healthintegrator

HEALTH INTEGRATOR -PREVENTION OF TYPE 2 DIABETES

Final report

JUNE 2025

CONTENT

01
VERSION HISTORY

02
ABSTRACT

03
INTRODUCTION

- 3.1 Background and description of the pilot project
- 3.2 Purpose and scope
- 3.3. Health Integrator's health program
- 3.4 Pilot study to develop the intervention program
- 3.5 Target group and recruitment
- 3.6 Objectives

04
ENROLMENT OF PARTICIPANTS

05
PRIMARY AND SECONDARY OUTCOME VARIABLES

- 5.1 Baseline data and assessments over time
- 5.2 Results of primary and secondary outcome variables

06
DISCUSSION

07
CONCLUSION

08
TESTIMONIALS
REFERENCES
APPENDIX

1.VERSION HISTORY

This the final report of this program. It covers data for all participants as observed up to 42 months follow-up in the Region of Stockholm Health Program.

Appendix 36 month report

24-month report

18-month report

12-month report

2.ABSTRACT

Backgrund

Region Stockholm's health care board has decided to test a model for more effective governance and financing of prevention initiatives. Among other things, the region wants to evaluate Health Integrator's preventive health program, a prevention with significant digital elements to reduce the risk of type 2 diabetes. Previous scientific studies have shown that it is possible to halve the risk of type 2 diabetes with health-promoting lifestyle initiatives. Region Stockholm expects a health economic effect of EUR 140 million per year at full scale-up to all pre-diabetics. This project was terminated at June 2025, where data are resonable reliable up to the 3-year follow-up with some data for 42 months follow-up.

Aims and Objectives

The intervention aims to transition as many participants as possible (at least one third) of the from the prediabetes stage (HbA1c 42-47 mmol/mol) to a normal HbA1c (<42 mmol/mol) after two years of active intervention and to maintain that proportion at the 3-, 4- and 5-year follow-up.

Participants and Methodology

Participants were mainly recruited through advertisements in social media and the daily press (both print and digital), newsletters to various companies and interest groups, and information sheets in waiting rooms at health centres. Interested participants were further screened using the FINDRISC form and blood tests where participants had to have an HbA1c between 42-47 mmol/mol to be included in the intervention. 925 participants were recruited from October 2020 to February 2022. The participants met with a health coach and together they planned different types of health goals to improve their lifestyle. Participants then booked health services and products using the Health Integrator digital platform.

Results

On June 2025, 774 participants had reported data for the 24 months follow up, and 693 for the 36 months follow up, 77 participants had dropped out. The results show that 53.2% (95% CI: 49.7%-56.7%) of the participants at 24 months and 48.9% (95% CI: 45.2%-52.6%) at 36 months had a blood test at HbA1c <42 mmol/mol. In total, 453 (57.3%) of 791 who had a follow-up visit at 24 months or later, achieved the program objective with a HbA1c <42 mmol/mol. There were 7.0% of the participants at 24 months and 8.4% at 36 months who increased their HbA1c to meet the diagnostic criteria for diabetes, >=48 mmol/mol with only 6.1% in participants with last follow-up at 24 months or later. The results showed a statistically significant reduction in both HbA1c and BMI at 24 months and 36 months compared to baseline, p<0.001.

Conclusion

The results show that the intervention achieved its primary objective to improve at least 1/3 of all participants into a normal HbA1C level <42 mmol/mol. where around half of the participants had reduced the HbA1c levels to the point of leaving prediabetes status. In total, 453 participants reached the objective at the last observed follow-up at 24 months or later. The lifestyle intervention appears to also reduce the participants' BMI, with the effect occurring after six months and being sustained beyond 36 months. Less than 10% of participants have developed an HbA1c indicative of type 2 diabetes over 3 years compared to 23% without lifestyle intervention. This constitutes to a risk reduction for diabetes of 73.5%.

The Health Impact Bond has demonstrated success, delivering a full financial return to Skandia, the impact bond investor (Reference 13).

3.INTRODUCTION

Today, the healthcare system is facing major challenges. Chronic and lifestyle-related diseases are increasing rapidly, the cost of medicines is rising, and we are living longer. The need for care for the sick appears to be increasing, but few efforts are being made to reduce the influx of new cases. The majority of health care resources in Sweden are currently spent on caring for those who are already ill. (Reference 1) Of the total cost of the health budget, chronic disease management accounts for about 80% of the total cost of the health budget. (Reference 2). On average, the cost of care for a person with type 2 diabetes is almost 4.5 times higher than for a person without type 2 diabetes. (page 6 in Hälsokontraktet, Reference 1)

With the right interventions, the trend can be reversed. Studies by the World Health Organisation (WHO) and others show that around 80% of chronic, lifestyle-related diseases worldwide could be prevented by health promotion. (Reference 3) Encouraging healthy behaviours such as exercise, diet, sleep, tobacco and alcohol consumption can prevent both physical and mental illness. Preventing disease will always be a win-win situation: for the individual, their families and society as a whole. (Reference 4)

Health Integrator's preventive health program is the first initiative with a so-called health impact bond. (Reference 5), where the program aims to support individuals at risk of developing type 2 diabetes to adopt healthy lifestyles in order to halt the progression of the disease. Region Stockholm has estimated that it could save 140 million EUR per year in healthcare costs if it chooses to scale up and offer the intervention to all pre-diabetics in the region.(Reference 6)

Program Summary and Outcome

The health program was discontinued as of June 16, 2025, following the Region of Stockholm's decision not to renew its five-year contract. Despite the success of the health program, the planned expansion was halted due to political decisions that prevented citizens from accessing an intervention proven to improve health outcomes and reduce long-term costs.

This decision came despite earlier intentions to scale the program to a broader population if the outcomes exceeded the success criteria—an assumption that underpinned Health Integrator's investment in delivering the intervention. According to the agreement, the contract would be deemed successful if 300 participants exited the type 2 diabetes risk zone after participating in the program for 24 months or longer. The final result far surpassed expectations: 454 participants successfully exited the risk zone—over 50% higher than the contractual target.

About the Intervention Model

The program, developed by Health Integrator, was funded through a Health Impact Bond—an outcome-based financing model where investors such as Skandia and SEB assume financial risk. If too few participants reach the health targets, providers and funders receive reduced compensation. In cases where outcomes fall short, private investors bear the financial loss.

Projected Economic Impact

According to the Region's own calculations, had the program been scaled as originally planned—providing preventive support to all individuals with prediabetes—it would have saved EUR 140 million annually by reducing the incidence of diabetes. The avoided human suffering would have been even more significant. By discontinuing the program, the Region has effectively chosen to pay more while delivering less public health value.

Evaluation and Data Transparency

This report summarizes results achieved by the end of the contract period. The program launch was delayed due to the COVID-19 pandemic and capacity limitations at regional testing facilities. As such, the outcomes presented here reflect results up to the Region's decision to terminate the initiative and do not represent its full five-year potential. Please note: this was not a controlled scientific study, as no control group was included. The aim was to generate real-world evidence of effective prevention and to evaluate health outcomes through a financial lens.

3.1 BACKGROUND AND DESCRIPTION OF THE PILOT PROJECT

In May 2020, Region Stockholm's health care board decided to test a model for more effective governance and financing of prevention initiatives through a pilot with Health Impact Bonds. (Reference 6) Health Integrator's preventive health program is one of three parts of service statement HSN 2019-1786 which reads as follows:

> **1. The Director of Health and Medical Services is instructed, in collaboration with AB Stockholm County Council's Internal Finance and FoUUI at the Regional Management Office, to carry out the development project Test of a model for more efficient governance and financing of prevention initiatives through a pilot with Health Impact Bonds. (Hälsokontrakt, se referens 1).**
> **2. The Director of Health is instructed to ask AB SLL Internfinans to execute the issue of a Health Impact Bond.**
> **3. The Director of Health and Medical Services is authorised to sign an agreement with Health Integrator AB during the project period.**

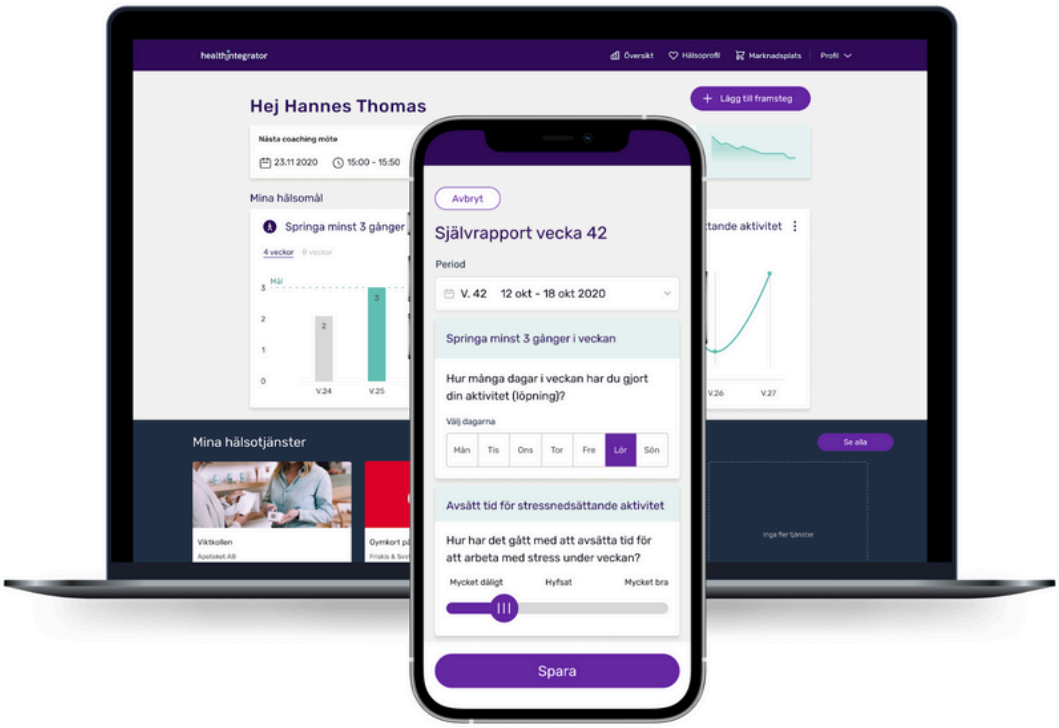
The background is that the region has called for models and processes to calculate the cost savings that arise if, at different levels of success, disease progression is averted and the need for care is avoided in different patient groups. The aim is to determine what is reasonable to pay for prevention, and to estimate the point at which the investment can be recouped.

A challenge in the shift from reactive to preventive care is the need for liquidity during a transition period when the region pays for prevention while continuing to pay for the care of those who are already sick. It may be difficult to justify allocating a larger share of health care resources to prevention if more acute care needs continue to increase. Those who have fallen ill should be prioritised, while preventive measures can reduce the incidence of new patients. In the short term, increasing the proportion of resources devoted to preventive care would lead to increased costs, but in the longer term it is likely to generate substantial savings.

In addition to reductions in direct costs such as healthcare costs, there are also savings in indirect costs such as the absence of costs for any sickness benefit and loss of production. The opportunity cost of choosing not to invest in disease prevention is difficult to calculate, but it is obvious that it is financially unsustainable not to invest in prevention. According to the World Health Organisation (WHO), one krona invested in disease prevention results in a saving of six kronor in lost health care and social costs.

To bridge the liquidity needs that arise in the transition period from caring for patients to increasing preventive treatment/intervention, outcome-based contracts can be used. This means that the financier is reimbursed based on the outcome of the prevention. This type of financing solution, a Health Impact Bond, forms the basis of the pilot project and Health Integrator's preventive health program. More detailed information on the Health Impact Bond (Reference 6).

