



REPUBLIC OF ESTONIA  
HEALTH BOARD

# COVID-19 and Applications of Digital Public Health

*Üllar Lanno*

*General Director*

*22 APR 2021*



Readiness for  
Health Crisis  
Cascade(s)?

Sensors at Medical  
Service Network  
and Resistance  
Key Indicators

Contact  
tracing  
e-solutions

Calls/  
e-citizen  
comm'n  
solutions/web/  
social media

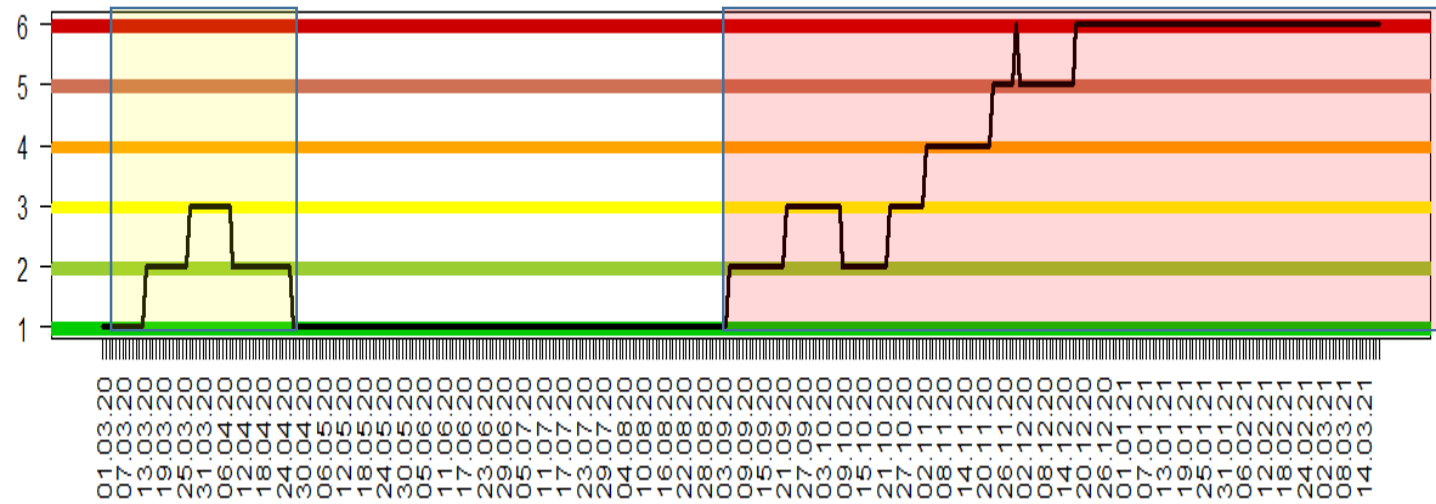
News and  
Spokes persons  
Just-in-time  
accurate  
feeding

