Finnish Institute of Occupational Health

WELL-BEING THROUGH WORK

AI based health and work disability risk assessment and service paths development in Finland

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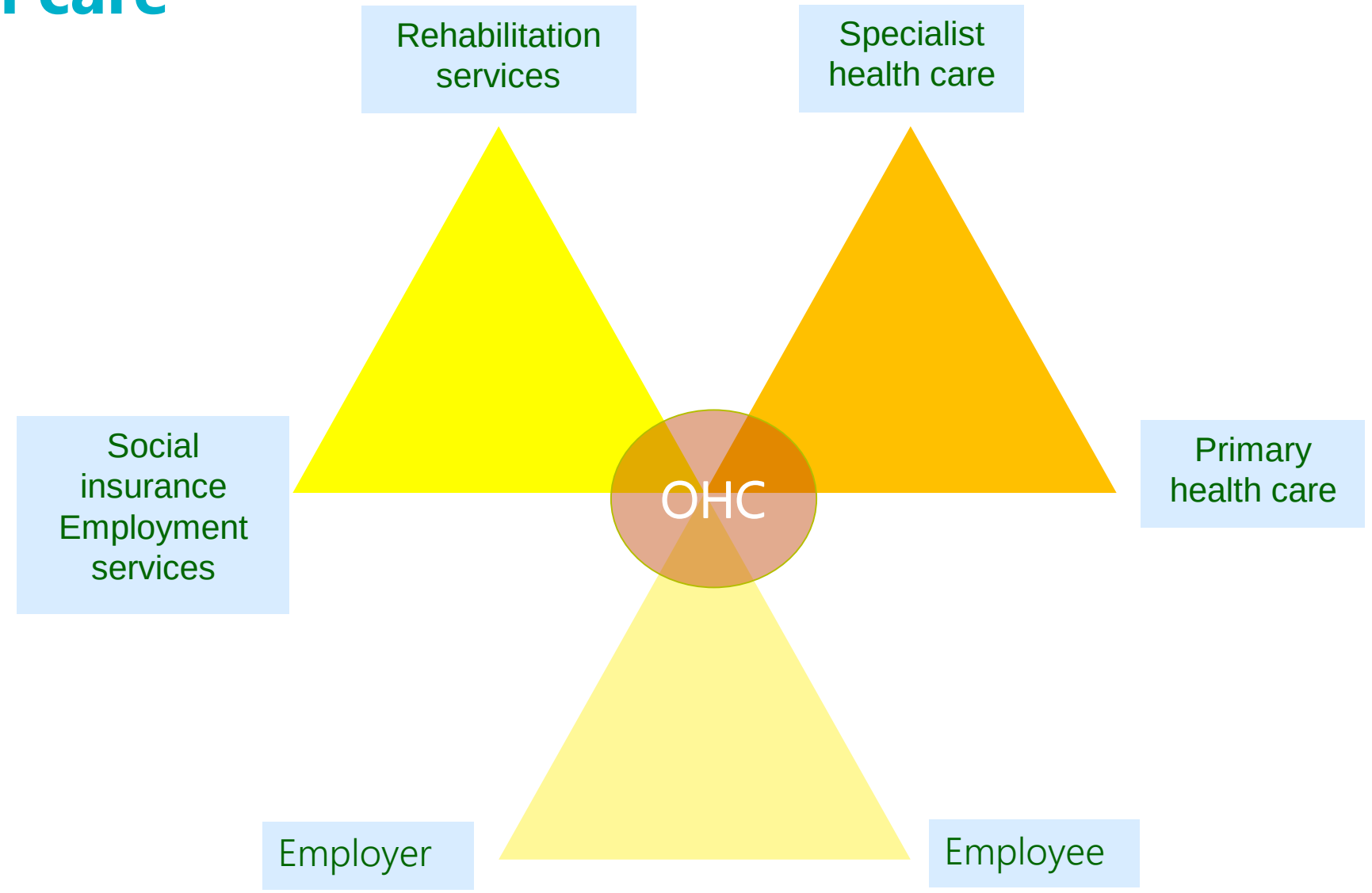
Facts about Finland

- Finland is one of the 28 EU member countries, joined EU in 1995
- Economical pillars: metal & engin., ICT technology, wood and paper
- 5.5 million inhabitants
- Labour force about 2.6 million
- Private sector employs 73%
- 66% of women work
- Average retirement age 60.9 years
- Health costs 9.4% of GDP; 19.8 billion €
- 76 Hospitals including 5 University Hospitals
- 160 Primary Health Care Centers
- 20.000 working-age physicians
- Universal social security scheme including health insurance and unemployment insurance

Position and collaboration of occupational health care



AI to boost value-based health and social care - case Espoo

Matti Ristimäki
Head of Data-driven transformation, Tieto

@mattiristimaki

tieto

Tieto is the leading Nordic software and services company

3,000
Projects annually

Serving Nordic clients since
1968

Around
900 clients

Turnover of approximately
€1.5 billion

Employing
15,000
experts globally, in around
20
countries

Serving customers in over
90
countries worldwide

Investments in technology and services more than
€130 million* per year
*incl. capital expenditure and operational costs

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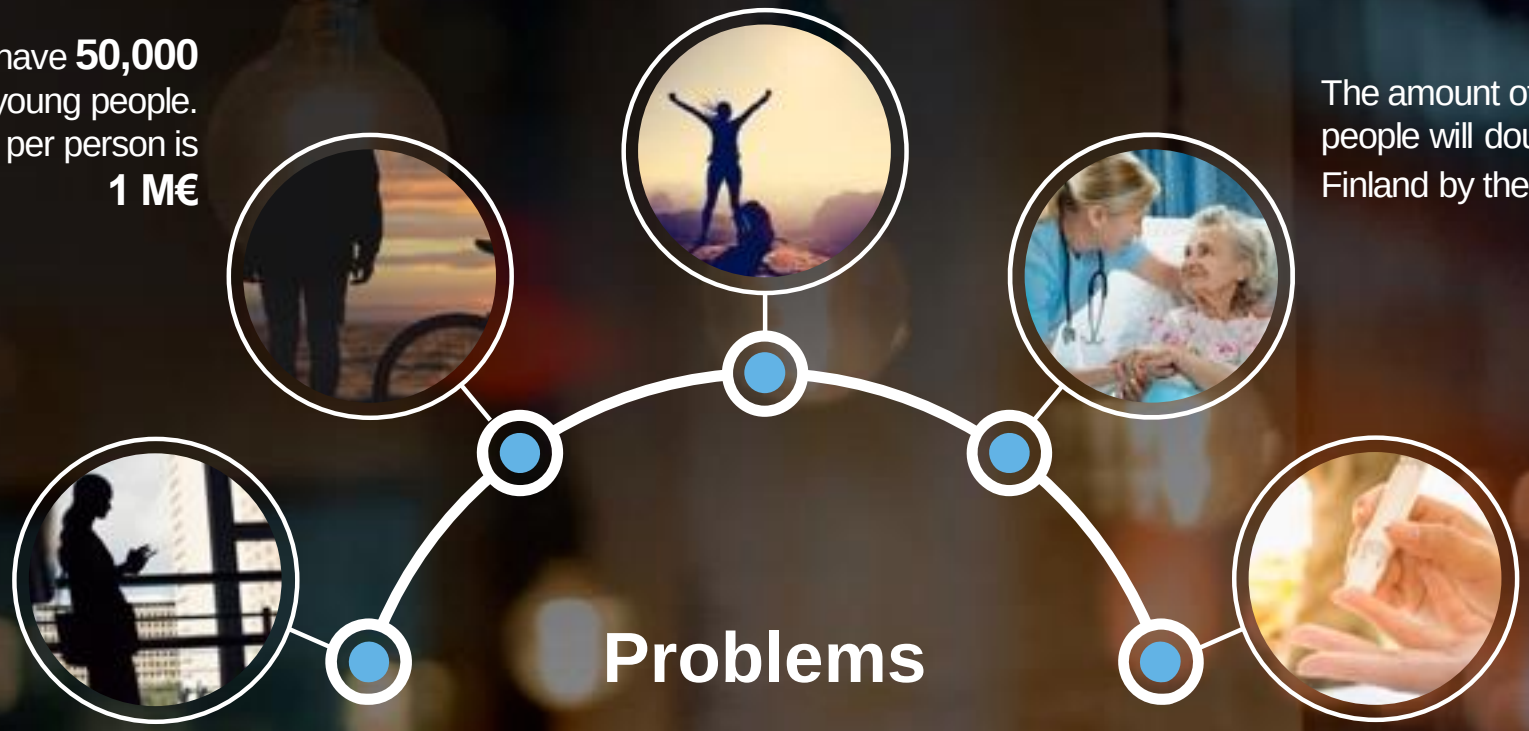
Challenges in our society