In the decision HSN 2019-1786; Test of a model for more efficient governance and financing of prevention initiatives through a pilot with Health Impact Bonds(Hälsokontrakt, se reference 1) describes that the primary care or other healthcare providers are not the optimal channel for reaching individuals at risk of disease, as these individuals are often not in the healthcare system as long as they are undiagnosed. Furthermore, it is considered that new channels and methods must be tested as a complement and thus also free up resources for primary care. A description of the recruitment and selection process for the Health Integrator health program is described in Chapter 3.5.



3.2 PURPOSE & SCOPE

The overall aim of the pilot project is to contribute to a systemic change in health care, moving from reactive care to preventive care. It contains three interlinked elements:

1) impact measurement
2) risk sharing through a new financial instrument
3) designing a prevention with significant digital elements.

This report aims to report the final data of the prevention program. Below is a description of the design of Health Integrator's health program and the results after the prevention program was terminated in June 2025. The analysis of the health development of the participants and the conclusions drawn are Health Integrator's own. Health Integrator is the provider of the health program on behalf of Region Stockholm.

According to previous scientific studies in diabetes prevention, a health-promoting lifestyle intervention over three years among people with glucose intolerance (blood sugar 6.0-7.0 mmol/l) can reduce the risk of diabetes by 58%, from 23% to 11%. (Reference 7, Reference 8). (Note that these studies did not use long-term blood sugar, HbA1c, as a basis for defining the program population). This means that the lifestyle intervention, Region Stockholm, could potentially prevent 12 percentage points (23%-11%) from developing type 2 diabetes over three years.

To prevent the development of type 2 diabetes, it is important to find and identify individuals at risk of type 2 diabetes before they become patients and are diagnosed with type 2 diabetes. (Reference 1) The measure used for the risk zone for prediabetes is long-term blood sugar, HbA1c = 42-47 mmol/mol. The diagnostic criterion for type 2 diabetes is HbA1c >=48 mmol/mol. A lifestyle intervention focusing on reducing HbA1c to <42 mmol/mol (normal level) can reduce the risk of this risk group developing type 2 diabetes.

The Health Contract defines a target value for the Health Integrator's health program. To be considered successful, at least 300 out of 925 participants should reach a normal level of HbA1c at the last follow-up. (Reference 1). It is a direct measure of how many people are reversing the course of the disease. The intervention also measures HbA1c development in terms of the proportion of participants who are developing type 2 diabetes with an HbA1c >=48 mmol/mol. To match previous randomised studies with a risk reduction of 58%, 11% or less of the participants in this intervention should develop type 2 diabetes. However, it should be mentioned that there are differences in inclusion criteria compared to previous studies.

The success and financial impact will be assessed using the criteria outlined in the contract, as previously described. The health economic benefit of a risk reduction of type 2 diabetes has already been estimated. (Reference 6) by Region Stockholm and is estimated at 1.4 billion per year when fully scaled up to all pre-diabetics.

The aim of this non-randomised intervention is to evaluate the effectiveness of the health program in bringing as many of the participants HbA1c levels down to normal levels as possible, and as few as possible increasing their levels and developing type 2 diabetes.

3.3 HEALTH INTEGRATOR'S HEALTH PROGRAM

Health Integrator's digital platform provides a digital marketplace that brings together providers of health promotion services and products that are considered helpful in tailoring a preventive health program for individuals at risk of disease with the help of health coaches. The health coaches are experts in preventive care and have completed at least three years of relevant education.

The health coach helps the individual to take a holistic approach to health, taking into account elements such as physical activity, diet, sleep, alcohol and tobacco consumption, mental health and stress. The health coach provides the participant with knowledge and understanding of the individual's current situation and establishes a health profile. On the basis of the health profile and with the guidance and support of the health coach, a customised health plan is created with planned and timed activities. These activities are based on the participant's needs and individual preferences for activities to increase adherence.



Each participant received a health balance totalling SEK 6 250 per year (about 600 EUR) for the first two years of the initiative. The health balance could be used for consumption of health services presented on the digital marketplace and for an increased number of counselling sessions with the health coach.

If the plan was not followed, the participant was contacted by the health coach for additional follow-up and support. All participants were invited to annual measurements and a follow-up meeting with their health coach.

After two years, the hope was that the participant had sufficient motivation and insight to pay for health services themselves or with the support of their employer. Any unused balance were available for continued consumption during the total duration of the program.

Health Integrator creates a digital ecosystem around users for better health, see more info (Reference 11 and Reference 12)

3.4 PILOT STUDY TO DEVELOP THE INTERVENTION PROGRAM

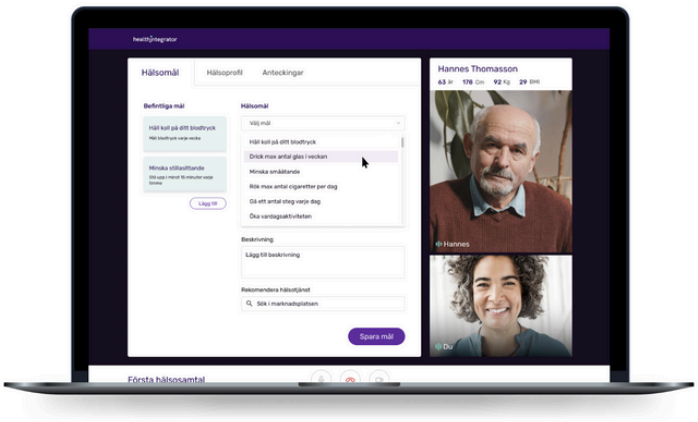
The health program has been tested in a clinical pilot study. (Reference 9, Reference 10). The study was led by Ylva Trolle Lagerros, Professor of Prevention and researcher employed by Region Stockholm and Karolinska Institutet with extensive experience in diabetes care and lifestyle for individuals living with diabetes. The study was a randomised, controlled parallel group study in which 209 individuals were recruited from four companies in Stockholm. Participants were healthy volunteers with a mix of salaried employees from insurance companies and pharmacies and workers from bus companies. Participants were randomised with equal chance to one of the following options for the three-month intervention:

1) Monthly health coaching calls and access to a digital platform, the precursor to Health Integrator's current platform, to record health goals. Over three months, participants were offered three health talks, two sessions and one follow-up.

2) Access to the digital platform but no access to counselling with a health coach.

3) Control group with neither access to the digital platform nor health coaching. However, they were offered access to the digital platform and counselling after the end of the study period.

The study showed that the health coaching and platform had a positive effect on the health of individuals compared to those in the control group in terms of waist size, BMI, and body fat. (Reference 10). The study shows that the functionality worked and that some effect on health can be achieved although this population is different from the one intended to be studied in this intervention, people at risk of diabetes.



3.5 TARGET GROUP AND RECRUITMENT

The target group was people aged between 50 and 60 who lived in the Stockholm region and had an increased risk of developing type 2 diabetes. The aim was to include as many men as possible and individuals from socio-economically disadvantaged areas. The target group was considered to have a very high probability of developing diabetes within a five to ten year period, based on analyses of the healthcare events in Region Stockholm's VAL database.

A total of 925 participants were recruited to the health program over 16 months, from October 2020 to February 2022. The first health interview was conducted in February 2021.

Recruitment began by asking those who were interested to sign up for the program. They were then asked to fill in a screening form, and those who qualified were invited for a blood test.



RECRUITMENT

Interested people were invited to apply for the health program digitally on the application site www.folkhalsastockholm.se where they were asked to fill in contact details and a health form. This site is no longer active. The recruitment of participants to the health program was done by Health Integrator through advertising in digital and analogue channels, resulting in more than 28,000 applications. The following channels were used for recruitment:

1. Social media on Instagram and Facebook. The advertisements were aimed at all geographical areas in Stockholm County, with a particularly strong focus on men in these areas.
2. Editorial articles in newsletters to non-profit organisations and partners, including Blå Vagnen, Blodsockerkollen, the Facebook groups Diabetes Sverige, Viktminskning - Lifesum and Kaloriunderskott. Further, through newsletters and social media channels on the companies Apoteket, Skandia, SEB, Lloyd Apotek, Apohem, KGK, Nobina, Svenska Taxiförbundet, MTR, Lidingö Kommun, Friskis och Svettis, Järvafältet idrott, Bonava, TL Bygg, NCC, Wellobe and En Friskis Generation.
3. Paid adverts in both print and digital form in Aftonbladet, Svenska Dagbladet, Hemnet, Blocket, Mitti and LinkedIn.
4. Information about the initiative was distributed in the form of information sheets in waiting rooms in healthcare centres in Stockholm and on information sheets in connection with covid vaccination during the summer of 2021. A large part of the advertising was done in västerort, an area with low socio-economic status.
5. Collaboration with some influencers in social media who were judged to have a large number of followers in the target group.

All campaigns were conducted in Swedish due to limitation in language support at 1177 (Swedish official website which provides information about illnesses, care and health) which limits the target group to a certain extent.

SCREENING

The screening was conducted outside of primary care because individuals with prediabetes in most cases have no diabetes-related contact with the health care system as they are undiagnosed. Screening outside of primary care also does not burden the healthcare system.

The screening was done in two stages. The first step was the application session at the www.folkhalsastockholm.se where the interested persons filled in a health questionnaire, FINDRISC, which is designed to identify individuals at risk of type 2 diabetes. FINDRISC includes questions about the individual's weight, height, exercise and dietary habits and more. Based on the answers in the form, a score is calculated that indicates a high (13 or more) or low (12 or less) risk of developing type 2 diabetes. Those deemed to be at high risk were invited for blood tests and those at low risk were informed about the recruitment process and that other applicants had been prioritised.

The second step in the screening process was blood testing. The applicants received an invitation via email asking them to order a blood test for long-term blood sugar (HbA1c) via 1177 with an invitation code given to them. Those who did not meet the inclusion criteria for age (between 50 and 60 years) or civil registration address (resident in Stockholm County) at the time of identification were denied the opportunity to order the blood test on 1177. Those who took the blood test and received a result within the range of HbA1c 42-47 mmol/mol were offered a place in the program, where they were booked in with a health coach, until the intervention was fully recruited.

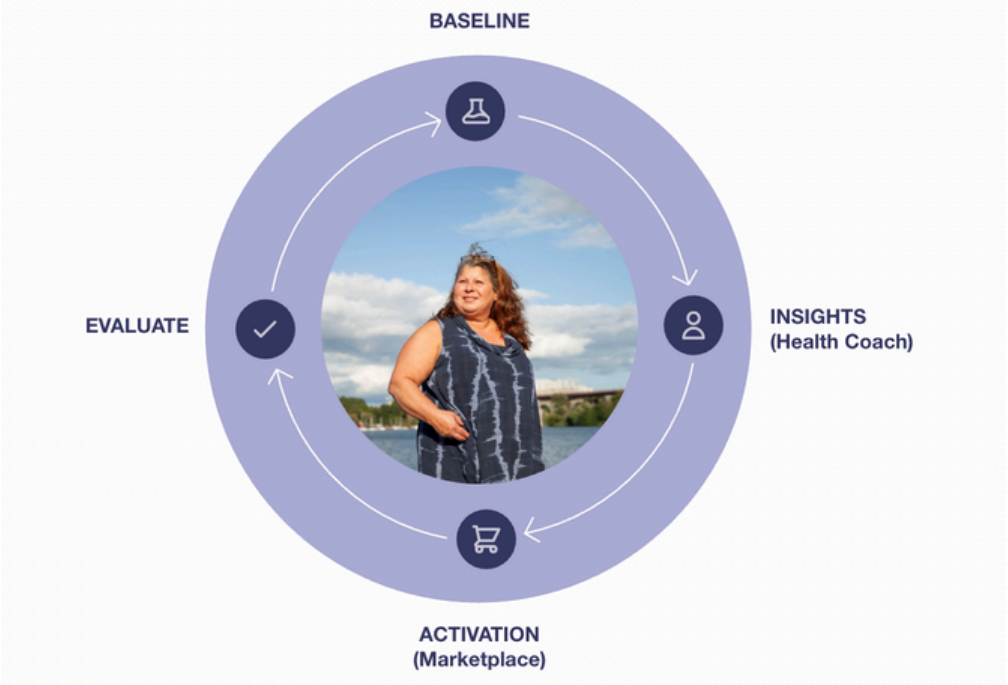
USER FLOW

Initial Screening & Health Profile
Each participant completes a comprehensive health screening—including self-reported forms and blood tests. This creates a personalized health profile, covering factors like physical activity, nutrition, sleep, stress, tobacco and alcohol use, and mental well-being.

