Estonia – Achieving Digitalisation of Healthcare at a National Level

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Today's journey

25 years of Estonian e-health — what we built, what we learned, what comes next

1 Why Estonia
A modest country · why it works · e-health at a glance

2 How it's built
One code for life · the infrastructure · how it works · the cost

3 What people see
Health Portal · the clinician's side · AI in hospitals · working smarter

4 Honest lessons
Trust and security · what didn't work · if we started again

5 From data to innovation
Genomics · policy · innovation pipeline · companies going global

6 Together
Growing the next generation · learning together

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01

Why Estonia

A small country that digitised healthcare at national level

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A Modest Country

- Population: 1.3 million
- Area: 45,339 km2
- Currency: Euro
- Member of: UN, EU, NATO, OECD, WTO, CERN etc.
- Employees in the ICT sector contribute to 10% of the GDP



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Estonia

Achieving Digitalisation of Healthcare at a National Level

#1

Europe Digital Health Index*

99%

Health data digitised

2008

Universal e-health records since

1.3M

Population

* Bertelsmann 2024]

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Why Estonia Works?

Three numbers that explain the model:

100%

Government services online

160M+

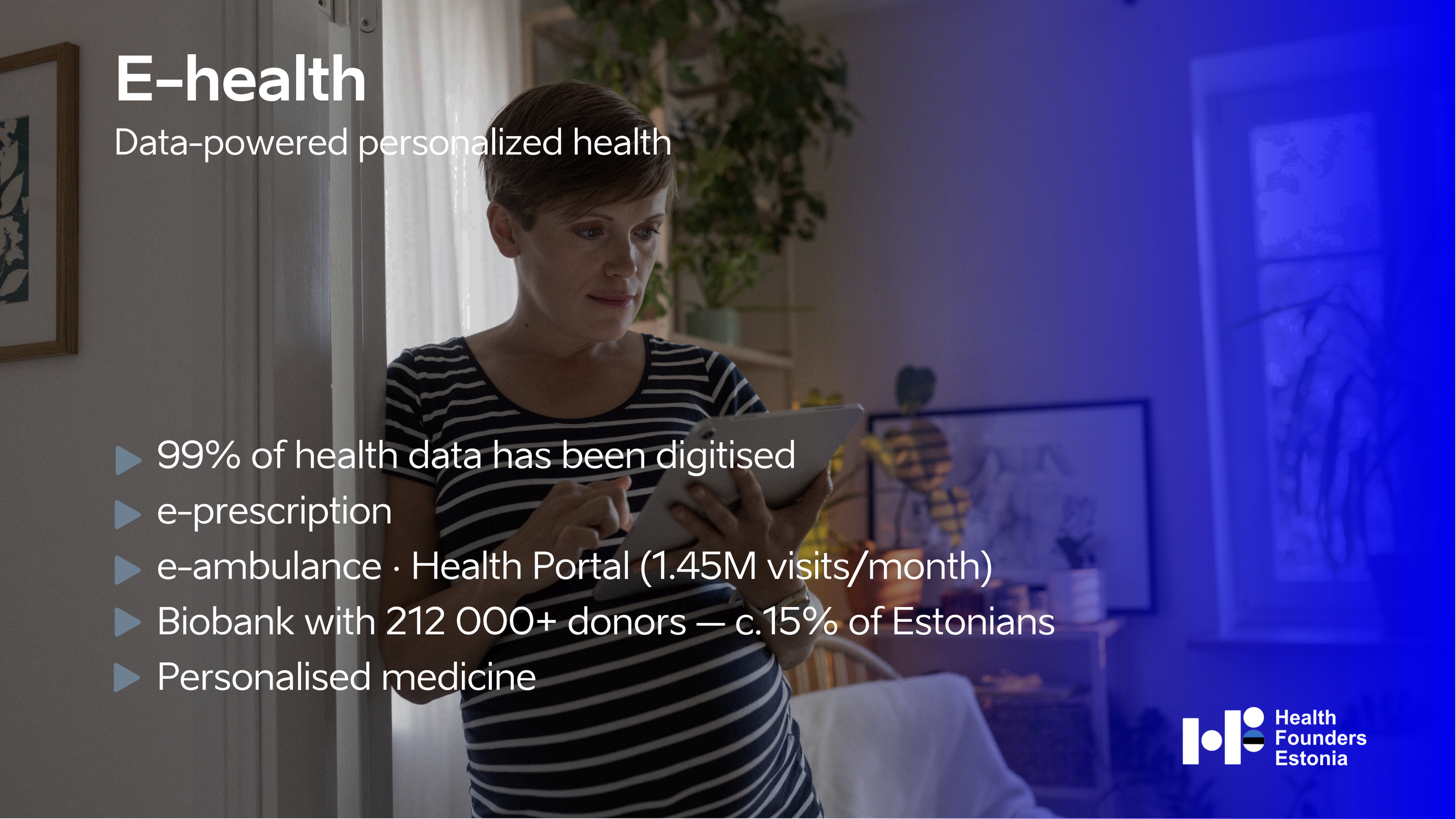
Documents in national health system

2%

of GDP saved via digital signatures annually

> *"I should have called the Estonians when we were setting up our health care website."*
>
> *— Barack Obama, former President of the United States*

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E-health

Data-powered personalized health

- 99% of health data has been digitised
- e-prescription
- e-ambulance · Health Portal (1.45M visits/month)
- Biobank with 212 000+ donors — c.15% of Estonians
- Personalised medicine

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02

How it's built

The foundations: identity, data exchange, one record — and the cost

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The foundation: one code for life

An 11-digit personal code links every register — including health

G	YYMMDD	SSS	C
Sex & century	Date of birth	Serial number	Check digit

Given at birth

- Assigned when a birth is registered, kept for life
- The same code for tax, health, school and banking
