Aarhus Kommunes Diabeteshandleplan 2018*. Aarhus, Denmark: Aarhus Kommune, Sundhed og Omsorg;2018.
2. Aarhus Kommune. Aarhus i tal. Aarhus Kommune. https://ledelsesinformation.aarhuskommune.dk/aarhus-i-tal/default.aspx?doc=vfs://Global/AARHUS-I-TAL/BEFOLKNING_I_TAL.xview. Published 2021. Accessed 2021.
3. Sundhedsstyrelsen. *Danskernes Sundhed - Den Nationale Sundhedsprofil 2017*. Sundhedsstyrelsen. <https://www.sst.dk/da/udgivelser/2018/danskernes-sundhed-den-nationale-sundhedsprofil-2017>. Published 2017. Accessed 2021.
4. World Health Organization. *Global report on diabetes*. World Health Organization;2016.