Personal Health Coach
Participants are paired with a certified health coach. Meetings are held 100% digitally at convenient times. Together they discuss baseline health and individual health goals, co-create a health plan with short- and long-term objectives, track progress via the personal health profile on the platform.

Integrated Marketplace for Health Services & Products
The platform includes a curated marketplace offering health services and products. Guided by their coach, users can select tools such as work out classes, dietary plans, stress management programs, and sleep support—designed to support sustainable lifestyle changes.

Behavioral Change & Follow-Up
Health Integrator provides structured behavioral support through regular sessions with a health coach, helping users overcome obstacles, stay motivated, and build lasting healthy habits. Progress is tracked continuously through follow-ups and outcome measurements.



3.6 OBJECTIVES

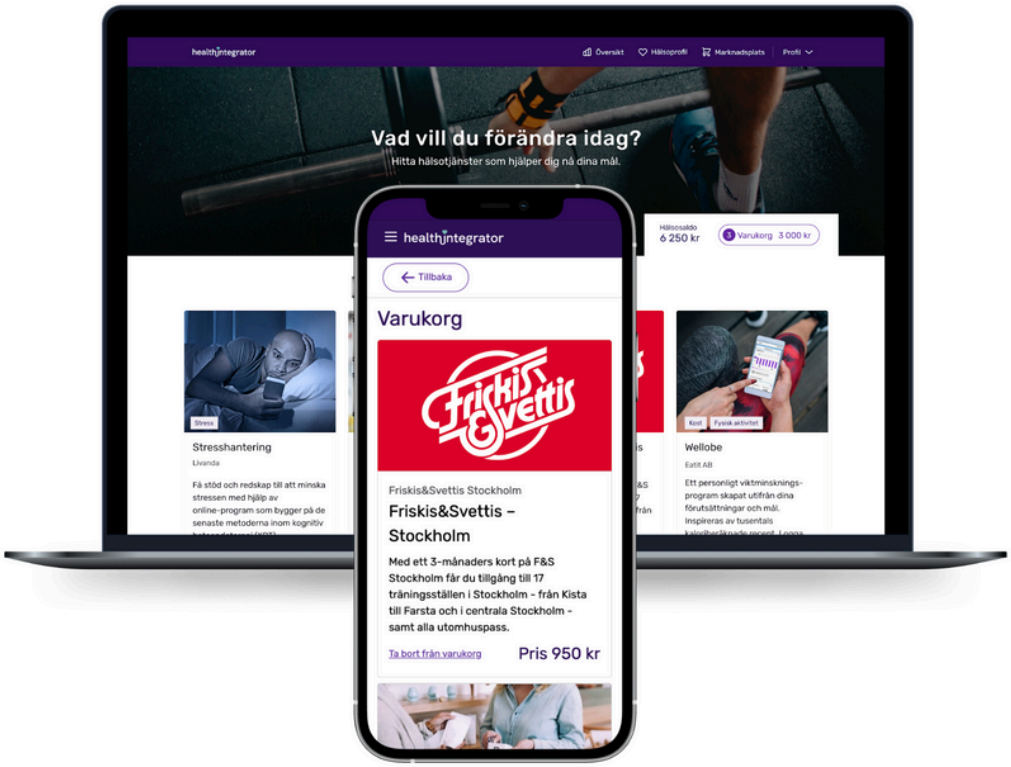
Primary objective

The primary objective is to reduce HbA1c among as many participants as possible and to move them from a pre-diabetic health state for type 2 diabetes with an HbA1c of 42-47 mmol/ml, to a normal value below 42 mmol/ml. Successful outcome is defined as at least 300 out of 925 participants achieving this goal.

Secondary objectives

Secondary objectives are to

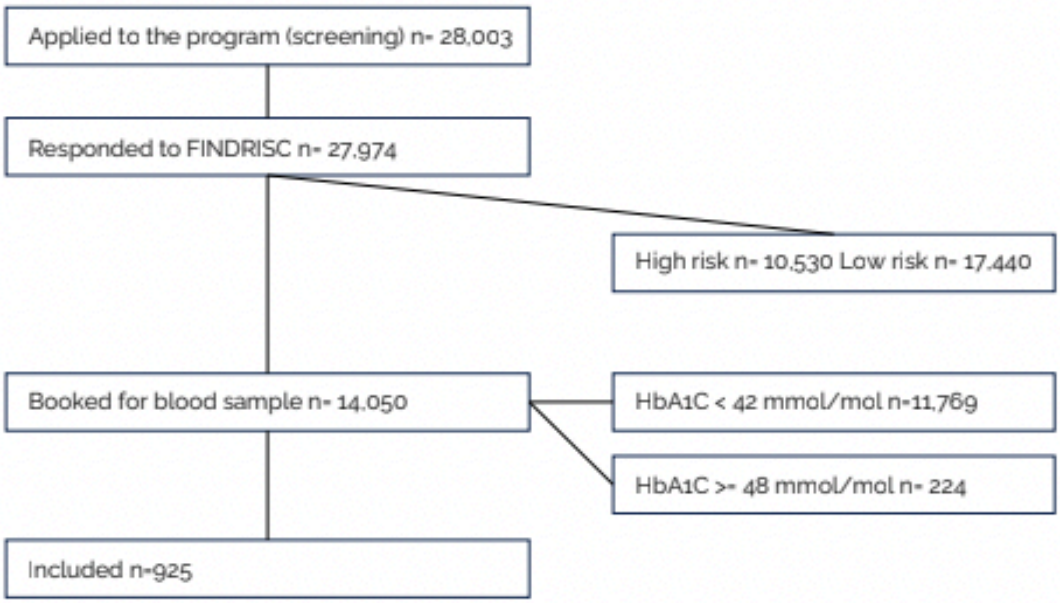
- Reduce HbA1c among as many participants as possible
- Reduce participants' BMI
- Proportion of participants who maintain <42 mmol/mol in HbA1c after 24 months.
- Participants improve their lifestyle



4.ENROLMENT OF PARTICIPANTS

Of the 28 003 applicants on folkhalsastockholm.se, all were invited to take a blood test for HbA1c. The first 925 consecutive applicants who met all inclusion criteria with respect to FINDRISC and HbA1c were included in the intervention. 224 of the applicants reported a blood test above 48 or more mmol/mol in HbA1c, indicating that they already had diabetes and were referred to the health care system for further assessment and treatment. There could be more individuals with a high HbA1c, but was not reported to HI.

Figure 1. Flow Diagram of the Recruitment of Participants.



DEVIATIONS FROM THE PLANNED IMPLEMENTATION OF THE HEALTH PROGRAM

COVID-19 restrictions caused delays in the recruitment process as several of the applicants at high risk of type 2 diabetes who were invited for blood tests delayed their visit to the testing centre. Some applicants also opted to cancel their application as they did not want to spend time in public spaces among other people unnecessarily.

Other planning deviations that occurred included making information on the health program available to reception and nursing staff at the sampling centres. A common misunderstanding was that the applicant was asked to show a referral at testing centres where they had technical problems getting the blood test order into their booking system. The applicant was then sent home, unnecessarily, as no referral was necessary to place an order for long-term blood sugar on 1177 with an order key. Because of this, some chose to cancel the process as they felt that it was too time-consuming to visit the sampling unit again. Many felt that Own sampling on 1177 was difficult to use and turned directly to Health Integrator for support instead of 1177.

The 1177 service was perceived by users as not user-friendly and generated a high volume of support requests for Health Integrator. There were no alternative services available, as the use of 1177 was stipulated in the contract with Region Stockholm.

As the operation was not fully recruited in January 2022, all applicants were invited to be sampled regardless of their FINDRISC score, i.e. also people at low risk according to FINDRISC. Among these, an additional 181 participants were recruited for the intervention.

The sample of participants is representative of society in general and no differences in geography or socioeconomics can be noted.

5. PRIMARY AND SECONDARY OUTCOME VARIABLES

Primary outcome variable:

- Proportion of participants with HbA1c <42 mmol/mol at 24 months.

Secondary outcome variables

- Proportion of participants with HbA1c <42 mmol/mol
- Proportion of participants who improved HbA1c
- Mean change in HbA1c
- Mean change in BMI
- Proportion of participants with BMI classification of normal weight, .
- Proportion of participants measuring and maintaining HbA1c <42 mmol/mol
- Change in perceived quality of life

STATISTICS

The statistics are the same as previously reported. Analyses and results have been updated with the additional participants at 36 months and 42 months follow-up.

5.1 BASELINE DATA AND ASSESSMENTS OVER TIME

As of June 2025, 774 participants have responded to the 24-month follow-up and 693 participants responded to the 36 months follow-up.

Baseline data for the participants is presented in Table 1a and 1b. Data may differ from previous reporting as data has been cleaned from incorrect entries found since the 18-month reporting.

An overview of participants' assessments over time is presented in Table 1c. There were 791 participants who had a final/last assessment of HbA1c at 24 months or later.

Table 1a. Descriptive Statistics Baseline.

		Valid N	Mean	Standard Deviation	Median	Minimum	Maximum
Female	Weight (kg)	611	90,3	19,1	88,0	51,0	167,8
Male	Weight (kg)	314	100,1	17,9	98,7	52,0	155,0
Total	Weight (kg)	925	93,6	19,2	91,8	51,0	167,8
Female	BMI	611	32,6	6,4	31,8	18,7	57,4
Male	BMI	314	30,9	5,1	30,4	18,0	52,0
Total	BMI	925	32,0	6,1	31,2	18,0	57,4
Female	Waist circumference (cm)	596	105,4	15,2	104,0	60,0	165,0
Male	Waist circumference (cm)	300	110,9	14,0	110,0	82,0	175,0
Total	Waist circumference (cm)	896	107,3	15,1	106,0	60,0	175,0
Female	Height (cm)	611	166,3	6,1	167,0	149,0	182,0
Male	Height (cm)	314	180,0	6,7	180,0	159,0	200,0
Total	Height (cm)	925	170,9	9,0	170,0	149,0	200,0
Female	Age	611	55,8	3,0	56,0	50,0	62,0
Male	Age	314	55,2	2,9	55,0	50,0	61,0
Total	Age	925	55,6	3,0	56,0	50,0	62,0
Female	Findrisc score	608	16,2	3,9	16,0	4,0	25,0
Male	Findrisc score	313	15,5	4,2	16,0	4,0	25,0
Total	Findrisc score	921	15,9	4,0	16,0	4,0	25,0

Table 1b. Descriptive Statistics Baseline Categorical Variables.

			Count	Column N %
Female	Viktstatus	Normal (BMI<25)	57	9.3%
		Overweight (BMI 25-30)	177	29.0%
		Obesity class 1 (BMI 30-35)	181	29.6%
		Obesity class 2 (BMI 35-40)	117	19.1%
		Obesity class 3 (BMI>40)	79	12.9%
		Total	611	100.0%
Male	Viktstatus	Normal (BMI<25)	30	9.6%
		Overweight (BMI 25-30)	115	36.6%
		Obesity class 1 (BMI 30-35)	114	36.3%
		Obesity class 2 (BMI 35-40)	38	12.1%
		Obesity class 3 (BMI>40)	17	5.4%
		Total	314	100.0%
Female	Age	50-55 years	284	46.5%
		56-60 years	327	53.5%
		Total	611	100.0%
Male	Age	50-55 years	162	51.6%
		56-60 years	152	48.4%
		Total	314	100.0%

Table 1c. Participants' Assessment over Time (months) by HbA1c and BMI.