Even though most health and social care issues are related to lifestyle, the are mostly reactive treatments

In Finland we have **50,000** excluded young people. Average cost per person is **1 M€**

The amount of aging people will double in Finland by the year **2040**

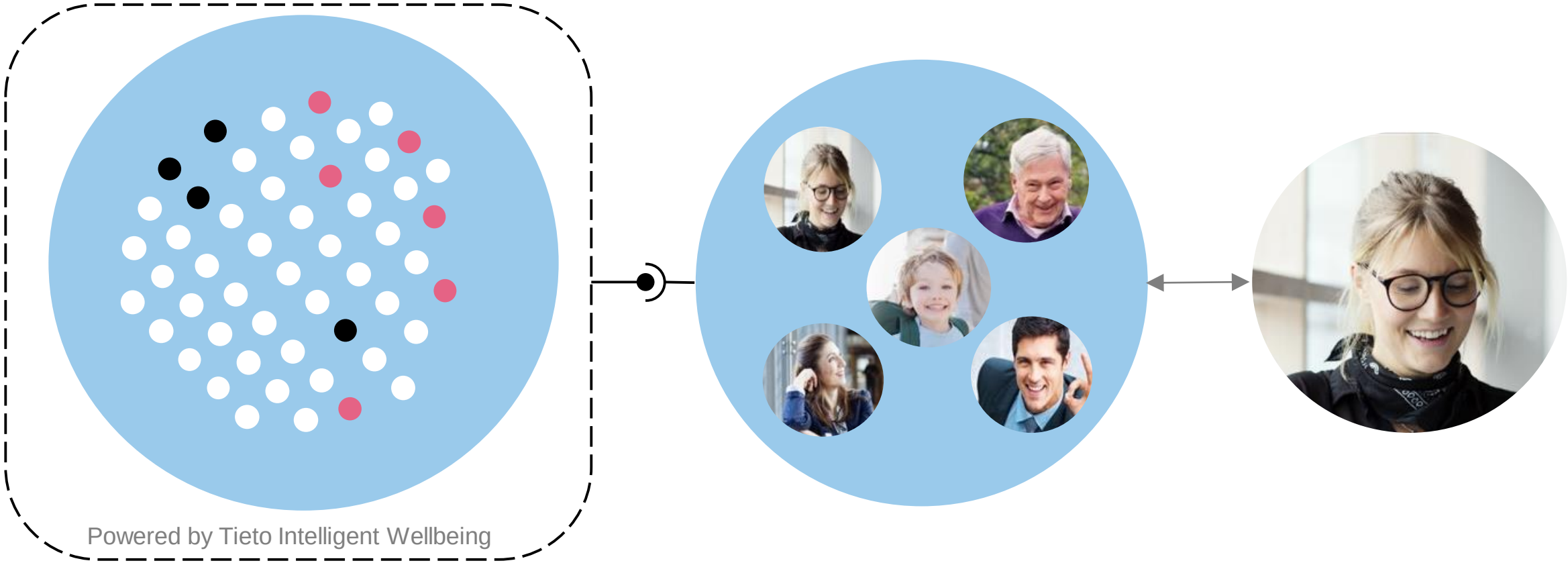


Costs of undone work **5,3 B€ / y**

Chronic diseases cause notable costs

Problems

Target: Preventive social care and healthcare



To identify individuals who would benefit from preventive services by AI

Automated preventive care supply based on individual needs

Empowerment of individual with his own data

AI trial with City of Espoo

Welfare system

Healthcare system

Early-education system

Citizen registry

Care Quality analytics

Predictive care analytics

Data Insights use cases

Tieto Health Data and Analytics Platform

Advanced machine learning pipeline

1. **Population view**
2. **Segments**
3. **Service usage**
4. **Service demand forecast**

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Case Espoo - Facts

Anonymized healthcare and social care data of ca 500,000 inhabitants were combined to form a 360-view to a customer

Millions of events, e.g. healthcare and social care contacts, laboratory results

Customers segmented based on their interaction with care services by applying unsupervised machine learning

Customer journeys between the segments and over all SOTE services were forecasted by supervised machine learning

Forecasting models for future wellbeing of customers & utilization of welfare services were constructed