- In use since the early 1990s, with ID card from 2002.

Why health needs it

- No patient matching between systems
- Every record, prescription and test links to one person
- Data is collected once, then reused

The NHS parallel

- The NHS number does this job inside health
- The lesson: use it everywhere, every time
- The code isn't secret — the ID card proves who you are

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The Infrastructure

What was actually built:

X-ROAD	Secure data exchange backbone - 3,000+ services, billions of transactions/year
e-Identity	State-issued since 2002. Mandatory. Enables every e-service
e-Health record	Since 2008. 160M+ documents. Patients see it all in the Health Portal
e-Prescription	100% digital. Patient presents ID card at pharmacy. Valid cross-border in 13 EU countries

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How it actually works

CIO question: one national EPR — or many systems talking?

Federated

Many systems, one record

- Each hospital and GP keeps its own system
- The law requires them to send documents to the national Health Information System over X-Road (since 2008)
- Clinicians and patients see one view across all providers

Multi-vendor

Who builds it

- Hospital systems are built from several vendors, e.g. Nortal at Tartu University Hospital group
- National platform built by private firms for the state IT centre TEHIK
- Apr 2026: ~€10M tender for up to 4 vendors

FHIR next

Standards, 2025–2030

- Built on documents in 2008
- New real-time exchange on FHIR; old flows migrate over time
- Modular provider systems on a shared data platform; open source and cloud preferred

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What does it cost?

National e-health IT run by the state (Ministry of Social Affairs incl. TEHIK), 2024

€35M	~€26	221	×2.4
total state e-health IT spend	per resident per year	TEHIK staff (99 in 2019)	growth in spend, 2019—2024

What the €35M covers

- €12.9M investment in new systems
- €10.6M running costs
- €11.6M IT staff
- Example: new Health Portal built for €1.24M

The fine print

- Excludes hospitals' and GPs' own IT
- Across government, IT needs were only about half funded in 2023—24

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03

What people see

Patients, clinicians and AI — working smarter with fewer people

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The patient front door: Health Portal

Terviseportaal replaced Digilugu in Dec 2023 — Estonia's equivalent of the NHS App