Months in Study	Number of participants with a HbA1c assessment	Cumulative number of participants with a HbA1c assessment*	Number of participants who reported BMI
0	924	925	925
6	747	859	435
12	824	838	773
18	688	805	329
24	774	**791^**	725
30	670	748	260
36	693	700	658
42	343	424	139
48	73	238	86
54	184	184	0

^Number of participants with a least a 24 months assessment

5.2 RESULTS OF PRIMARY AND SECONDARY OUTCOME VARIABLES

5.2.1 PRIMARY OUTCOME VARIABLE

There primary outcome variable for the proportion of participants who met the criteria of normal HbA1C was 53.2% at 24 months and 48.9% at 36 months, The results are presented in Table 2a. There were more men than women who developed HbA1c levels qualifying for diabetes, >=48 mmol/mol at 24 and 36 months. HbA1c levels by age and FINDRISC score at baseline are presented in 2c.

There was a similar proportion of normal HbA1c in both age groups. There was somewhat a greater proportion with normal HbA1c among those with a FINDRISC score <13 'low risk' at baseline than those with 13 or more 'high risk'.

Figure 2 illustrates the results for the primary outcome variable and the proportion leaving pre-diabetes at each follow-up point.

Table 2a. Primary Outcome Variable HbA1c by Gender

		Time in the program (months)											
		0		12		24		36		42		Final obs*	
Gender	HbA1c (mmol/mol)	N	Percent	N	Percent	N	Percent	N	Percent	N	Percent	N	Percent
Female	Normal <42	0	0.0%	280	51.3%	281	54.2%	240	51.6%	114	49.6%	321	60.9%
	Prediabetes 42-47	611	100.0%	243	44.5%	207	40.0%	198	42.6%	96	41.7%	181	34.3%
	Diabetes >=48	0	0.0%	23	4.2%	30	5.8%	27	5.8%	20	8.7%	25	4.7%
	Total	611	100.0%	546	100.0%	518	100.0%	465	100.0%	230	100.0%	527	100.0%
Male	Normal <42	0	0.0%	147	52.9%	131	51.2%	99	43.4%	55	48.7%	132	50.0%
	Prediabetes 42-47	313	100.0%	110	39.6%	101	39.5%	98	43.0%	49	43.4%	109	41.3%
	Diabetes >=48	0	0.0%	21	7.6%	24	9.4%	31	13.6%	9	8.0%	23	8.7%
	Total	313	100.0%	278	100.0%	256	100.0%	228	100.0%	113	100.0%	264	100.0%
Total	Normal <42	0	0.0%	427	51.8%	412	53.2%	339	48.9%	169	49.3%	453	57.3%
	Prediabetes 42-47	925	100.0%	353	42.8%	308	39.8%	296	42.7%	145	42.3%	290	36.7%
	Diabetes >=48	0	0.0%	44	5.3%	54	7.0%	58	8.4%	29	8.5%	48	6.1%
	Total	925	100.0%	824	100.0%	774	100.0%	693	100.0%	343	100.0%	791	100.0%

* any observation 24 months or later

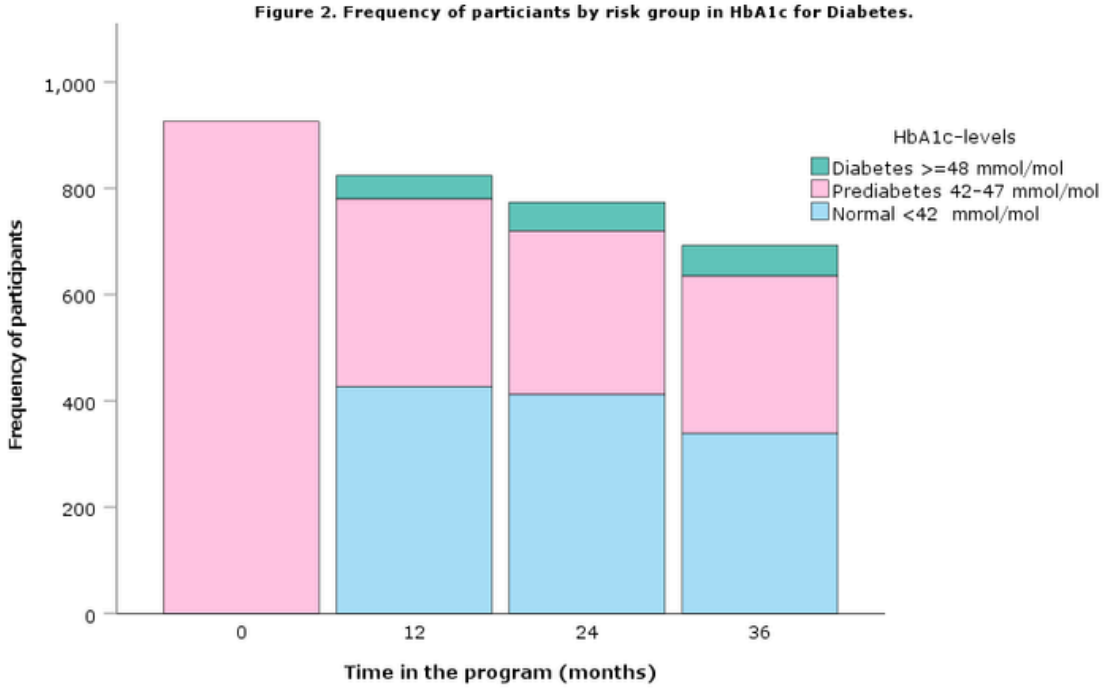
5.2.1 PRIMARY OUTCOME VARIABLE (CONT)

Table 2c. Primary Outcome Variable HbA1c by FINDRISC score at baseline.

		Time in the program (months)											
		0		12		24		36		42		Final obs*	
FINDRISC	HbA1c (mmol/mol)	N	Percent	N	Percent	N	Percent	N	Percent	N	Percent	N	Percent
<13	Normal <42	0	0.0%	114	66.3%	89	55.3%	68	48.6%	18	60.00%	99	60.4%
	Prediabetes 42-47	181	100.0%	50	29.1%	65	40.4%	62	44.3%	12	40.00%	60	36.6%
	Diabetes >=48	0	0.0%	8	4.7%	7	4.3%	10	7.1%	0	0.00%	5	3.0%
	Total	181	100.0%	172	100.0%	161	100.0%	140	100.0%	30	100.00%	164	100.0%
>=13	Normal <42	0	0.0%	310	47.8%	321	52.6%	269	48.9%	150	48.40%	352	56.4%
	Prediabetes 42-47	740	100.0%	302	46.6%	242	39.7%	234	42.5%	132	42.60%	230	36.9%
	Diabetes >=48	0	0.0%	36	5.6%	47	7.7%	47	8.5%	28	9.00%	42	6.7%
	Total	740	100.0%	648	100.0%	610	100.0%	550	100.0%	310	100.00%	624	100.0%
Total	Normal <42	0	0.0%	424	51.7%	410	53.2%	337	48.8%	168	49.40%	451	57.2%
	Prediabetes 42-47	921	100.0%	352	42.9%	307	39.8%	296	42.9%	144	42.40%	290	36.8%
	Diabetes >=48	0	0.0%	44	5.4%	54	7.0%	57	8.3%	28	8.20%	47	6.0%
	Total	921	100.0%	820	100.0%	771	100.0%	690	100.0%	340	100.00%	788	100.0%

* any observation 24 months or later

Figure 2. Frequency of particiants by risk group in HbA1c for Diabetes.



5.2.2 SECONDARY OUTCOME VARIABLES

The mean HbA1c at each follow-up occasion is presented in Table 3a.

Table 3a. Mean HbA1c over Time by Gender.

		Time in the program (months)					
Gender	HbA1c (mmol/mol)	0	12	24	36	42	Final obs*
Female	Valid N	611	546	518	465	230	527.00
	Mean	43.37	41.64	41.52	41.54	41.6	41.14
	Standard Deviation	1.54	3.31	3.51	3.74	4.219	3.72
	Median	43.00	41.00	41.00	41.00	42	41.00
	Minimum	42.00	30.00	30.00	27.00	30	30.00
	Maximum	47.00	56.00	63.00	64.00	58	64.00
Male	Valid N	313	278	256	228	113	264.00
	Mean	43.54	42.29	41.68	42.40	41.9	42.03
	Standard Deviation	1.55	5.95	3.98	4.82	4.404	4.48
	Median	43.00	41.00	41.00	42.00	42	41.50
	Minimum	42.00	34.00	31.00	29.00	33	32.00
	Maximum	47.00	100.00	58.00	64.00	60	61.00
Total	Valid N	925	824	774	693	343	791.00
	Mean	43.43	41.86	41.57	41.82	41.7	41.43
	Standard Deviation	1.54	4.39	3.67	4.15	4.277	4.01
	Median	43.00	41.00	41.00	42.00	42	41.00
	Minimum	42.00	30.00	30.00	27.00	30	30.00
	Maximum	47.00	100.00	63.00	64.00	60	64.00

* any observation 24 months or later

As presented in Table 3c, mean HbA1c was statistically significant decreased from baseline to follow-up at 24 months and 36 months, $p<0.001$.

More than 60% of the participants improved in HbA1c from baseline to 24 and 36 months with somewhat greater proportion for women than for men.

The results are presented in Table 4. The number of participants who improved in HbA1c is illustrated in Figure 3.

5.2.2 SECONDARY OUTCOME VARIABLES

Table 3c. Mean Change in HbA1c over Time by Gender.

		Time in the program (months)					
Gender	HbA1c (mmol/mol)	0	12	24	36	42	Final obs*
Female	Valid N	611	545	518	465	230	527
	Mean	-0.005	-1.719	-1.836	-1.800	-1.86	-2.211
	95.0% Lower CL for	-0.015	-1.976	-2.132	-2.140	-2.39	-2.531
	95.0% Upper CL for	0.005	-1.463	-1.540	-1.460	-1.32	-1.89
	Standard Deviation	0.121	3.047	3.425	3.728	4.118	3.7436
	Median	0.000	-2.000	-2.000	-2.000	-2	-2
	Minimum	-3.000	-14.000	-17.000	-15.000	-13	-13
	Maximum	0.000	14.000	21.000	22.000	12	22
Male	Valid N	313	278	256	228	113	264
	Mean	0.000	-1.241	-1.859	-1.206	-1.78	-1.53
	95.0% Lower CL for	0.000	-1.902	-2.327	-1.829	-2.61	-2.067
	95.0% Upper CL for	0.000	-0.580	-1.391	-0.583	-0.95	-0.994
	Standard Deviation	0.000	5.597	3.801	4.773	4.47	4.4267
	Median	0.000	-2.000	-2.000	-1.000	-2	-2
	Minimum	0.000	-12.000	-13.000	-17.000	-12	-14
	Maximum	0.000	53.000	12.000	18.000	14	17
Total	Valid N	926	823	774	693	343	791
	Mean	-0.003	-1.558	-1.844	-1.605	-1.83	-1.984
	95.0% Lower CL for	-0.010	-1.838	-2.094	-1.911	-2.28	-2.262
	95.0% Upper CL for	0.003	-1.278	-1.593	-1.298	-1.38	-1.705
	Standard Deviation	0.099	4.093	3.552	4.107	4.231	3.9947
	Median	0.000	-2.000	-2.000	-2.000	-2	-2
	Minimum	-3.000	-14.000	-17.000	-17.000	-13	-14
	Maximum	0.000	53.000	21.000	22.000	14	22