Domestic and  
Cross-Border  
Interoperability

# Estonian journey since 27.02.2020

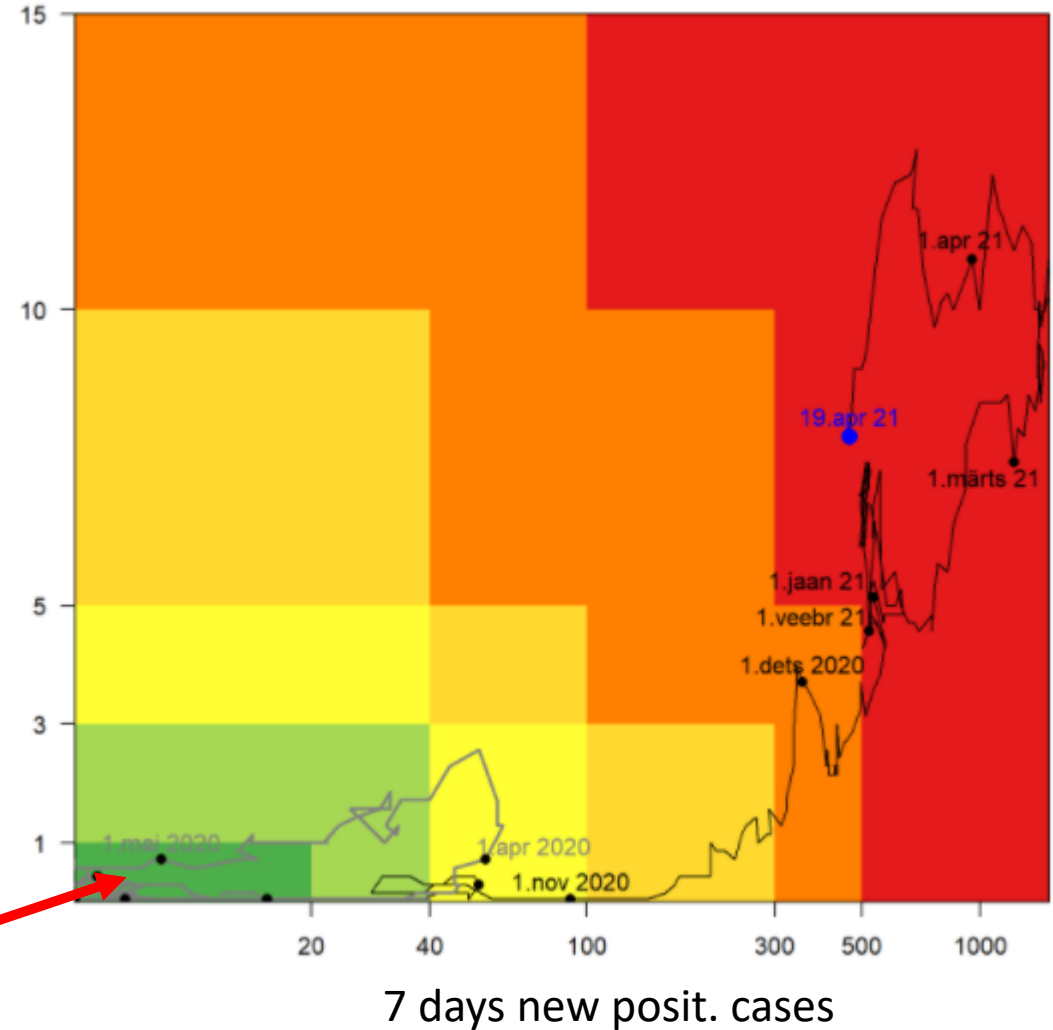
Probability (part A) x impact (part B) = risk (part C)

Probability \ Impact	Very low	Low	Moderate	High
Very low	Very low risk	Low risk	Low risk	Moderate risk
Low	Low risk	Low risk	Moderate risk	Moderate risk
Moderate	Low risk	Moderate risk	Moderate risk	High risk
High	Moderate risk	Moderate risk	High risk	High risk
Very high	Moderate risk	High risk	High risk	Very high risk



May 1st 2020

7 days mortality



7 days new posit. cases

## Key element – Communication Synergy

GOV + MOSA + NHB + ITA=  
JOINT COMM FORCE



# CORONAVIRUS TESTING



This website contains all the information about getting tested based on a coronavirus referral letter, cross-border testing and paid testing options as well as information about the virus, testing methods and a lot more.

If you have a referral letter, you can book an appointment to give a sample [HERE](#).

**Stay negative!**



For Patients

For Doctors

For Organisations



News



Testing sites

The screenshot shows a webpage for the TESTI mobile app. At the top, it says 'CORONAVIRUS TESTING' and has navigation links for 'For Patients', 'For Doctors', and 'For Organisations'. Below the header, there is a 'TESTI' section with a virus icon. The text describes the app's functionality: 'The TESTI mobile app allows you to view the results of the coronavirus SARS-CoV-2 test carried out in the SYNLAB Eesti laboratory, share the results in PDF format and generate a free-of-charge certificate. You can use the TESTI mobile app free of charge. Open the app [HERE](#).' There is a 'Download the app here' link and an 'Install the app' button. To the right, there are images of two smartphones displaying the app interface.