1.45M
visits per month

2/3+
of users on mobile

2009
health history back to

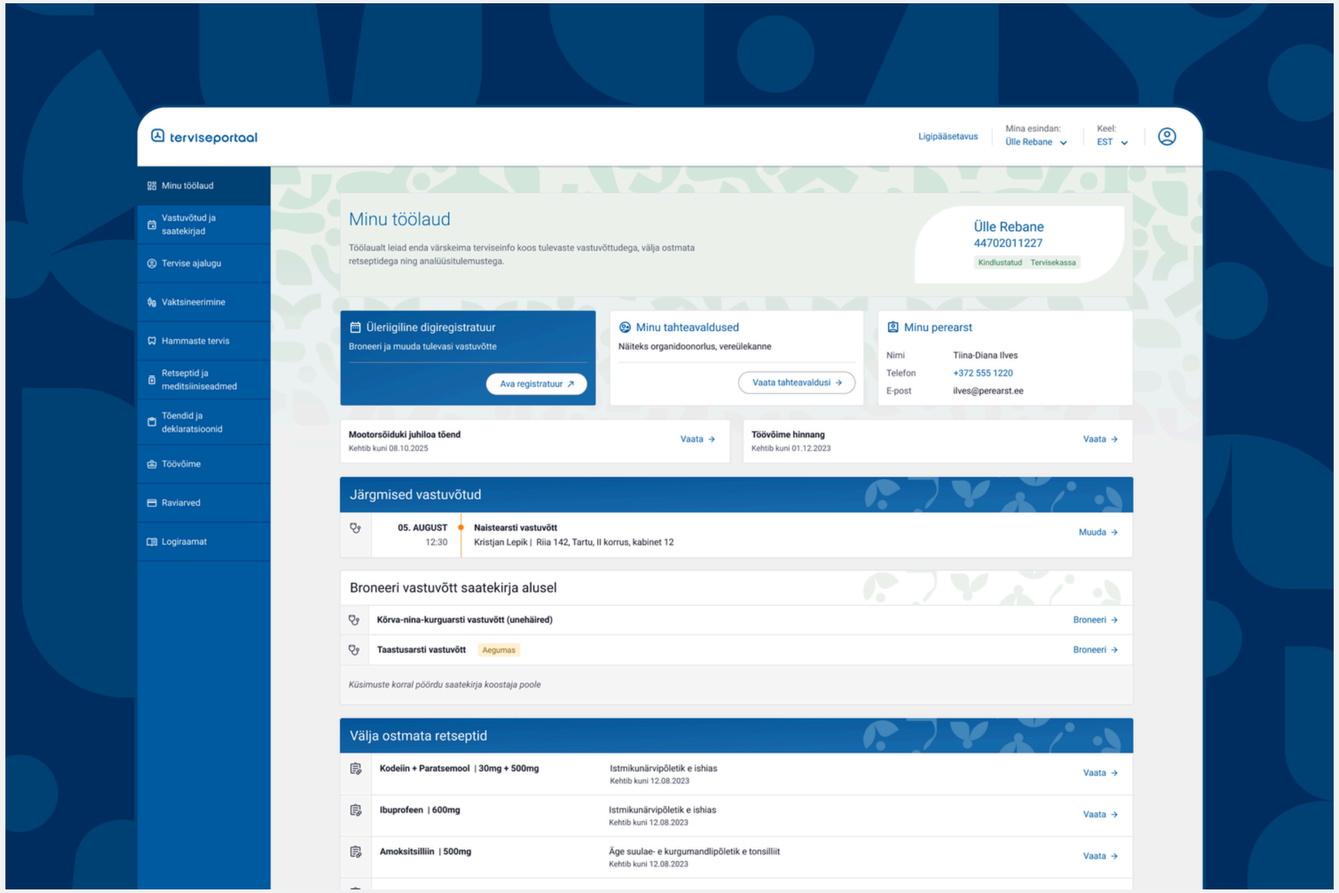
€1.24M
total build cost

Appointments, prescriptions, tests, vaccinations and e-booking in one place. Login via ID card, Mobile-ID or Smart-ID.

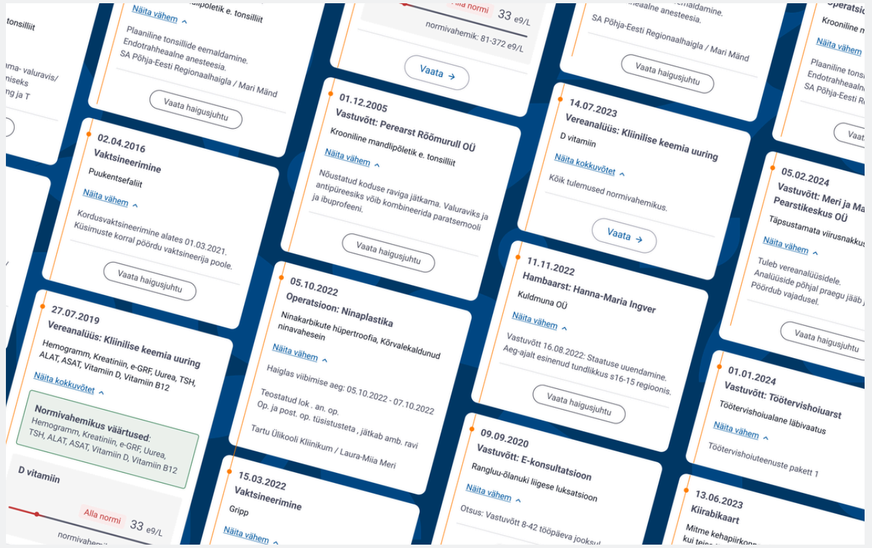
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Health Portal up close