* any observation 24 months or later

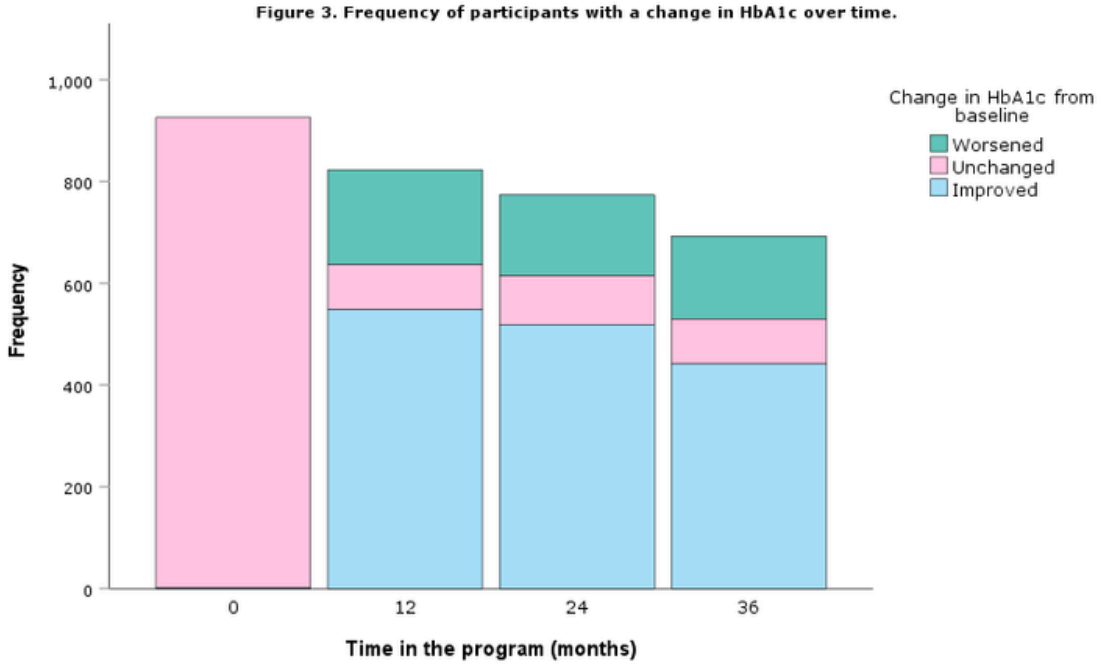
5.2.2 SECONDARY OUTCOME VARIABLES

Table 4a. Proportion of participants with improvement in HbA1c by Gender.

		Time in the program (months)										
	Change in HbA1c	0		12		24		36		42		Final obs*
Gender	(mmol/mol)	N	Percent	N	Percent	N	Percent	N	Percent			
Female	Improved	1	0.2%	374	68.6%	355	68.5%	312	67.1%	147	63.9%	73.1%
	Unchanged	610	99.8%	56	10.3%	65	12.5%	52	11.2%	27	11.7%	8.3%
	Worsened	0	0.0%	115	21.1%	98	18.9%	101	21.7%	56	24.3%	18.6%
	Total	611	100.0%	545	100.0%	518	100.0%	465	100.0%	230	100.0%	100.0%
Male	Improved	0	0.0%	175	62.9%	164	64.1%	130	57.0%	73	64.6%	63.6%
	Unchanged	313	100.0%	32	11.5%	31	12.1%	36	15.8%	6	5.3%	11.0%
	Worsened	0	0.0%	71	25.5%	61	23.8%	62	27.2%	34	30.1%	25.4%
	Total	313	100.0%	278	100.0%	256	100.0%	228	100.0%	113	100.0%	100.0%
Total	Improved	1	0.1%	549	66.7%	519	67.1%	442	63.8%	220	64.1%	69.9%
	Unchanged	925	99.9%	88	10.7%	96	12.4%	88	12.7%	33	9.6%	9.2%
	Worsened	0	0.0%	186	22.6%	159	20.5%	163	23.5%	90	26.2%	20.9%
	Total	926	100.0%	823	100.0%	774	100.0%	693	100.0%	343	100.0%	100.0%

* any observation 24 months or later

Figure 3. Frequency of participants with a change in HbA1c over time.



5.2.2 SECONDARY OUTCOME VARIABLES

Change in weight status

There were only 139 participants who reported weight status after 36 months. Therefore, Tables for weight status are presented for 36 months follow-up.

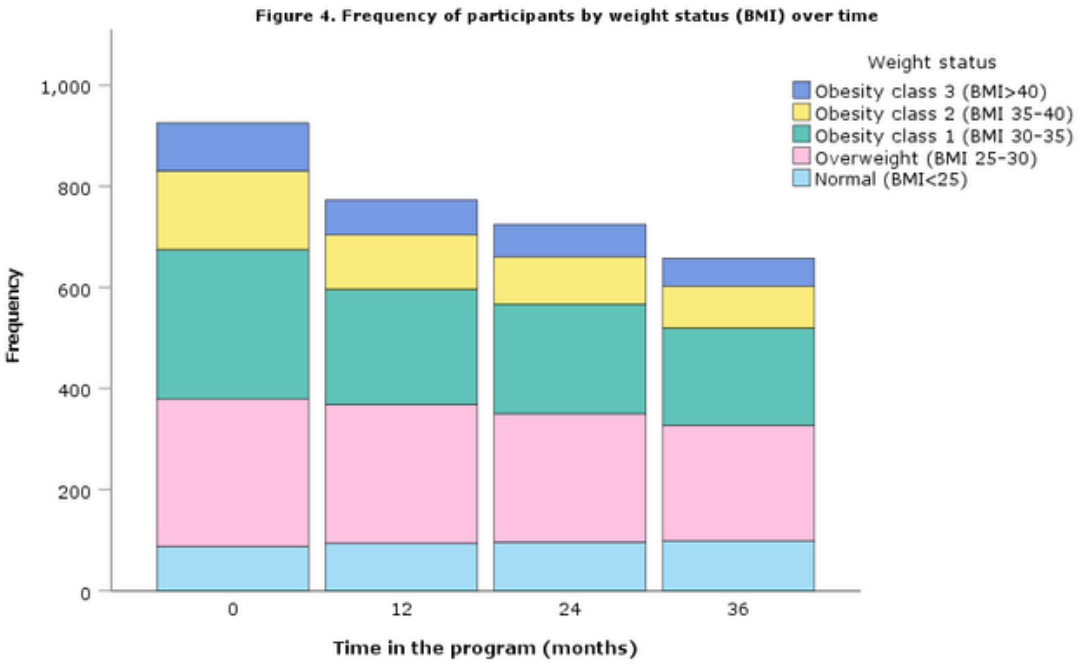
The proportion of participants with obesity has decreased from 59% at baseline to 51,7% at 24 and 50.3% at 36 months, see Table 5. The change in weight status at each follow-up point is illustrated in Figure 4. Also, the proportion of participants with normal BMI increase from 9.4% a start to 15.0% at 36 months.

Table 5a. BMI over Time by Gender.

		Time in the program (months)							
		0		12		24		36	
Gender	Weight status	N	Percent	N	Percent	N	Percent	N	Percent
Female	Normal (BMI<25)	58	9.5%	66	12.9%	65	13.4%	70	15.8%
	Overweight (BMI 25-	178	29.1%	159	31.0%	147	30.3%	136	30.7%
	Obesity class 1 (BMI	180	29.4%	146	28.5%	144	29.7%	127	28.7%
	Obesity class 2 (BMI	117	19.1%	83	16.2%	77	15.9%	65	14.7%
	Obesity class 3	79	12.9%	59	11.5%	52	10.7%	45	10.2%
	Total	612	100.0%	513	100.0%	485	100.0%	443	100.0%
Male	Normal (BMI<25)	29	9.2%	28	10.8%	30	12.5%	29	13.5%
	Overweight (BMI 25-	115	36.6%	115	44.2%	108	45.0%	92	42.8%
	Obesity class 1 (BMI	115	36.6%	82	31.5%	73	30.4%	65	30.2%
	Obesity class 2 (BMI	38	12.1%	26	10.0%	17	7.1%	19	8.8%
	Obesity class 3	17	5.4%	9	3.5%	12	5.0%	10	4.7%
	Total	314	100.0%	260	100.0%	240	100.0%	215	100.0%
Total	Normal (BMI<25)	87	9.4%	94	12.2%	95	13.1%	99	15.0%
	Overweight (BMI 25-	293	31.6%	274	35.4%	255	35.2%	228	34.7%
	Obesity class 1 (BMI	295	31.9%	228	29.5%	217	29.9%	192	29.2%
	Obesity class 2 (BMI	155	16.7%	109	14.1%	94	13.0%	84	12.8%
	Obesity class 3	96	10.4%	68	8.8%	64	8.8%	55	8.4%
	Total	926	100.0%	773	100.0%	725	100.0%	658	100.0%

* any observation 24 months or later

5.2.2 SECONDARY OUTCOME VARIABLES



5.2.2 SECONDARY OUTCOME VARIABLES

The mean BMI at each follow-up point is presented in Table 6, and the corresponding mean change from baseline in BMI is presented in Table 7.

Table 6a. BMI over Time by Gender.

		Time in the program (months)			
Gender	BMI	0	12	24	36
Female	Valid N	612	513	485	443
	Mean	32.61	31.91	32.73	31.36
	Standard Deviation	6.44	6.64	21.55	6.25
	Median	31.72	30.78	30.63	30.45
	Minimum	18.69	19.14	19.18	19.36
	Maximum	57.39	57.45	482.48	59.88
Male	Valid N	314	260	240	215
	Mean	30.91	30.21	31.06	29.99
	Standard Deviation	5.01	4.72	19.27	5.27
	Median	30.44	29.21	29.05	28.73
	Minimum	19.41	19.11	20.31	19.41
	Maximum	51.99	47.01	319.19	53.84
Total	Valid N	926	773	725	658
	Mean	32.03	31.34	32.18	30.91
	Standard Deviation	6.05	6.11	20.82	5.98
	Median	31.19	30.37	30.12	30.04
	Minimum	18.69	19.11	19.18	19.36
	Maximum	57.39	57.45	482.48	59.88

* any observation 24 months or late

5.2.2 SECONDARY OUTCOME VARIABLES

Table 7a. Mean change in BMI over Time by Gender.

		Time in the program (months)			
Gender	Change in BMI	0	12	24	36
Female	Valid N	612	513	485	443
	Mean	0.000	-0.55	0.14	-1.10
	95.0% Lower CL for	0.000	-0.74	-1.63	-1.41
	95.0% Upper CL for	0.000	-0.36	1.92	-0.79
	Standard Deviation	0.000	2.18	19.86	3.31
	Median	0.000	-0.33	-0.36	-0.70
	Minimum	0.000	-16.23	-12.41	-12.62
	Maximum	0.000	22.41	431.59	36.69
Male	Valid N	314	260	240	215
	Mean	0.000	-0.23	0.79	-0.12
	95.0% Lower CL for	0.000	-0.42	-1.57	-0.49
	95.0% Upper CL for	0.000	-0.05	3.15	0.25
	Standard Deviation	0.000	1.49	18.55	2.76
	Median	0.000	-0.29	-0.31	-0.28
	Minimum	0.000	-6.34	-9.12	-11.63
	Maximum	0.000	10.72	285.68	28.05
Total	Valid N	926	773	725	658
	Mean	0.000	-0.44	0.36	-0.78
	95.0% Lower CL for	0.000	-0.58	-1.06	-1.02
	95.0% Upper CL for	0.000	-0.30	1.77	-0.54
	Standard Deviation	0.000	1.98	19.42	3.18
	Median	0.000	-0.30	-0.34	-0.46
	Minimum	0.000	-16.23	-12.41	-12.62
	Maximum	0.000	22.41	431.59	36.69

* any observation 24 months or late

Missing data analysis

There were 77 dropouts in the program at 36 months, 14 men and 40 women,
Of these, 33 reported personal reasons, 15 has moved, 5 were having a severe disease, and one deceased.