Mobile apps

# A solution for COVID-19 laboratory test results

COVID-19 test data is automatically sent from national laboratories to HIS

Data validation rules assure that the number of possible errors is minimized.

## Process

- The laboratories analyzers record the digital results of the analysis in the laboratory information system
- Laboratories confirm the results and the result is sent to HIS in real-time

**Patients can immediately get the COVID-19 test results from the national patient portal.**



# Family doctors COVID-19 patients query

A service developed for family doctors for obtaining information about Covid-19 patients, in order to support them in their recovery.

## Process

- Family doctors can query the list of their patients by entering a time period about which they wish to get the results
- HIS returns information about the patients who have COVID-19 analysis results

**Family doctors are aware of which of their patients are sick and need additional support in recovery.**



# Med-SITREP

Solution for the transmission of COVID-19 patients and hospital resources data



A web application where data can be entered by authorized personnel in hospitals.

## Hospitals provide information about

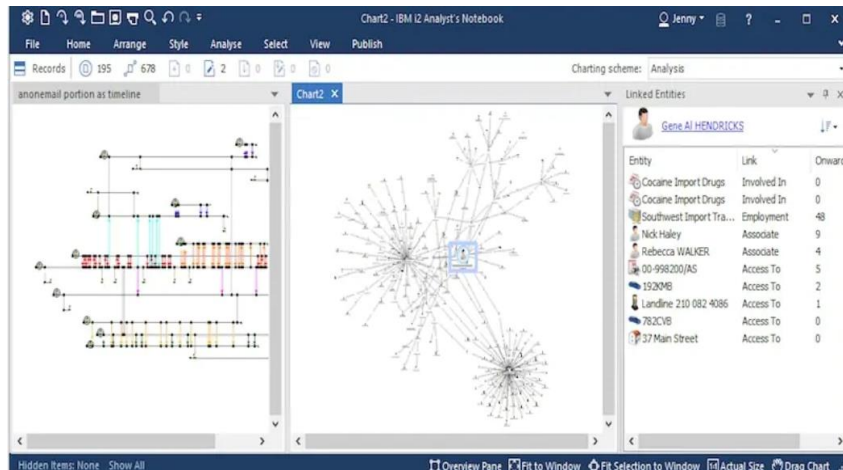
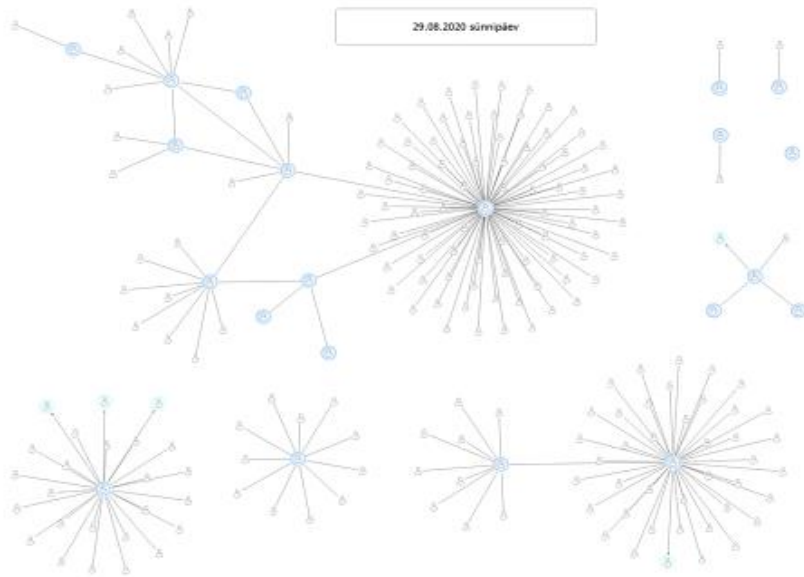
- COVID patients on ventilation, Level III intensive care patients and discharged patients
- Resource information about available and occupied hospital beds in COVID departments

The data is uploaded to data warehouse and displayed to the Health Board as a crisis management input and is published as open data.