Segment and individual level forecasts

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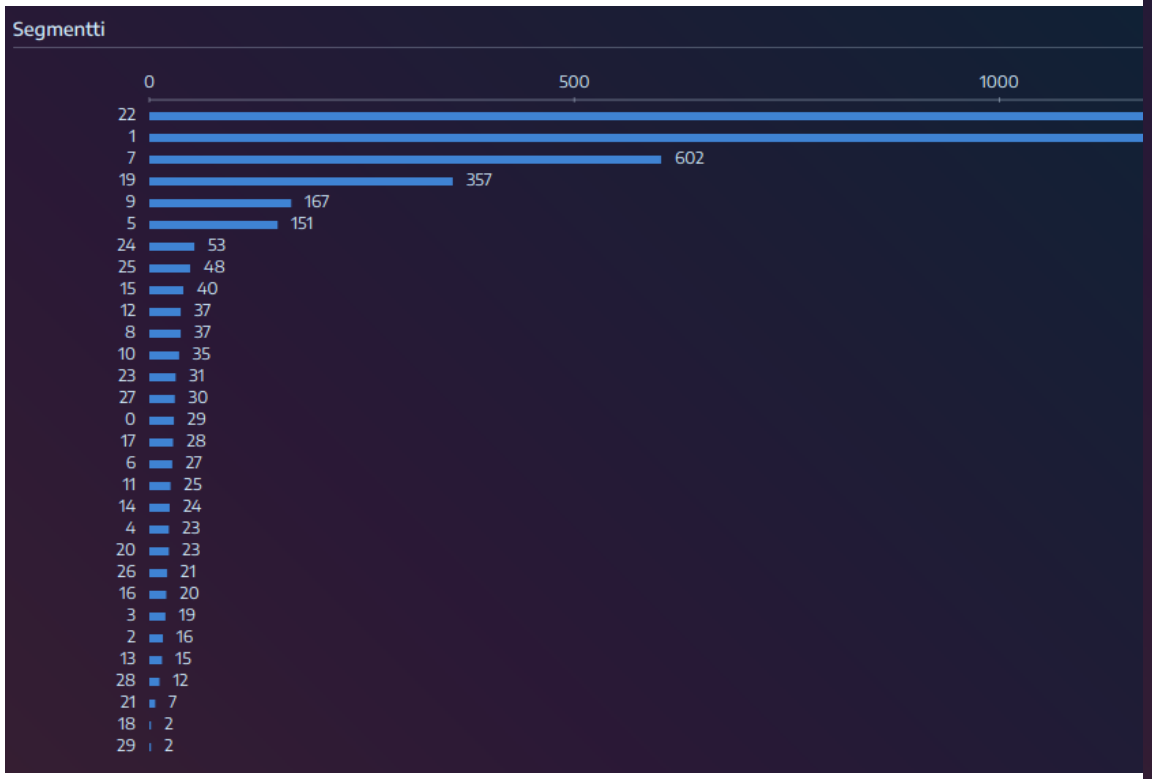
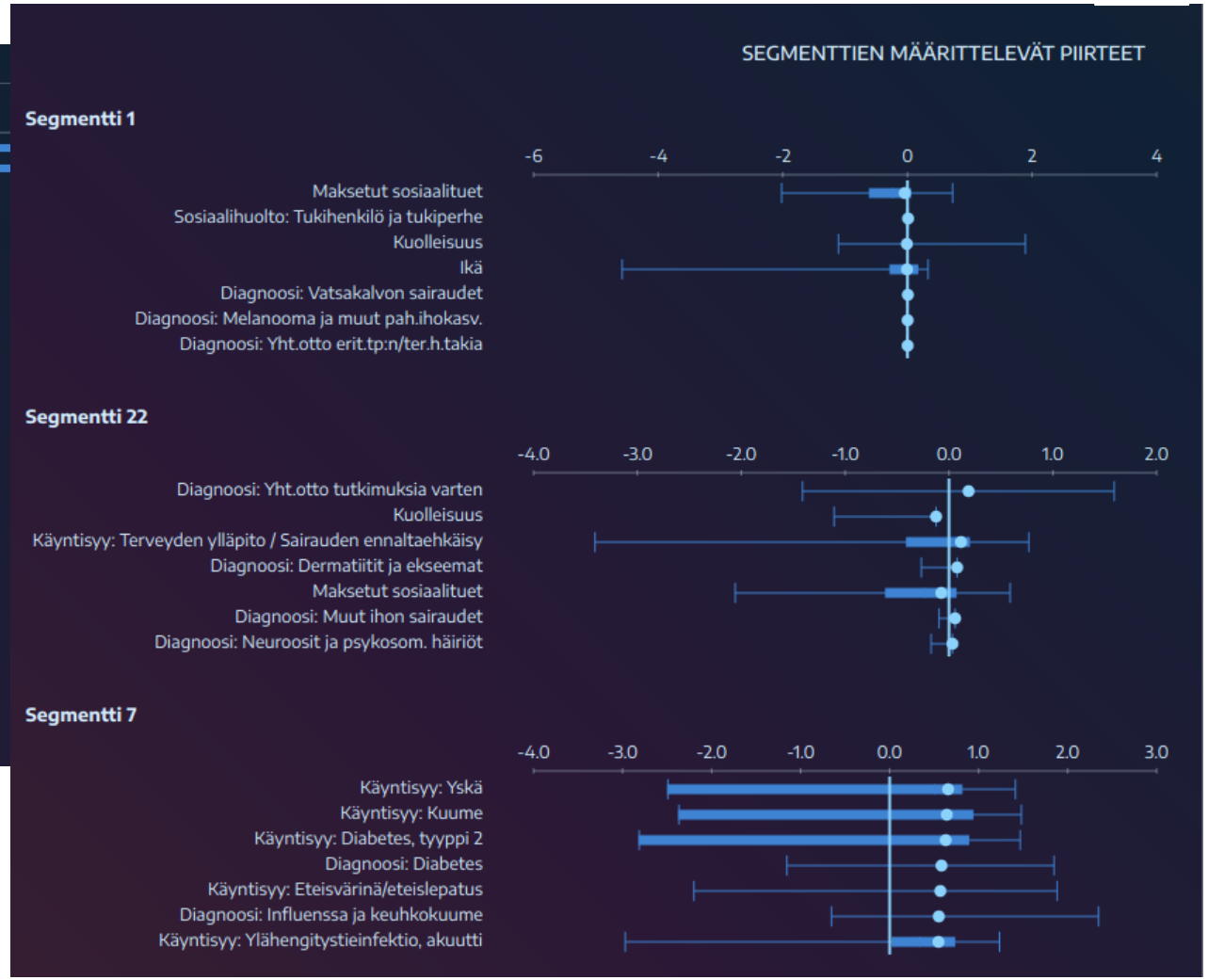
AI based segmentation





Data from several source systems was joined and structurised. 280 forecasting parameters were used.

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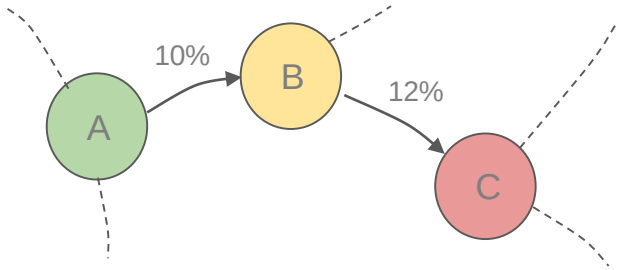
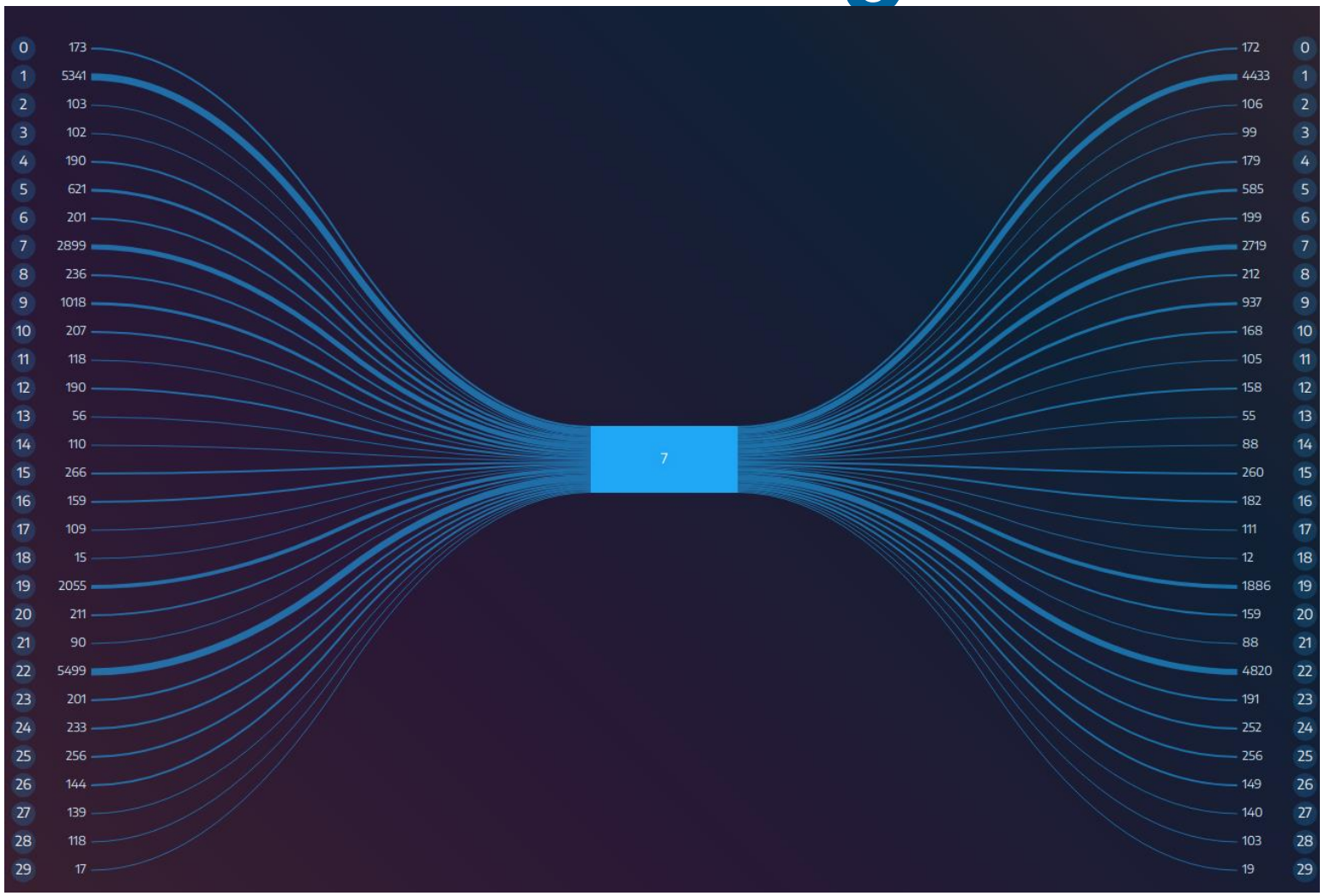
AI based demand forecasting