There were 774 (83.4%) of all participants (925) who have reported data for the 24-month follow-up, and 693 (79.4%) at 36 months. A conservative sensitivity analysis for the primary outcome variable, i.e., the proportion of participants who achived normal HbA1c status, imputing non-Normal diabetes status for all participants with missing data, shows that there were 44.5% at 24 months and 36.6% who met the primary outcome variable.

The missing data analysis for subjects who actively dropped out at 24 months is presented in Table 8 and shows that there is slightly greater missing data among men (29%) than among women (23%). The age distribution similar for both the two groups. HbA1c at baseline was the same for those reporting 43.5 (1.7) and not reporting 43.6 (1.6) data at 24 months. They also having similar FINDRISC score at baseline, 16.0 (3.5) for those reporting and 16.9 (3.3) not reporting data at 24 months.

Table 8. Missing data analysis at 24 months, baseline data.

			Missing data group	
			Eligible at 24 months	Missing at 24 months
Gender	Female	Count	251	77
		Column N %	67,7%	60,6%
	Male	Count	120	50
		Column N %	32,3%	39,4%
Age	-55 år	Count	179	64
		Column N %	48,2%	50,4%
	>55 år	Count	192	63
		Column N %	51,8%	49,6%
HbA1c (mmol/mol)	Mean		43.5	43.6
	Median		43.0	43.0
	Standard Deviation		1.7	1.6
Findrisc score	Mean		16.9	16.9
	Median		17.0	17.0
	Standard Deviation		3.5	3.3

5.2.2 SECONDARY OUTCOME VARIABLES

Health goals

Among the participants who reported 24-month data, they had set between 1 and 21 health goals per participant by themselves or with the help of the coach during this period, with an average of 7.2 health goals per participant. The most common health goals that participants worked on during the period were exercise (322 participants), diet (182), stress management (32), sleep (23), beverages (12) and other activities (338).

The category "other activities" consists mainly of strategies to achieve a goal, mostly in the area of nutrition. See tables 9a and 9b. The average number of activities within each category of health goal is illustrated in Figure 6.

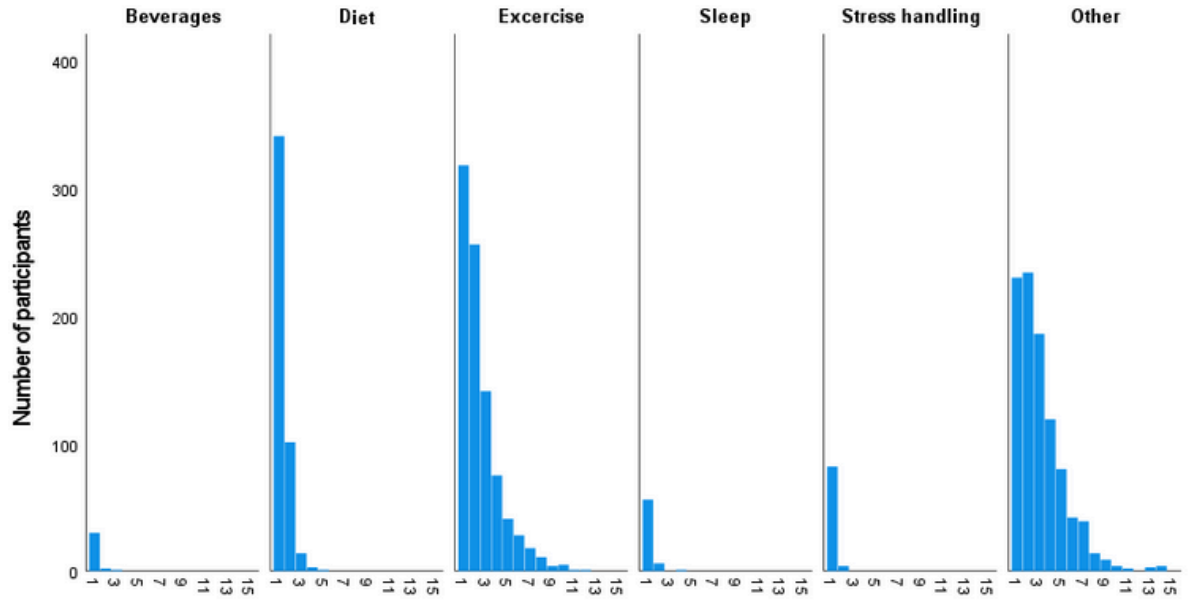
Table 9a. Number of Planned Health Goals.

All Activities	Count	Valid N	Mean	Standard Deviation	Minimum	Median	Maximum
Number of Activities	913	913	6.02	3.20	1.00	5.00	21.00

Tabell 9b. Number of Planned Health Goals, by Activity.

		Valid N	Mean	Standard Deviation	Minimum	Median	Maximum
Activity	Beverages	24	1.08	0.28	1.00	1.00	2.00
	Diet	413	1.32	0.60	1.00	1.00	5.00
	Excercise	795	2.63	1.86	1.00	2.00	12.00
	Sleep	46	1.17	0.53	1.00	1.00	4.00
	Stress handling	71	1.04	0.20	1.00	1.00	2.00
	Other	836	3.24	2.19	1.00	3.00	14.00

Figure 5. Number of Health Goals by Activity.



5.2.2 SECONDARY OUTCOME VARIABLES

Health services and health products

All 925 participants reported that they spent a total of about SEK 7.3 million on health services and health products in the program. There are large variations between individuals. Among the 847 participants who have spent money on health-related products, mean SEK 8,592 were spent per participant. They could spend a maximum of SEK 6,250 per year during the first two years, totalling SEK 12,500. Table 10b presents the mean number of health-related products spent by among all services, Table 10c presents money spent by category of service: diet, equipment, courses and inspiration, health coaching, gym, sleep and stress, and services to reduce alcohol and tobacco consumption.

Self-perceived change in quality of life

82% of participants felt that the health program has been a contributing factor to improved quality of life, see appendix 2, figures 6 + 7.

Table 10a. Money (SEK) spent on health-related products.

	Valid N	Mean	Standard Deviation	Minimum	Median	Maximum
Money (SEK) spent	847	8 592	3 797	0	9 328	19 706
Money (EUR) spent	847	776	343	0	843	1 780

Table 10b. Number of health-related product spent.

	Valid N	Mean	Standard Deviation	Minimum	Median	Maximum
Number of health-related products	847	14.76	8.40	1.00	14.00	48.00

Table 10c. Number of health-related products by category.

	Valid N	Mean	Standard Deviation	Minimum	Median	Maximum
Diet (products)	770	4.22	2.88	1.00	4.00	19.00
Equipment and other	794	6.06	4.55	1.00	5.00	26.00
Courses and inspiration	713	4.11	3.27	1.00	3.00	19.00
Home-training	687	3.45	2.67	1.00	3.00	22.00
Health coach	501	1.77	1.07	1.00	1.00	6.00
Gym	697	3.83	3.15	1.00	3.00	18.00
Sleep and stress	320	2.08	1.53	1.00	2.00	14.00
Alcohol and tobacco	84	1.56	1.12	1.00	1.00	7.00

5.2.2 SECONDARY OUTCOME VARIABLES

Health Coach intervention and participants feedback

A vast majority of the intervention consisted of sessions with conversations bewteen participants and health coaches. Each participants received individual support and guidance from a health coach with solid training and expertise in prevention and health promotion.

The health coach's primary task was to set goals and create a plan adapted to each individual's life circumstances. The coach also recommended suitable services available on the Marketplace that align with the goals that were set.
At the start, participants were offered seven sessions during the first year, to then be gradually decreased subsequently based on ambitions, new habits and behaviors, The need for the health coach's support was reduced after two years. Many participants were using their health credits to purchase additional sessions from the Marketplace, The coach and the participant were jointly planning how the sessions should be allocated, with some having more frequent conversations and others less. The sessions were conducted digitally, which were enabling a great accessibility and flexibility.

The platform was originally designed to empower users to make informed decisions about their health, supported by both the platform and personal coaching. It is grounded in lifestyle modification and built upon the foundational principles of identity, authentication, authority, and contextual awareness.

Quotes from participants

"I was able to leave the risk zone for diabetes, lost weight, and began to change the lifestyle that affected my well-being despite major challenges in life. Through regular conversations with my coach, I was able to take small steps toward better health. I won the battle against my inner resistance to exercise regularly, eat mindfully, and take care of myself. Thank you!"

"Being part of a health program with follow-up and the development of strategies—especially with the health coach—has led to greater awareness of my own behavior and increased both the possibility and desire to make healthier choices and become more physically active. Even though nothing was really new in terms of knowledge for me, it has absolutely helped me far more than I could have imagined, with a weight loss from a BMI of 32 to 21 and a reduction in HbA1c."

"Through encouraging conversations with the health coach and increased knowledge about how I could change my lifestyle in small steps—going through setbacks but managing to get back on track with help—both my blood sugar and other health factors have improved. Slowly but surely, I have made progress."

6. DISCUSSION

Health Integrator was appointed to explore the effectiveness of a lifestyle intervention program, i.e., to explore the outcome of an intervention on a selection on markers such as HbA1c and BMI, to see if that potentially could have a preventitive risk for developing diabetes in this program population. Hence, the program was never formed as an interventional study to compare to a control group, nor to covers aspects such as influence of medication use, variations in socio economics, or other. The efficacy of lifestyle interventions has alreacy been shown in previous studies.

This project investigated participants' experiences with a health coaching intervention paired with personalized toolkits sourced from a digital marketplace. The results indicate that digitally delivered, adaptive coaching played a key role in enhancing health awareness, promoting behavior change, and fostering a sense of empowerment among participants.

Consistent with previous research, the participants emphasized the importance of being seen and listened to by a knowledgeable coach. The ongoing, trust-based relationship enabled tailored goal-setting and incremental behavior change, which aligns with (referens_10). The combination of structured support and flexible delivery appears to have facilitated participants' engagement. By co-designing the session plan, participants experienced a greater sense of control over their journey, which may have contributed to motivation and sustained change.

The 24-month and 36 months results presented in this report are based on a dataset where 84% at 24 months and 75% at 36 months, of the participants have reported data for the primary outcome variable. This is a great number and shows that compliance with the intervention program was high.

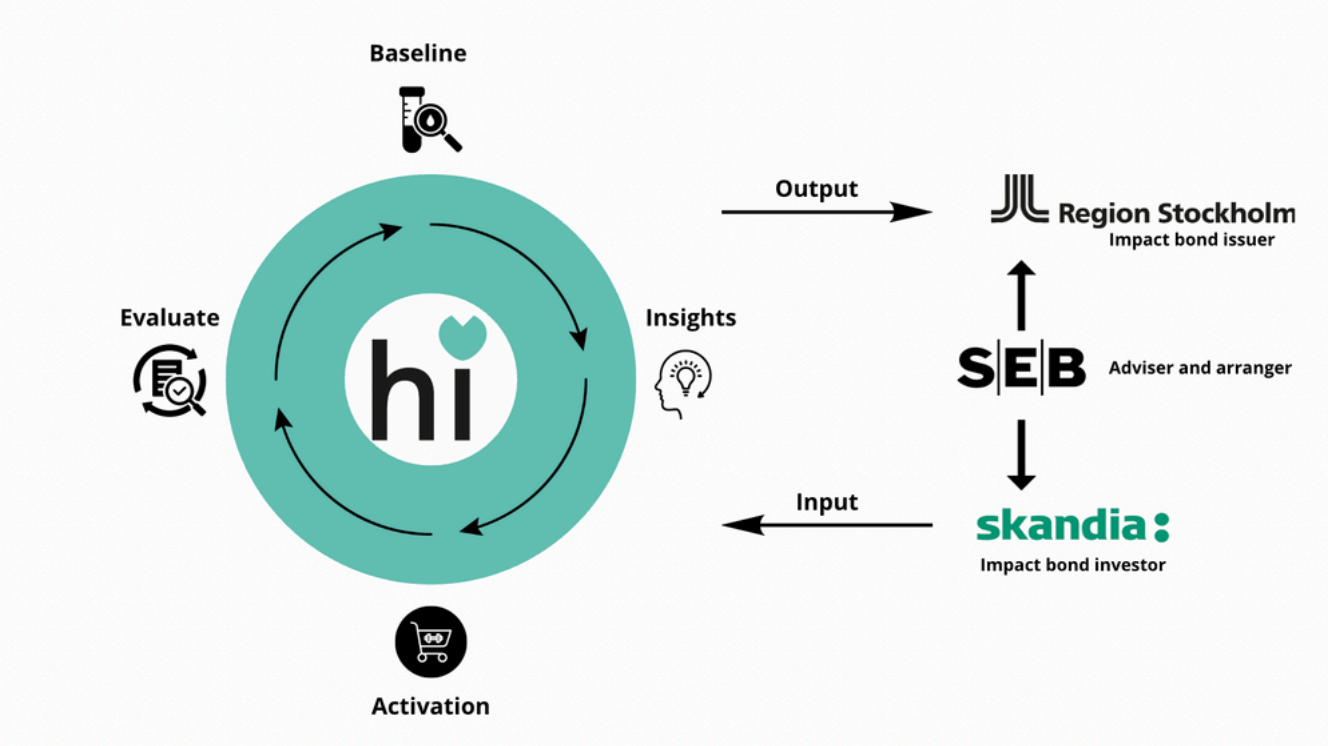
The results show that over around 50% of the participants have left the pre-diabetes status in HbA1c. It is statistically robust as the estimated proportion is statistically significantly greater than 32.4%, with a p-value <0.001. The narrow 95% confidence interval shows that the estimates of the proportion at 24 month and 36 months are robust. The results show that it has met the preset threshold with at least 300 out of 925 (32.4%) participants with a risk reduction for type 2 diabetes.