What every resident sees — on the web and on their phone



'My dashboard': appointments, prescriptions, tests and vaccinations in one view · Source: Tervisekassa



- E-mail alert for every new prescription (2025) — 1 in 5 prescriptions used to go unfilled
- National e-booking built in; a 'smart time finder' looks for slots for you
- Parents and authorised proxies can see family records

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The clinician's side

The same national record, put to work for GPs, specialists and ambulance crews

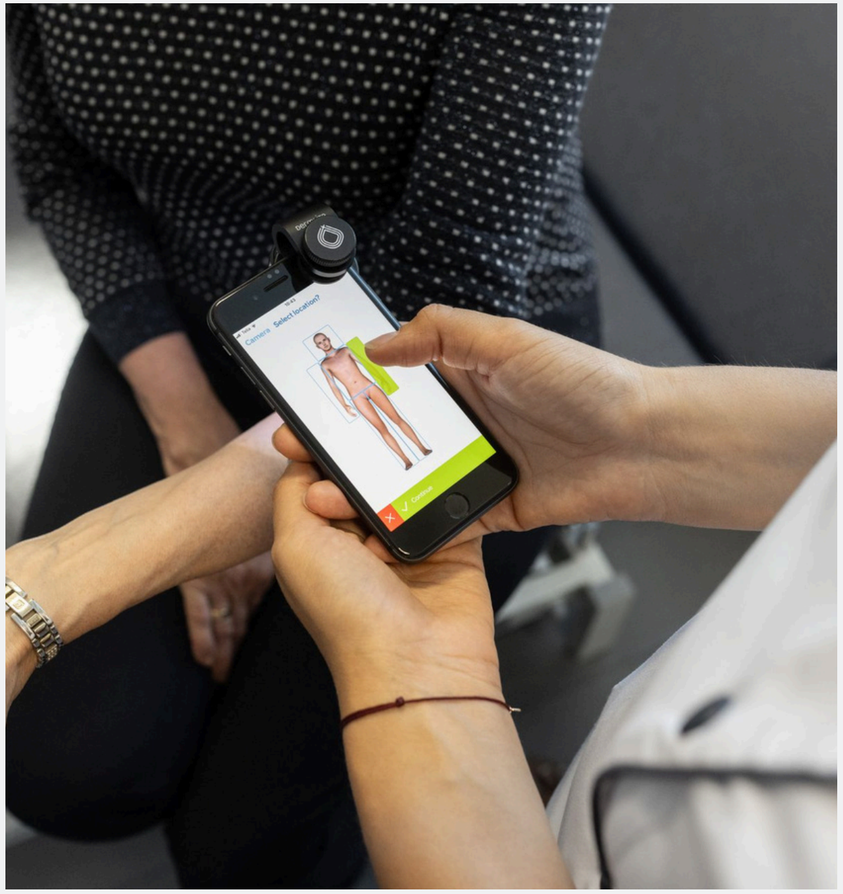


Photo: e-Estonia · Dermtest

e-Consultation

GP sends a structured referral; the specialist answers digitally. Since 2013, now 33 specialties; use doubled in 3 years.

Decision support

~1,600 algorithms scan national record data and prompt GPs and nurses, e.g. falling kidney function. Drug checks since 2016.

eAmbulance

Crews see the patient's record on a tablet, the ambulance card is pre-filled, and the hospital reads it before arrival.

Specialist workspace

One national workspace for structured data and care plans — in development

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AI in Estonian hospitals, 2026

From imaging to AI scribes — and the rules around them

~50%

Imaging AI in routine use

- Radiotherapy auto-contouring (~300 structures) at North Estonia Medical Centre: ~50% faster planning, ~€17 per patient
- Stroke CT analysis at North Estonia Medical Centre and Tartu University Hospital
- Joint digital-pathology AI

Oct 2026

AI scribes go mainstream

- Tartu University Hospital: EMO24 emergency department pilot from Oct 2026
- Confido, Medicum and Heba already use AI documentation
- National GP and eAmbulance transcribers in development

Consent

Guardrails

- Recording needs a legal basis, e.g. explicit consent (Data Protection Inspectorate)
- Patients can say no without losing care
- The doctor decides; unreviewed AI text never enters the record

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Working smarter with fewer people

How a country of 1.3 million runs national e-health with a small team

Build once

Shared national services

- One national IT centre builds booking, prescriptions and the patient portal once, for every provider
- Hospitals and GPs don't each need their own team for these
- One shared security standard for all

Join up

One shared record

- Hospitals, GPs, ambulance and pharmacies share one record by default
- Joining up doesn't depend on a few people in cross-organisation roles
- No re-keying between organisations

Give time back

Less admin, more care

- e-Consultation answers many referrals without a visit
- Decision support flags risks automatically
- AI scribes piloted to cut evening paperwork

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Honest lessons

Trust, what didn't work, and what we would do differently

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Trust, consent and security

CIO question: how do you keep 1.3 million people on side?