People flow between segments was modeled by using advanced machine learning algorithms. Forecast in which segments individuals are ending next 3-5 years was made available.



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Case Espoo – Results

City of Espoo: Understanding on the importance of data

City of Espoo: Social services development

Tieto: Product development and technical validation

General discussion in society


Kauppalehti ≡ UUTISET PÖRSSI YRITYKSET JOHTAMINEN OPTIO

Tekoälykokeilussa löydettiin 280 lastensuojelun asiakkuutta ennakoivaa tekijää – Tietojen hyödyntäminen vaatii eettistä harkintaa

7.6.2018 06:00 TEKOÄLY DIGITALOUS PALVELUT

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CASE

Työterveys Virta

Predicting occupational health risk

Työterveys Virta is committed to providing high-quality and cost-effective healthcare services to their corporate customers. They focus on supporting work ability and promoting health and safety at work in partnership with the customer company.

Predictability and timely influence are key factors in maintaining work ability. This is why efficient follow-up on the wellbeing of the employees is crucial. Follow-up has been done manually for years and produced strong expertise in the organization.

Työterveys Virta wanted to speed up, intensify and systematize the risk recognition work by utilizing artificial intelligence.

Early retirement due to various health issues is costly for the society. Early identification of individuals at risk is the key to preventing these health issues as well as to improving the quality of life of the individuals. By effectively targeting the individuals at risk also saves the resources of the occupational health care professionals.

CASE

Työterveys Virta

Individuals are monitored annually for the risk of work disability and early retirement

Done before manually, which is very time-consuming and thus costly.

- The aim of the project was to automatize the risk assessment
- To support the decision making of healthcare professionals
- To free health care professionals' resources from tedious work to treating patients

CASE

Työterveys Virta

CGI

Artificial intelligence in occupational health risk assessment

- A machine learning model was trained with data from an annual occupational health risk assessment done by Työterveys Virta
- Individuals are classified into one of three categories: low risk, increased risk or high risk of work disability and early retirement

- The model assesses the risk of work disability and early retirement of an individual by going through his/her whole patient history from electronic health records
- Data includes both structured (sick-leave and diagnosis information) and non-structured data (free text, notes from doctors and nurses)
- Total of ~150 features utilized by the model

- The final model achieved ~90% overlap when compared to the risk assessment scoring done by the health care professionals

- (The risk score from the model is brought to the electronic health record system for a health care professional to assess

- The final risk assessment is always done by the healthcare professional)

työterveys VIRTA

Benefits of utilizing artificial intelligence

Provides up-to-date information on individuals at risk of work disability to health care professionals to support in decision making

- The healthcare professional does always the final risk assessment and proceeds to help the patient

Relieves the healthcare professionals time from going through electronic health records to actually helping the patients

- Tens of working days per year

The model may also identify individuals at risk based on very early signs that may be otherwise missed by the healthcare professionals

Contact

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DIGITAL POPULATION HEALTH MANAGEMENT IMPROVES DIABETES CARE AND PREVENTION

Sari Riihijärvi, MD, PhD, VP clinical development
Terveystalo Plc

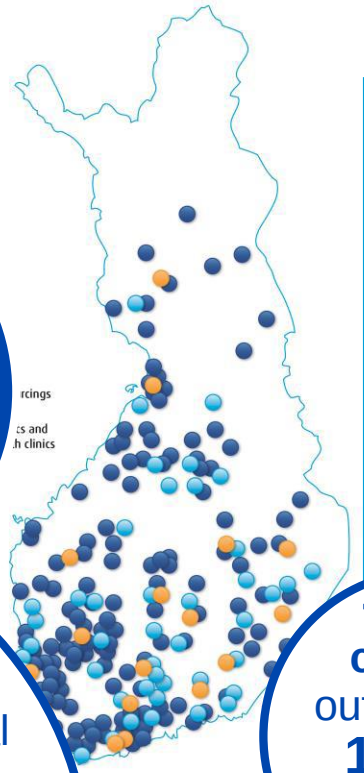
terveystalo.com
#terveystalo

Terveystalo is the largest healthcare service company in Finland

Nearly **1.2 million** individual customers annually

15% of all physician visits in Finland

3.5 million physician visits



Approximately 670,000 people receiving occupational healthcare from Terveystalo

of the almost **1.83 million** Finns covered by occupational healthcare (Kela's occupational healthcare statistics, 2016)

~260 clinics, out of which **17 clinic hospitals**

over **10,000** healthcare professionals

Patient data of over **4 million** Finns in Terveystalo's national EMR

Terveystalo Assisting Intelligence Etydi

EMRs are reactive rather than proactive and require a lot of attention and manual work from the health care professionals (HCP) during appointments. By utilizing insights from an assisting intelligence system, this can be reversed.

Etydi

- Interactive and easy to use population management tool for all HCP in Terveystalo
- Supports HCP's work on detecting anomalities, including risk for diabetes, in large population
- Handles huge amount of data daily
- Notifications and personal task lists
- Data guides patients to individual health plan paths including digital health plans

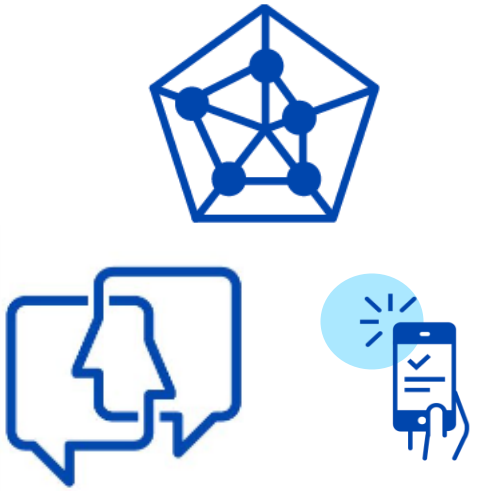
© Terveystalo

Assisting intelligence Etydi collects data and detects risk patients

In every appointment, data is collected into EMR as well as laboratory results.