Further, aggregating all participants last assessment at 24 months or later (up to 54 months) reveals that 453 of 791 (57.3%) participants met the primary objective with normal status in HbA1c, i.e., <42 mmol/mol. Therefore the data also suggests that the risk of developing diabetes in the long term, i.e. beyond 24 months, is greatly reduced,

There was a slightly higher proportion of women than men who achieved the primary objective of the intervention. The intervention also shown that the lifestyle change achieved at six months was sustained, and participants were also willing to spend money on these activities after the initial intervention period where these activies were founded by this program. This indicates that a substantial proportion of the participants have changed their lifestyle with this program and that the intervention is sustained.

A conservative sensitivity analysis where all participants with missing data at 24 and 36 months are considered, i.e., imputed with non-normal diabetes status regarding the primary outcome variable, reveal that 44.5% at 24 months and 36.6% at 36 months has met the primary objective of this program. And overall among the 925 participantts 49% met the primary outcome at 24 months or later at the last observation in this program, The additional results reinforces the conclusions of the primary outcome variable.

Previous studies have shown that the proportion of participants who develop type 2 diabetes after 3 years of lifestyle intervention is 11% compared to 23% in the control group, i.e. a risk reduction of 58%. The 24 and 36 months follow-up data shows that it is <10% who have developed a HbA1C value which indicates diabetes. Among the participants who had a follow-up at 24 months or later the corresponding figure was 6.1%. This indicates a risk reduction for diabetes of 73.5% which is stronger than the previous intervention study, The prevention program indicates to be preventitive for diabetes.
The Health Impact Bond has demonstrated success, delivering a full financial return to Skandia, the impact bond investor (Reference 13).



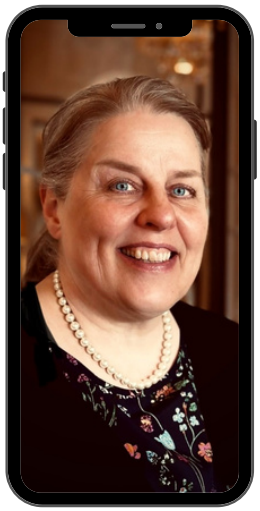
The results show that the intervention also has en effect on reducing the participantts BMI and the proportion of participants who were obese at baseline has decreased and a a greater number of participants at normal weight at 24 months and 36 months were observed. Overall, 85% of participants felt that the health program contributed to improved quality of life. This could likely explain the low dropout rate of only 54 participants, which is just over 5%.

A limitation of this project and for the interpretation of the results is the lack of information on the contemporary medication use of the participants. The participants were recruited from outside the health care system and likely that some of them could have been included into the health care system for treatment of, for example, obesity or diabetes, as 8.4% of the participants met the diagnostic criteria for type 2 diabetes in HbA1c at 36 months. Therefore, this is one factor that may have contributed to the observed effectiveness of the intervention.
Health Integrator has not been provided with any data regarding medication that participants may have used or are currently using or stopped using.
Theoretically, it would be possible to link these data with the drug registry in Sweden to measure the participants' medication use during the same time period. However, this falls outside the scope of this test of a model for more effective governance and financing of preventive initiatives.

7. CONCLUSION

The results show that the intervention is statistically significant to transition at least 1/3 of all participants into a normal HbA1C level <42 mmol/mol. The effectiveness was concluded at 24 months and sustained beyond 36 months. The proportion of participants who developed the diagnostic criteria for type 2 diabetes in HbA1c was very low, which indicates that the intervention is preventive for diabetes.
These results suggest that it is possible to change lifestyle behaviors through supportive interventions.
The lifestyle intervention appears to also reduce the participants' BMI, with the effect occurring after six months and being sustained beyond 36 months.
The Health Impact Bond delivered a full financial return to Skandia, the impact bond investor.

8. TESTIMONIALS



"With the right tools, continuous follow-up, and someone to guide me along the way, I've managed to change my lifestyle. This program has been a lifesaver for me.

Ritta

Participant in the Region of Stockholm Health Program



"The ongoing support from my coach has been incredibly valuable and thanks to the program, I've gained knowledge how I can personally take action to avoid developing the disease."

Carina

Participant in the Region of Stockholm Health Program



With the help of Health Integrator and my coach, I can now control my blood sugar. Following a plan and a program makes change possible. I've now found sustainable habits and a healthier lifestyle.

Robert

Participant in the Region of Stockholm Health Program



"With help from The Health Program I successfully brought my long-term blood sugar down from 44 to 34. To be honest, I don't think many people will succeed without a coaching aspect. It's the holistic approach that is key where you get all the help you need in one place."

Charles

Participant in the Region of Stockholm Health Program



“The feeling of helping someone discover their own potential is unbeatable and the feeling I get as a coach when I get to witness a client reach their goals is truly amazing.

Linda

Health Coach Health Integrator

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APPENDIX

LIST OF TABLES AND FIGURES

Table 1a. Descriptive statistics baseline.
Table 1b. Baseline descriptive statistics, category variables.
Table 1c. Participants' Assessment over Time (months) by HbA1c and BMI.
Table 2a Primary outcome variable - Interval HbA1c, by gender.
Table 2b. Primary outcome variable - Range of HbA1c, by age range.
Table 2c. Primary outcome variable - Range HbA1c, by FINDRISC at baseline.
Table 2d. Primary outcome variable - HbA1c range with confidence intervals.
Table 3a. HbA1c mean over time, by gender.
Table 3b. HbA1c mean over time by age group.
Table 3c. Mean change in HbA1c over time by gender.
Table 3d. Mean change in HbA1c over time by age group.
Table 4a Proportion of participants with an improvement in HbA1c, by gender.
Table 4b. Proportion of participants with an improvement in HbA1c, by age range.
Table 5a Weight status (BMI) over time, by gender.
Table 5b. Weight status (BMI) over time, by age group.
Table 6a. BMI over time, by gender.
Table 6b. BMI over time, by age group.
Table 7a. Mean change in BMI over time, by gender.
Table 7b. Mean change in BMI over time, by age group.
Figure 1. Flowchart of participant.
Figure 2 Frequency of participants by risk group in HbA1c for diabetes.
Figure 3 Frequency of participants with a change in HbA1c over time.
Figure 4. Frequency of participants by weight status (BMI) over time.
Figure 5. Number of Health Goals by Activity.
Figure 6. Frequency of participants with change in quality of life.
Figure 7 a+b. Frequency of participants with improved quality of life.

2. SUPPLEMENTARY TABLES AND FIGURES

Table 2b. Primary Outcome Variable HbA1c by Age.

		Time in the program (months)											
		0		12		24		36		42		Final obs*	
Age	HbA1c (mmol/mol)	N	Percent	N	Percent	N	Percent	N	Percent	N	Percent	N	Percent
-55 years	Normal <42	0	0.0%	211	53.4%	193	52.6%	162	48.8%	74	46.80%	214	57.2%
	Prediabetes 42-47	446	100.0%	159	40.3%	154	42.0%	143	43.1%	69	43.70%	139	37.2%
	Diabetes >=48	0	0.0%	25	6.3%	20	5.4%	27	8.1%	15	9.50%	21	5.6%
	Total	446	100.0%	395	100.0%	367	100.0%	332	100.0%	158	100.00%	374	100.0%
>55 years	Normal <42	0	0.0%	216	50.3%	219	53.8%	177	49.0%	95	51.40%	239	57.3%
	Prediabetes 42-47	478	100.0%	194	45.2%	154	37.8%	153	42.4%	76	41.10%	151	36.2%
	Diabetes >=48	0	0.0%	19	4.4%	34	8.4%	31	8.6%	14	7.60%	27	6.5%
	Total	478	100.0%	429	100.0%	407	100.0%	361	100.0%	185	100.00%	417	100.0%
Total	Normal <42	0	0.0%	427	51.8%	412	53.2%	339	48.9%	169	49.30%	453	57.3%
	Prediabetes 42-47	924	100.0%	353	42.8%	308	39.8%	296	42.7%	145	42.30%	290	36.7%
	Diabetes >=48	0	0.0%	44	5.3%	54	7.0%	58	8.4%	29	8.50%	48	6.1%
	Total	924	100.0%	824	100.0%	774	100.0%	693	100.0%	343	100.00%	791	100.0%

* any observation 24 months or later

Table 2d. Primary Outcome Variable HbA1c with

HbA1c		Time in the program (months)					
(mmol/mo		0	12	24	36	42	Final obs*
Normal <42	N	0	427	412	339	169	453
	Percent	0.0%	51.8%	53.2%	48.9%	49.30%	57.3%
	95.0% Lower CL for		48.4%	49.7%	45.2%	44.00%	53.8%
	95.0% Upper CL for		55.2%	56.7%	52.6%	54.50%	60.7%
Prediabete	N	925	353	308	296	145	290
s 42-47	Percent	100.0%	42.8%	39.8%	42.7%	42.30%	36.7%
	95.0% Lower CL for		39.5%	36.4%	39.1%	37.10%	33.4%
	95.0% Upper CL for		46.2%	43.3%	46.4%	47.50%	40.1%
Diabetes	N	0	44	54	58	29	48
>=48	Percent	0.0%	5.3%	7.0%	8.4%	8.50%	6.1%
	95.0% Lower CL for		4.0%	5.3%	6.5%	5.90%	4.6%
	95.0% Upper CL for		7.0%	8.9%	10.6%	11.70%	7.9%

* any observation 24 months or later

2. SUPPLEMENTARY TABLES AND FIGURES

Table 3b. Mean HbA1c over Time by Age.