Opt-out

Patient control

- Everyone has a record — no opt-in needed
- Patients can close single documents or the whole record
- Critical data stays visible: allergies, last visit, recent procedures

Logged

Every look is visible

- Patients see who opened their record
- Misuse is fined, e.g. a health worker who checked a neighbour's ambulance call
- Parents and carers get access as named representatives

Breaches

The security record

- 2017: ID-card chip flaw — ~750,000 cards fixed
- 2023: ransomware at a private genetics lab, ~10,000 people — a company database, not the national system
- Research access still slow: one study waited ~2.5 years

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What didn't work — and what we're fixing

National Audit Office, Dec 2025: a national record ≠ a complete record

79%
of discharge summaries sent in an outdated format (2024)

1 in 5
providers sent no documents to the national system (2024)

152k
treatment summaries sent late in Q1 2025

Why it happened

- Governance split: Ministry, TEHIK, Health Insurance Fund
- Payment checks the invoice, not the record
- Fragmented, ageing provider IT systems

What Estonia is doing now

- Event-based data exchange (TEHIK plan 2025—2030)
- Pay only when care is documented in the record
- International terminology standards; EHDS from 2029

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If Estonia started again in 2026

Our own self-criticism — offered for what it's worth to the single patient record

1. Standardise data, not documents
   FHIR and shared terminology from day one
2. Name one accountable owner
   Not split across ministry, IT centre and insurer
3. No record, no payment
   Tie provider payment to documented care
4. Show patients every access
   Trust comes from transparency, not promises
5. Build modular and multi-vendor
   Shared data platform, open source, cloud
6. Plan research access early
   It shouldn't take 2.5 years to get data

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05

From data to innovation

Genomics, policy and the companies built on the infrastructure

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Genomics and the Biobank

Europe’s most data-rich Biobank:

20%
Adults in Biobank (vs 5% EU avg)

212k
Genome-wide samples

200k
Metabolomics samples

24M
Primary care diagnoses

Precision Medicine

From Apr 2026, consented genetic data flows into the national health record

Early cancer detection

Genetic-risk breast screening from age 40 (live from November 2026) · Antegenes MHRA-registered in UK

Unique triangle

Biobank + University Hospital + Faculty of Medicine co-located — faster, safer, more precise innovation

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Policy momentum



Health Tech MoU (Sept 2025)

Healthcare Technologies Innovation Roadmap:

12 steps for technology, clinical, regulatory and business validation

Ecosystem Delivery:

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Health Technology Business Innovation Roadmap