Validated questonnaires and self assesments & measurements are also collected.

Etydi combines and analyzes the data with over 100 algorithms and serves it to HCP: risk patients are detected and contacted



Digital care plans (OmaSuunnitelma) are created in Etydi to patients in risk of diabetes and diabetics. OmaSuunnitelma is visible to patient via Terveystalo's OmaTerveys app

Etydi Dashboard

Terveystalo

Terveystalo
Etydi

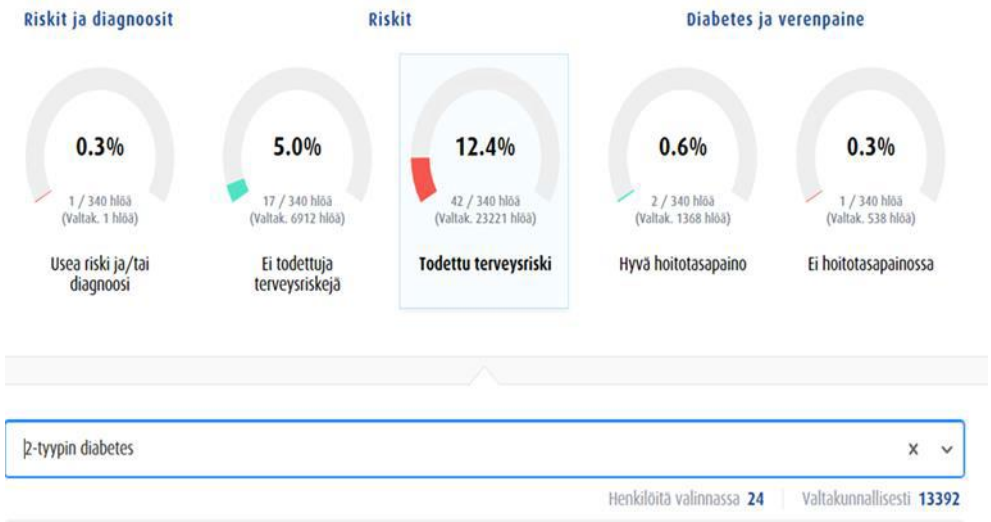
Näkymät | Tehtävälista | Ajanvaraukset | Oma Suunnitelmat | Työni lukuina | Työkalut

Suodattimet
Terveystalo Kamppi | Vain TTH asiakkaat | Demografiasuodattimet ja valinnat

Valinnan henkilömäärä, josta tilasto on muodostettu: 57 258, valtakunnallisesti 704 985 Näytä haun ehdot

Tilastot kategoriasta Tyypin 2 diabetes

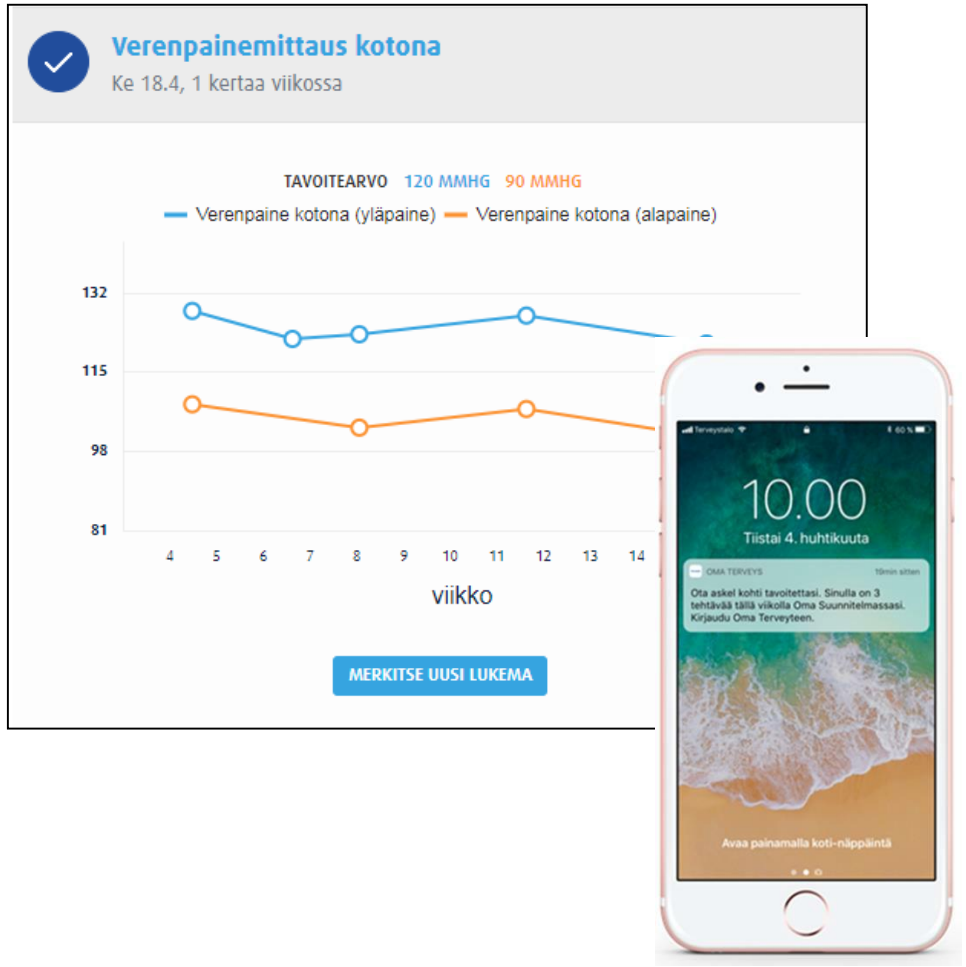
Tyypin 2 diabetes	Henkilöitä	osuus henkilövalinnasta	Terveystalo	valtakunnallisesti
E11 diagnosoitu tai diabeteslääke määrätty	1 070	1,9 %	17 274	2,5 %
E11 diagnosoitu tai lääkitys ja liitännäissairaus diagnoosimerkintä (sepelvaltimotauti, aivoverenkiertohäiriö tai munuaisten vajaatoiminta)	85	0,1 %	1 340	0,2 %
Diagnoosia ei ole kirjattu Henkilöt, joilla HbA1c > 6.5 TAI 2 tunnin sokerirasitus >= 11.0 TAI plasman paastoglukoosi >= 7.0, mutta E11 tai E10 diagnoosia ei ole kirjattu.	159	0,3 %	3 607	0,5 %
Riski Henkilöt, joilla HbA1c > 6.0 <=6.5 TAI diabetes riskitestissä yli 12 pistettä TAI kahden tunnin sokerirasituksen arvo 7.8 - 10.9 TAI paastoverensokeri välillä 6.1 6.9 mutta E11 tai E10 diagnoosia ei ole kirjattu.	2 418	4,2 %	43 758	6,2 %
Riski E11 diagnosoitu, HbA1c>7.0 JA Verenpaine systolinen >150	86	0,2 %	1 295	0,2 %
Hoito tasapainossa Henkilöt, joilla hoito tasapainossa. Diagnosoitu E11 tai diabeteslääke määrätty, ja viimeisin HbA1c on 7 tai alle.	650	60,7 %	10 411	60,3 %
Hoito epätasapainossa Henkilöt, joilla hoito epätasapainossa. Diagnosoitu E11 tai diabeteslääke määrätty, ja viimeisin HbA1c > 7.	291	27,2 %	3 917	22,7 %