		Time in the program (months)					
Age	HbA1c (mmol/mol)	0	12	24	36	42	Final obs*
-55 years	Valid N	446	395	367	332	158	374.00
	Mean	43.34	41.76	41.48	41.77	41.91	41.29
	Standard Deviation	1.49	4.54	3.72	4.21	4.46	3.98
	Median	43.00	41.00	41.00	42.00	42.00	41.00
	Minimum	42.00	30.00	30.00	27.00	31.00	31.00
	Maximum	47.00	87.00	63.00	64.00	58.00	64.00
>55 years	Valid N	478	429	407	361	185	417.00
	Mean	43.50	41.94	41.65	41.88	41.53	41.56
	Standard Deviation	1.59	4.25	3.62	4.10	4.12	4.04
	Median	43.00	41.00	41.00	42.00	41.00	41.00
	Minimum	42.00	35.00	33.00	29.00	30.00	30.00
	Maximum	47.00	100.00	58.00	61.00	60.00	61.00
Total	Valid N	924	824	774	693	343	791.00
	Mean	43.43	41.86	41.57	41.82	41.70	41.43
	Standard Deviation	1.54	4.39	3.67	4.15	4.28	4.01
	Median	43.00	41.00	41.00	42.00	42.00	41.00
	Minimum	42.00	30.00	30.00	27.00	30.00	30.00
	Maximum	47.00	100.00	63.00	64.00	60.00	64.00

* any observation 24 months or later

Table 3d. Mean Change in HbA1c over Time by Age.

		Time in the program (months)					
Age	HbA1c (mmol/mol)	0	12	24	36	42	Final obs*
-55 years	Valid N	446	395	367	332	158	374
	Mean	0.000	-1.592	-1.880	-1.593	-1.58	-2.064
	95.0% Lower CL for	0.000	-2.014	-2.262	-2.041	-2.28	-2.471
	95.0% Upper CL for	0.000	-1.171	-1.498	-1.146	-0.89	-1.657
	Standard Deviation	0.000	4.262	3.724	4.148	4.415	4.003
	Median	0.000	-2.000	-2.000	-2.000	-2	-2
	Minimum	0.000	-14.000	-17.000	-15.000	-13	-13
	Maximum	0.000	42.000	21.000	22.000	12	22
>55 years	Valid N	478	428	407	361	185	417
	Mean	-0.006	-1.526	-1.811	-1.615	-2.04	-1.911
	95.0% Lower CL for	-0.019	-1.900	-2.141	-2.037	-2.63	-2.295
	95.0% Upper CL for	0.006	-1.152	-1.480	-1.193	-1.45	-1.527
	Standard Deviation	0.137	3.935	3.393	4.075	4.067	3.991
	Median	0.000	-2.000	-2.000	-2.000	-2	-2
	Minimum	-3.000	-12.000	-13.000	-17.000	-12	-14
	Maximum	0.000	53.000	11.000	17.000	14	17
Total	Valid N	924	823	774	693	343	791
	Mean	-0.003	-1.558	-1.844	-1.605	-1.83	-1.984
	95.0% Lower CL for	-0.010	-1.838	-2.094	-1.911	-2.28	-2.262
	95.0% Upper CL for	0.003	-1.278	-1.593	-1.298	-1.38	-1.705
	Standard Deviation	0.099	4.093	3.552	4.107	4.231	3.995
	Median	0.000	-2.000	-2.000	-2.000	-2	-2
	Minimum	-3.000	-14.000	-17.000	-17.000	-13	-14
	Maximum	0.000	53.000	21.000	22.000	14	22

* any observation 24 months or later

Table 4b. Proportion of participants with improvment in HbA1c by Age.

		Time in the program (months)											
	Change in HbA1c	0		12		24		36		42		Final obs*	
Age	(mmol/mol)	N	Percent	N	Percent	N	Percent	N	Percent	N	Percent	N	Percent
-55 years	Improved	0	0.0%	266	67.3%	241	65.7%	211	63.6%	101	63.90%	263	70.30%
	Unchanged	446	100.0%	41	10.4%	54	14.7%	41	12.3%	15	9.50%	36	9.60%
	Worsened	0	0.0%	88	22.3%	72	19.6%	80	24.1%	42	26.60%	75	20.10%
	Total	446	100.0%	395	100.0%	367	100.0%	332	100.0%	158	100.00%	374	100.00%
>55 years	Improved	1	0.2%	283	66.1%	278	68.3%	231	64.0%	119	64.30%	290	69.50%
	Unchanged	477	99.8%	47	11.0%	42	10.3%	47	13.0%	18	9.70%	37	8.90%
	Worsened	0	0.0%	98	22.9%	87	21.4%	83	23.0%	48	25.90%	90	21.60%
	Total	478	100.0%	428	100.0%	407	100.0%	361	100.0%	185	100.00%	417	100.00%
Total	Improved	1	0.1%	549	66.7%	519	67.1%	442	63.8%	220	64.10%	553	69.90%
	Unchanged	923	99.9%	88	10.7%	96	12.4%	88	12.7%	33	9.60%	73	9.20%
	Worsened	0	0.0%	186	22.6%	159	20.5%	163	23.5%	90	26.20%	165	20.90%
	Total	924	100.0%	823	100.0%	774	100.0%	693	100.0%	343	100.00%	791	100.00%

* any observation 24 months or later

Table 5b. BMI over Time by Age.

		Time in the program (months)							
		0		12		24		36	
Age	Weight status	N	Percent	N	Percent	N	Percent	N	Percent
-55	Normal (BMI<25)	33	7.4%	33	8.9%	40	11.7%	41	13.4%
	Overweight (BMI 25-	132	29.6%	128	34.6%	107	31.2%	100	32.6%
	Obesity class 1 (BMI	146	32.7%	115	31.1%	110	32.1%	91	29.6%
	Obesity class 2 (BMI	80	17.9%	57	15.4%	51	14.9%	46	15.0%
	Obesity class 3	55	12.3%	37	10.0%	35	10.2%	29	9.4%
	Total	446	100.0%	370	100.0%	343	100.0%	307	100.0%
>55	Normal (BMI<25)	54	11.3%	61	15.1%	55	14.4%	58	16.5%
	Overweight (BMI 25-	160	33.5%	146	36.2%	148	38.7%	128	36.5%
	Obesity class 1 (BMI	148	31.0%	113	28.0%	107	28.0%	101	28.8%
	Obesity class 2 (BMI	75	15.7%	52	12.9%	43	11.3%	38	10.8%
	Obesity class 3	41	8.6%	31	7.7%	29	7.6%	26	7.4%
	Total	478	100.0%	403	100.0%	382	100.0%	351	100.0%
Total	Normal (BMI<25)	87	9.4%	94	12.2%	95	13.1%	99	15.0%
	Overweight (BMI 25-	292	31.6%	274	35.4%	255	35.2%	228	34.7%
	Obesity class 1 (BMI	294	31.8%	228	29.5%	217	29.9%	192	29.2%
	Obesity class 2 (BMI	155	16.8%	109	14.1%	94	13.0%	84	12.8%
	Obesity class 3	96	10.4%	68	8.8%	64	8.8%	55	8.4%
	Total	924	100.0%	773	100.0%	725	100.0%	658	100.0%

* any observation 24 months or later

2. SUPPLEMENTARY TABLES AND FIGURES

Table 6b. BMI over Time by Age.

Age	BMI	Time in the program (months) 0	12	24	36
-55	Valid N	446	370	343	307
	Mean	32.64	31.93	32.58	31.38
	Standard Deviation	6.19	6.15	16.71	5.94
	Median	31.99	30.86	30.86	30.82
	Minimum	19.92	20.28	20.53	20.31
	Maximum	57.39	57.45	319.19	51.81
>55	Valid N	478	403	382	351
	Mean	31.48	30.79	31.81	30.51
	Standard Deviation	5.87	6.03	23.94	5.99
	Median	30.76	29.75	29.68	29.71
	Minimum	18.69	19.11	19.18	19.36
	Maximum	57.09	57.09	482.48	59.88
Total	Valid N	924	773	725	658
	Mean	32.04	31.34	32.18	30.91
	Standard Deviation	6.05	6.11	20.82	5.98
	Median	31.19	30.37	30.12	30.04
	Minimum	18.69	19.11	19.18	19.36
	Maximum	57.39	57.45	482.48	59.88

* any observation 24 months or late

2. SUPPLEMENTARY TABLES AND FIGURES

Table 7b. Mean change in BMI over Time by Age.

		Time in the program (months)			
Age	Change in BMI	0	12	24	36
-55	Valid N	446	370	343	307
	Mean	0.00	-0.52	0.10	-0.93
	95.0% Lower CL for	0.00	-0.72	-1.56	-1.29
	95.0% Upper CL for	0.00	-0.32	1.76	-0.58
	Standard Deviation	0.00	1.97	15.63	3.14
	Median	0.00	-0.31	-0.38	-0.60
	Minimum	0.00	-16.23	-12.41	-12.62
	Maximum	0.00	3.85	285.68	28.05
>55	Valid N	478	403	382	351
	Mean	0.00	-0.37	0.59	-0.65
	95.0% Lower CL for	0.00	-0.56	-1.65	-0.98
	95.0% Upper CL for	0.00	-0.17	2.83	-0.31
	Standard Deviation	0.00	1.99	22.30	3.20
	Median	0.00	-0.29	-0.33	-0.36
	Minimum	0.00	-8.69	-12.23	-12.32
	Maximum	0.000	22.406	431.588	36.689
Total	Valid N	924	773	725	658
	Mean	0.00	-0.44	0.36	-0.78
	95.0% Lower CL for	0.00	-0.58	-1.06	-1.02
	95.0% Upper CL for	0.00	-0.30	1.77	-0.54
	Standard Deviation	0.00	1.98	19.42	3.18
	Median	0.00	-0.30	-0.34	-0.46
	Minimum	0.00	-16.23	-12.41	-12.62
	Maximum	0.00	22.41	431.59	36.69

* any observation 24 months or late

2. SUPPLEMENTARY TABLES AND FIGURES

Figure 6. Frequency of participants with change in quality of life. (279 answers)

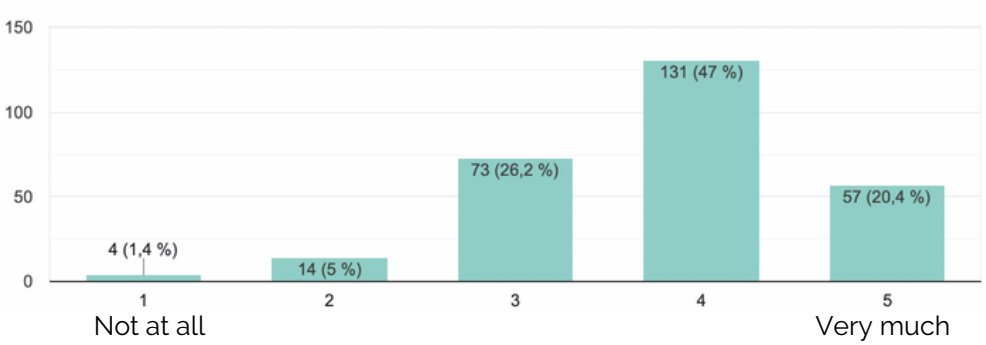
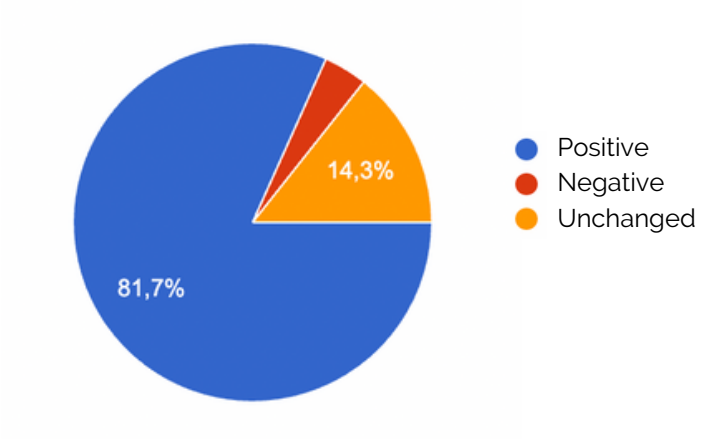


Figure 7a. Frequency of participants with change in quality of life.
(In what direction has the change taken place?)



Improved quality of life

Figure 7b. Frequency of participants with change in quality of life.
(Would you say that the health program has been a contributing factor to improved quality of life?)