	Education	Need	Idea	Proof of concept	Proof of feasibility	Proof of value	Clinical trials	Validation	Approval	Clinical use	Permanent use, supervision	Export
	0	1	2	3	4	5	6	7	8	9	10	11
		Preliminary information collected, readiness to define the clinical problem	Problem and need validated.	Solution idea available, clinical partner involved.	Concept validated, regulatory path and QMS defined.	The prototype is working, data protection is integrated.	Initial clinical and economic value proven.	Clinical trials successfully completed.	Solution validated in a clinical context.	Official approval available.	Solution in use and scaled.	The solution is in permanent market use, the monitoring system is working.	Successful international expansion, growing export volumes and a global user base.
Clinical	Getting to know the field, mapping problems	Problem formulation, stakeholder mapping	Involving a clinical partner	Concept validation with users	Pilot test design	Pilot study in a hospital	Conducting a clinical trial	Multicenter studies	Training preparation	Commissioning, adoption in clinics	Treatment guidelines, scientific articles, post-market research	Multi-country experience, mutual recognition
Regulatory	General introduction to regulations	Initial assessment of the device/ to the medicine	Mapping the regulatory path	Classification evaluation quality system basis	Data protection risk assessment, ethics application	Ethics committee approval, data protection compliance	Approval from the Medicines Agency and the Ethics Committee	Quality system validation	Market authorisation / CE certificate	Supervision and risk management	Regulatory analysis for innovations	International requirements, IP protection in foreign markets
Technological	Technology trends and skills acquisition	Initial solution idea	Prototype sketch	Development of the first prototype	Prototype testing, interoperability	Prototype improvement	Testing in a clinical trial	Integration with health information systems	Production readiness	Scaling to other hospitals	Technical supervision, new features, cybersecurity	Localization, global production and service processes
Commercial	Learning about the market and business models	Value proposition outline	Value proposition description	Preliminary financial forecast	Customer segment validation	Financing	Partner engagement	Market entry strategy	Go-to-market plan	Scaling the business model	Sales and new markets	International expansion, adapted business model
Partner: Country	• Universities and health care universities • Research and development institutions • Professional societies and clusters • Patient organizations • Estonian Research Council • Institute for Health Development • Health Board	• Universities • Healthcare provider innovation centers • Ministry of Social Affairs • Medicines Agency • Metrosert • Enterprise Estonia • Estonian Research Council	• Healthcare providers • Estonian Research Council • Enterprise Estonia • Metrosert	• Medicines Agency • Data Protection Inspectorate • Estonian Research Council • Accelerate Estonia • Ministry of Social Affairs • Metrosert	• Data Protection Inspectorate • State Information Systems Authority • Ethics committees • Medicines Agency • Metrosert • Enterprise Estonia	• Healthcare providers • TEHIK • Estonian Research Council • Metrosert • Enterprise Estonia	• Healthcare providers • Medicines Agency • Metrosert • Enterprise Estonia	• Health insurance • Metrosert • Enterprise Estonia • Estonian Research Council • Health Board	• Notified Bodies • Medicines Agency • Metrosert • Estonian Research Council • Enterprise Estonia	• Health insurance • Healthcare providers • International networks • Estonian Research Council • Metrosert • Health Board • Enterprise Estonia	• Health insurance • Healthcare providers • Notified bodies • Medicines Agency • International health technology networks • Estonian Research Council • Metrosert • Health Board • Enterprise Estonia	• Ministry of Economic Affairs and Communications • International hospital networks • International health technology networks • Ministry of Foreign Affairs • Health Board • Enterprise Estonia
Partner: Ecosystem	• Garage48 • Health Founders Estonia • Technopol • Tartu Science Park • Project-based hackathons • Tartu Biotechnology Park • Care About IT	• Health Founders Estonia • Tartu Science Park • Technopol • ITL • Tartu Biotechnology Park	• Health Founders Estonia • Tartu Science Park • Technopol • ITL • Tartu Biotechnology Park	• Health Founders Estonia • Tartu Science Park • Technopol • ITL • Tartu Biotechnology Park	• Health Founders Estonia • Tartu Science Park • Technopol • Metrosert • ITL • Tartu Biotechnology Park	• Health Founders Estonia • Tartu Science Park • Technopol • ITL • Tartu Biotechnology Park	• Health Founders Estonia • Tartu Science Park • Technopol • ITL • Tartu Biotechnology Park	• Health Founders Estonia • Tartu Science Park • Technopol • Tartu Biotechnology Park	• Health Founders Estonia • DTx Estonia • Tartu Science Park • Technopol • Tartu Biotechnology Park	• Health Founders Estonia • DTx Estonia • Tartu Science Park • Technopol • Tartu Biotechnology Park	• Health Founders Estonia • DTx Estonia • Tartu Science Park • Technopol • ITL • Tartu Biotechnology Park	• Health Founders Estonia • DTx Estonia • Technopol • Tartu Science Park • Team Estonia • ITL • Tartu Biotechnology Park
Financing measures	• Scholarships, study grants • Start-up grants (ETAg) • Idea competitions and hackathons	• TEMTA (ETAg) • Internal university grants	• Innovation Share (EIS)	• Applied Research Program (EIS) • EIC measures	• Applied Research Program (EIS) • EIC measures	• Deep technology start-up business development project support (EIS) • EIC measures	• Applied Research Program (EIS) • EIC measures	• Innovation support (Health Fund)	• Development share (EIS)	• AIRE pre-accelerator • EIS grants	• Development share (EIS)	• Engagement of an international expert (EIS) • Horizon Europe funding • EIS export refunds

The Innovation Pipeline

From infrastructure to industry:

23%
of deeptech startups are healthtech

34%
of university spin-offs are biotech

64
Startups in HFE Batch #1 + #2

€12.6M
Deeptech fund

Built on national data

Startups build on the same national standards and data exchange as hospitals

Ambition

Most healthtech unicorns per capita globally by 2035

Clinical partners

Hospitals such as Tartu University Hospital help test and validate new solutions

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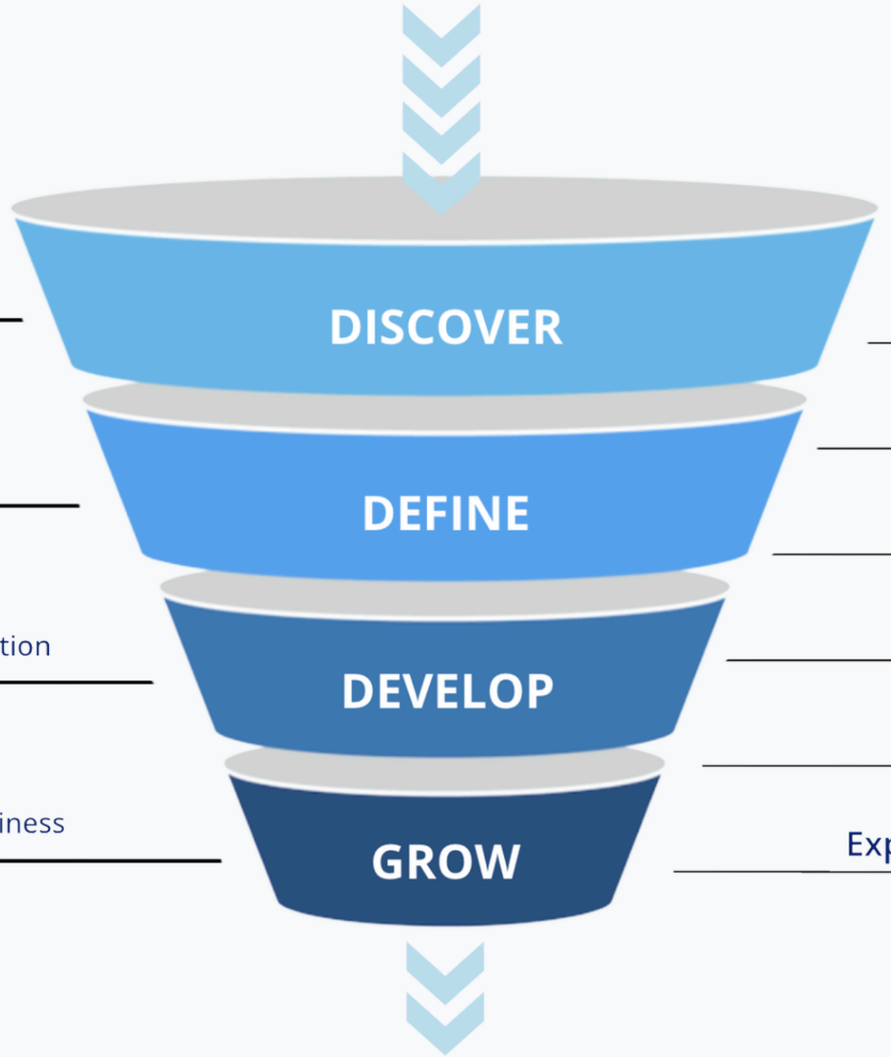
ACCELERATION PROGRAMS

DISCOVER
Entrepreneurial readiness

DEFINE
24-week core program

DEVELOP
Product development & validation

GROW
Go-to-market and export readiness



ECOSYSTEM DEVELOPMENT

- Health Innovators Club
- Clinical needs mapping
- Guidelines & playbooks
- Regulatory improvements
- New reimbursement models
- Investor training & demo days
- Export relations and partnerships

Tartu University Hospital • A.D. 1804 •

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HFE Batch #1+ #2

Estonia's next generation of health innovation, built on software and science.