Terveystalo Digital Health Plan Omasuunnitelma

An interactive application for patients and health care professionals - to set, measure and accomplish health goals in everyday life

- **Supports the patient's care path after the initial appointment** with the health care professional
- **Self-assessments and tasks** to be accomplished in the daily life, e.g. blood sugar level measurements
- **Motivates and encourages** diabetic in her path
- **Messaging** between the patient and health care professional
- Contains **variety of care path** content and tasks – from diagnostic care to predictive care.
  - e.g. Diabetes I and II ,High blood pressure, physiotherapy, nutrition



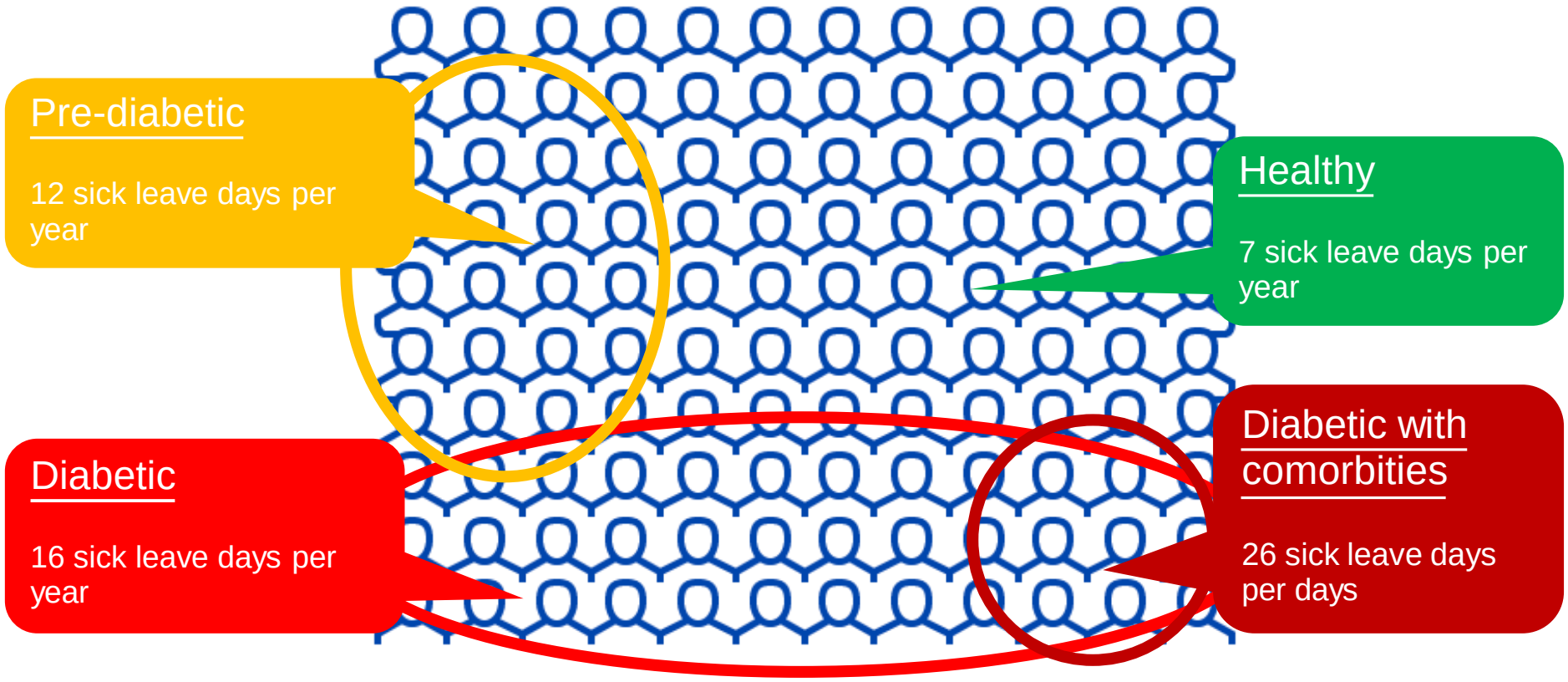
- Interface for both mobile and desktop services
- Easy fill and follow self-measurements
- Graphical history data
- Monthly goal-achievements-score assessments
- Instructions and rich content
- Weekly and monthly notifications

Pre-screening and early diagnosis creates value for the individual patient and for the society

Terveystalo

Example (Terveystalo database):

Type 2 diabetes and sick leaves



When diabetes or pre-diabetes is managed optimally, the amount of sick leave days is similar to those of healthy controls

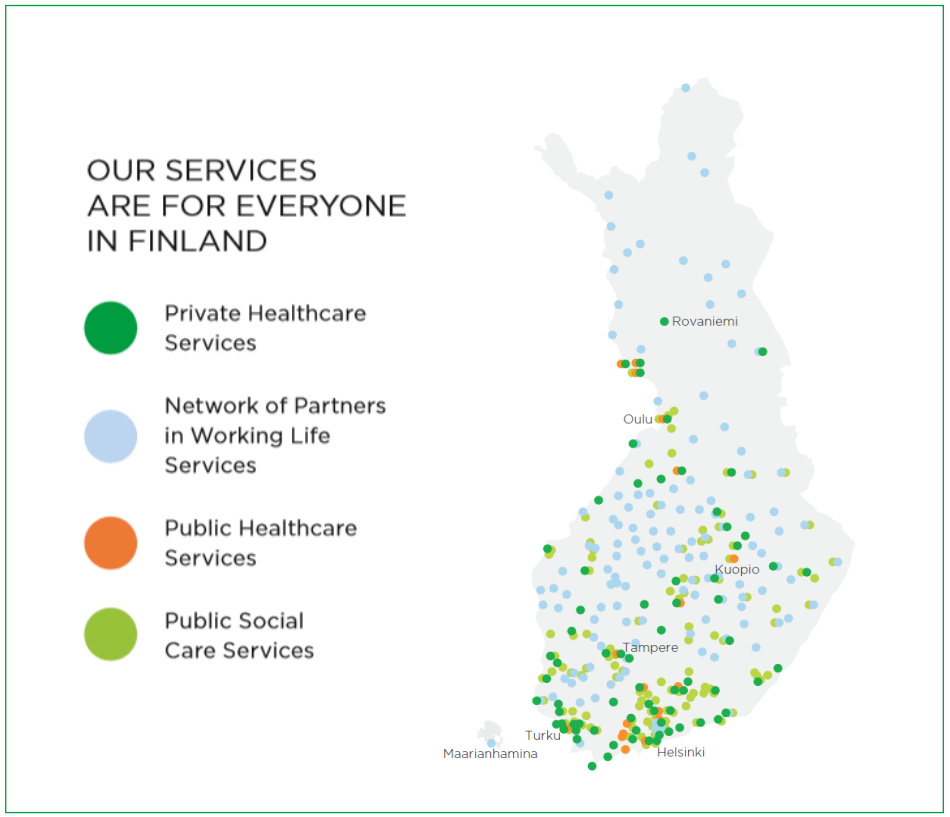
MEHILÄINEN

MEHILÄINEN WELLBEING RADAR

Annika Jalli, Director
Work life services

HEALTHCARE AND SOCIAL CARE SERVICES EVERYWHERE IN FINLAND

Mehiläinen provides extensive social care and healthcare services to private, insurance, corporate and municipal customers.



Private Healthcare Services
- Physician Services
- Diagnostics
- Operations
- Dental Care
- Working Life Services

Public Healthcare Services
- Health Centres with Customers' Freedom of Choice
- Outsourced Services
- Public Dental Care
- Emergency Care Services and Staffing
- Home Care Services

Public Social Care Services
- Residential Care Services for the Elderly
- Residential Care Services for the Disabled
- Mental Health Rehabilitation
- Child Welfare Services
- Non-Institutional Services within Child Welfare Services

MEHILÄINEN WORK LIFE SERVICES

58
full-service medical centres,
20
occupational health stations and multiple workplace receptions

900
occupational health care professionals, including
400
occupational health physicians

Mehiläinen measures the customer experience in health services with the real-time, widely used Net Promoter Score (NPS). The NPS score of our services in 2018 was 88, which is an excellent result.

440 000 people covered by the OHC services

16 000 corporate customers

OCCUPATIONAL HEALTHCARE MOVING FORWARD

MEHILÄINEN WORK LIFE SERVICES

- Services to support management, workplace community and individuals

Over 16 000 employers as customers

Occupational healthcare services cover more than 440 000 people

- Nearly 10% organic growth in 2018
- The modern occupational healthcare services provided by Mehiläinen emphasize engagement and the individual's active role, digital services, management by data, quality, effectiveness, cost-efficiency as well as joint evaluation of the results.

TARGETED SUPPORT FOR PERSONAL HEALTH PROMOTION

Proactive targeting

risk-based assessment of situation and need of support

Support and inclusion

professional support for personal health improvement

Monitoring and measuring

follow-up and professional monitoring ensure results

MEHILÄINEN WELLBEING RADAR - IDENTIFIED RISKS AND EFFECTIVE DIGITALLY SUPPORTED SERVICE PATHS

MEHILÄINEN

1.
Assessment of individual health risks based on health data

2.
Health survey to reveal person's situation and need for support

3.
Meeting with a nurse: individual goals, challenges and solutions

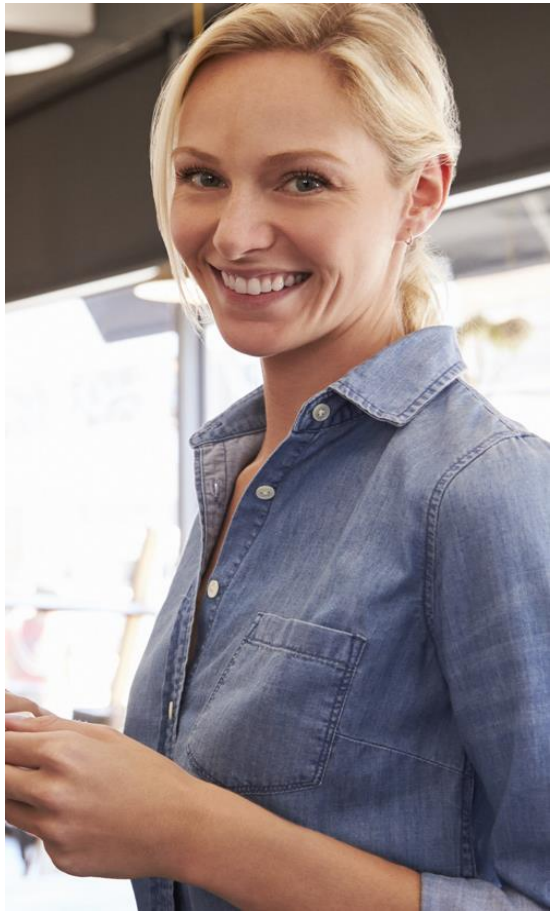
4.
Individual health and wellbeing plan and digital service paths

5.
Effectiveness: follow-up and instructions going forward

Support from healthcare professionals and digital services to enhance one's own wellbeing

WELLBEING RADAR: WHAT AND HOW?

Wellbeing Radar (Työkykytutka) aims at preventing sick-leave periods, disability and decrease in working ability by offering targeted support that maintains one's working ability. The tool enables Occupational Health Care to react earlier, and it is only used by occupational heath care professionals: no information is disclosed to the company.



1. Wellbeing Radar offers Occupational Heath Care an opportunity to proactively identify individuals with an increased risk of falling under measures that support working ability within the next 12 months.
2. Wellbeing Radar is based on a prediction model that determines the risk by utilising structured documentation compiled in connection with occupational health visits. The risk describes the **probability of requiring measures that support working ability** as calculated by the model.
3. We will send an 'Are you feeling well' questionnaire to customers whose likelihood of requiring support for working ability within the next 12 months is increased. When the customer has responded, the system sends an **impulse to the assigned occupational health nurse's work list**.

Wellbeing Radar is implemented in agreement with the customer company, and the personnel is notified.

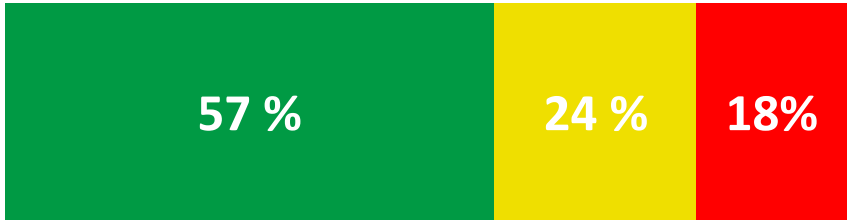
WELLBEING RADAR – NUMBERS

140
Companies use wellbeing radar

83.000
Persons in companies

7 500
questionnaires sent, 31% response

47 %
wish support



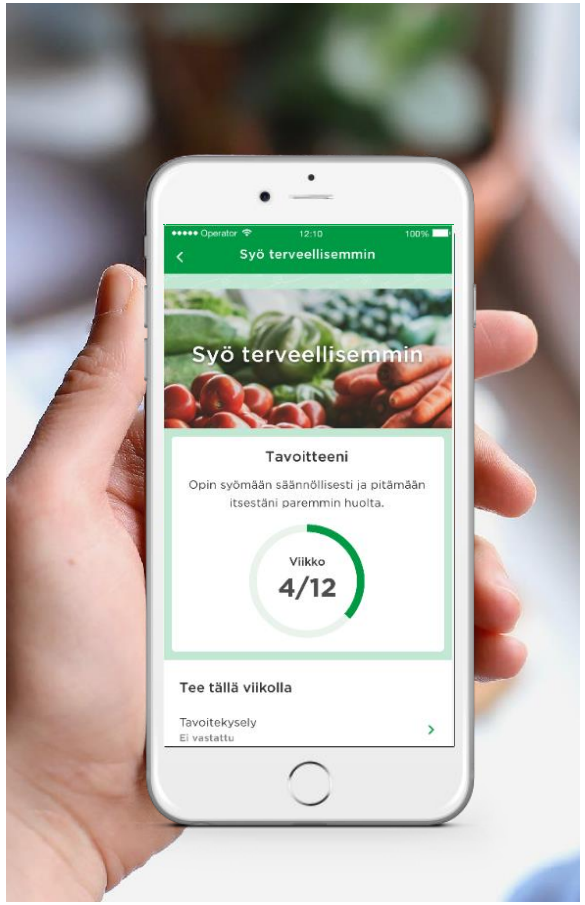
MEHILÄINEN

DIGITALLY SUPPORTED COACHING PROGRAMS

Mehiläinen’s health-promoting, preventive and treatment programs are selected according to individual needs. A health care professional evaluates whether the customer is in sufficiently good health for digital and remote coaching or whether he/she should also be referred to a more in-depth evaluation and treatment.