99
Applications

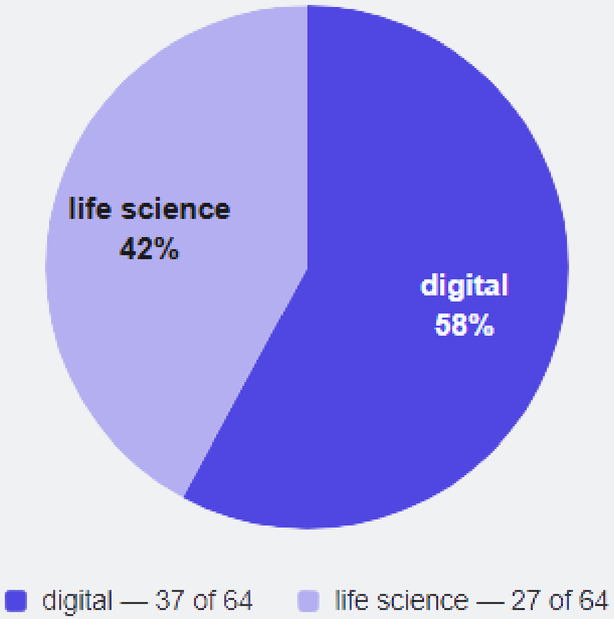
65%
Acceptance rate

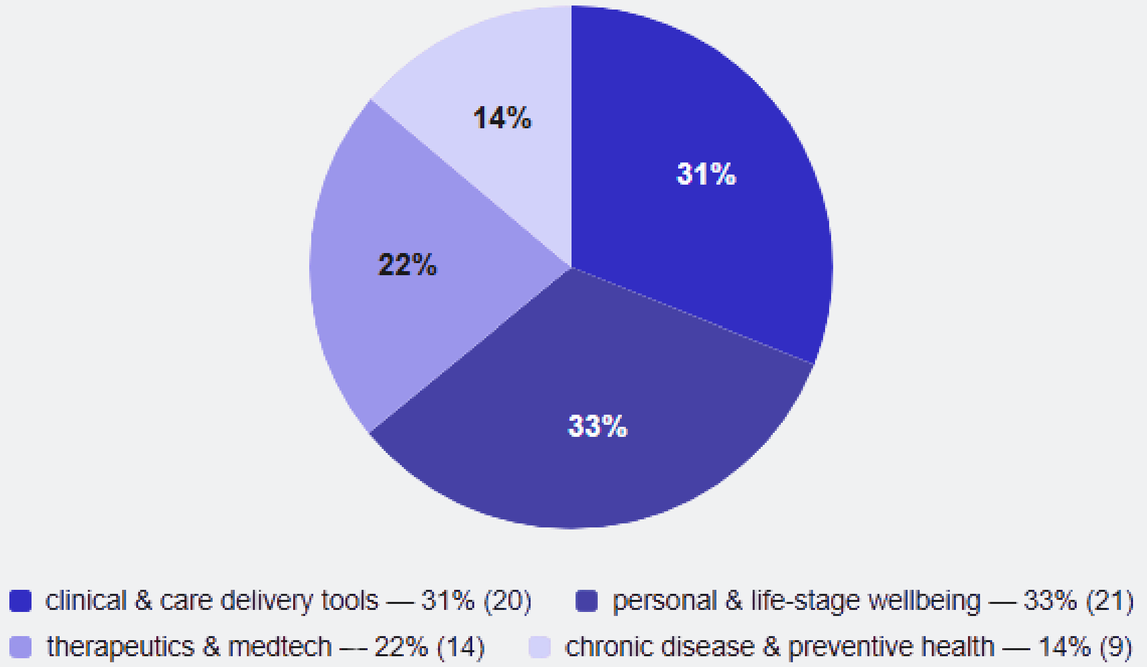
64*
Accepted

36
DEFINE

23
DEVELOP

5
GROW





*HFE dealflow analysis, * 7 teams moved from batch #1 define → batch #2 develop*

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Companies Going Global

Already testing abroad:

Lifeyear	Migrevention	Antegenes	Better Medicine	SPEAKTX.COM
Cardiovascular	Digital headache clinic	Cancer genomics	Radiology	Speech therapy
dermtest	Nortal	KODALITY	muun	CoNurse
Teledermatology	Software development	Software development	Women’s health	Nursing

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06

Together

Growing talent and learning from each other

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Growing the next generation — together

Estonia has a skills gap too — this is a shared problem, not a solved one

~50%

Our gap

- About half of medical engineering and physics posts unfilled
- Only 27 digital health master's graduates in two years (2023-2024)
- GP shortages in rural areas

Bridge roles

What helps us

- TalTech Digital Health MSc trains 'change managers' who speak both medicine and IT
- Tartu AI-in-health summer school for early-career staff
- Hackathons and start-up cohorts as hands-on learning
- Health Founders Estonia early stage programs for scientists and clinicians

Still open

What we're still learning

- Keeping digital talent when private firms pay more
- Giving clinicians time to build digital skills
- Growing bridge roles at scale — the NHS may know more

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What we'd take home

Four lessons from 25 years of Estonian e-health

1

One identifier used everywhere

2

Build national services once

3

Trust comes from showing people who looked at their data

4

Data quality needs incentives

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Thank you!

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www.hfe.ee

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