KUSTANNUS OY DUODECIM

MIELENTERVEYSTALO.FI



Nutrition & weight management

Mental well-being

Physical activity

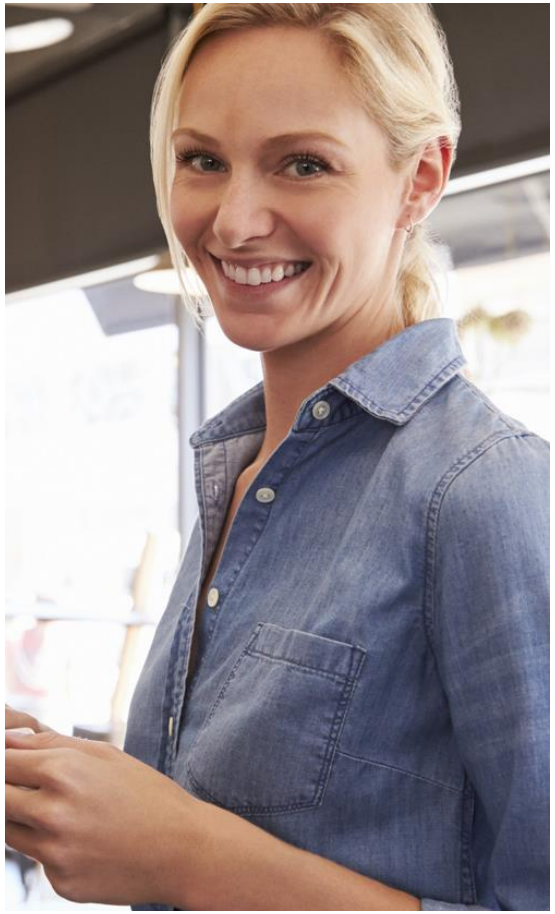
EXAMPLES OF DIGITAL COACHING PROGRAMS

- Eat Healthier - Coaching for a healthy diet
- Get Started - Coaching for increased physical activity
- Take it easy - Coaching for stress reduction and mental well-being
- Sleep Better - Coaching for temporary insomnia
- Be well at work - Coaching for burnout

All coaching programs includes personal coach and chat support.

Sleep problems and work exhaustion coaching include three face-to-face coach meetings.

The duration of the coaching is 12 weeks.



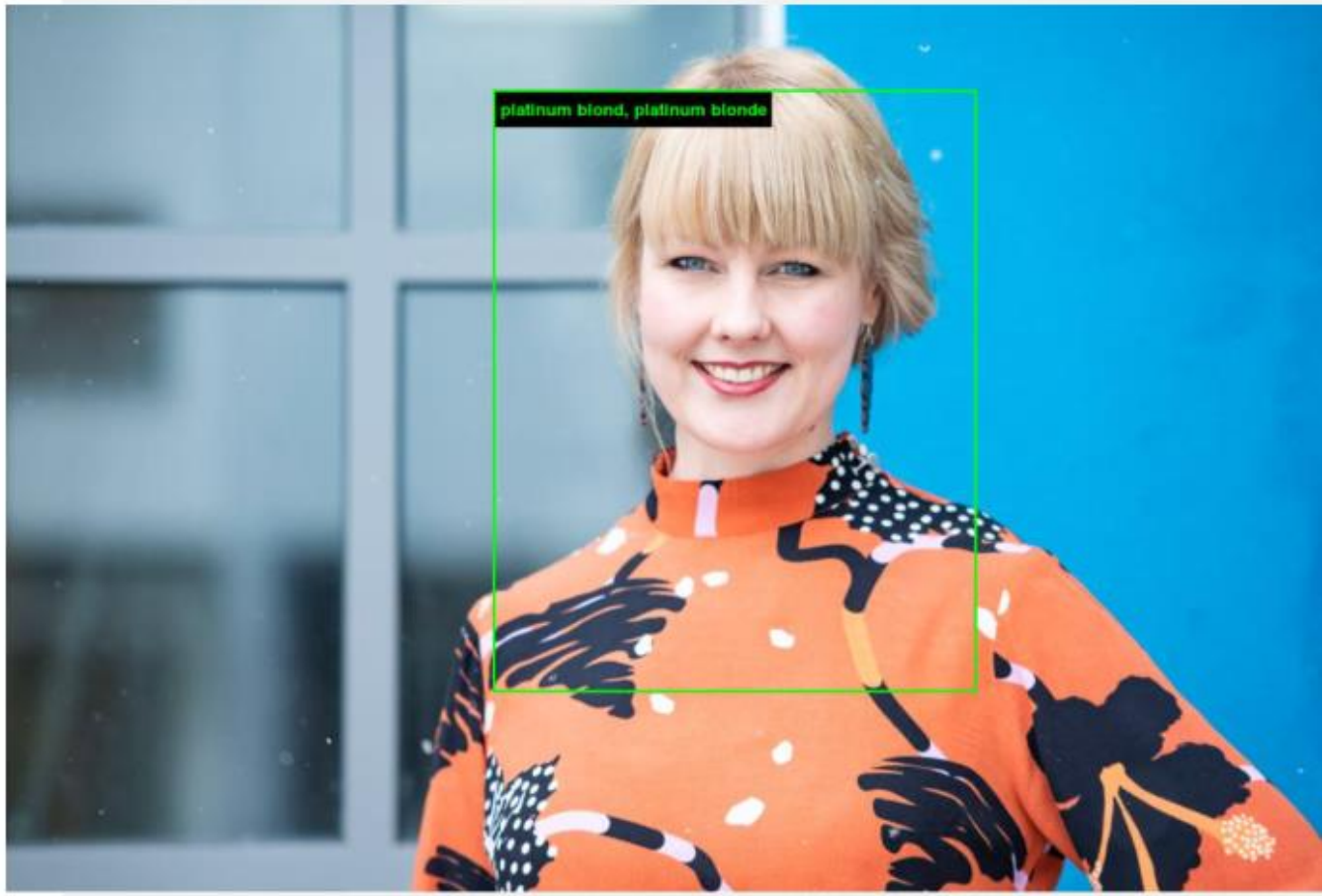
MEHILÄINEN

A COMPANY’S MOST IMPORTANT RESOURCE. IN 100% CONDITION.

Meeri Haataja

CEO & Co-Founder
+358407725010
meeri@saidot.ai
@meerihaataja

- Over 18 years of experience on driving data, analytics and AI use as well as privacy in large enterprises in financial services, telecommunications, high-tech and media.
- Chair of IEEE's Ethics Certification Program for Autonomous & Intelligent Systems.
- Affiliate at the Berkman Klein Center for Internet & Society at Harvard University (2019-2020).
- Previous chair of Ethics working group of Finland's AI Program.



Saidot

High-quality, clinically validated health care AI

1. is designed and evaluated in keeping with best practices in **user-centered design**, particularly for physicians and other members of the health care team;
2. is **transparent;**
3. conforms to leading standards for **reproducibility**;
4. identifies and takes steps to **address bias** and **avoids** introducing or exacerbating **health care disparities** including when testing or deploying new AI tools on vulnerable populations; and
5. safeguards patients' and other individuals' **privacy** interests and preserves the **security** and **integrity of personal information**.

Source: Augmented Intelligence in Health Care, H-480.940 by American Medical Association, 2018

Making Policy on Augmented Intelligence in Health Care

“Health AI must be deployed in ways that promote quality of care and minimize potentially disruptive effects.”

Elliot Crigger & Christopher Khoury on AMA Journal of Ethics

Finnish Institute of Occupational Health

WELL-BEING THROUGH WORK

Thank You!

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