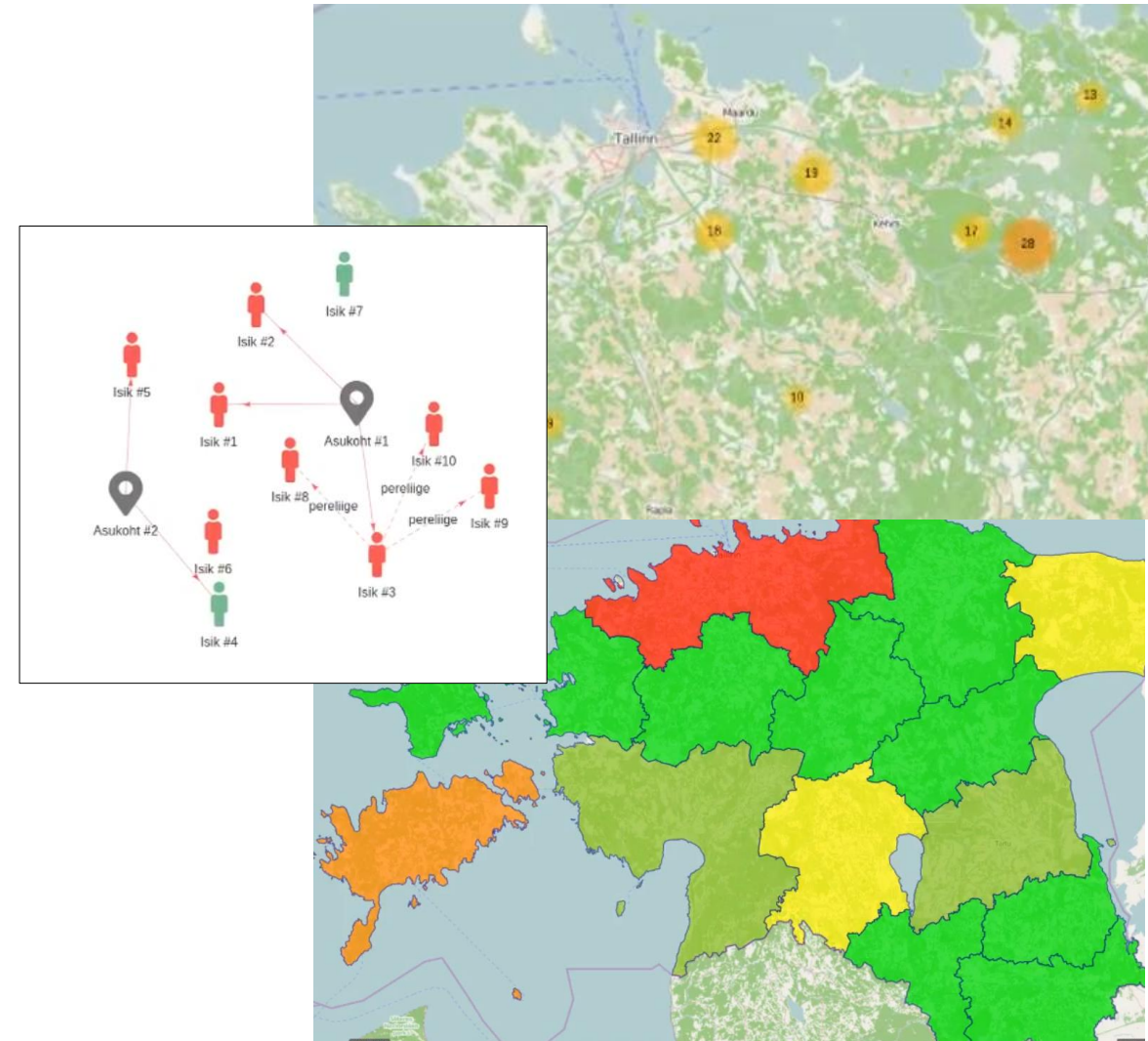


# Contact tracing e-solutions child disease period

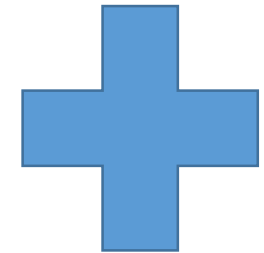
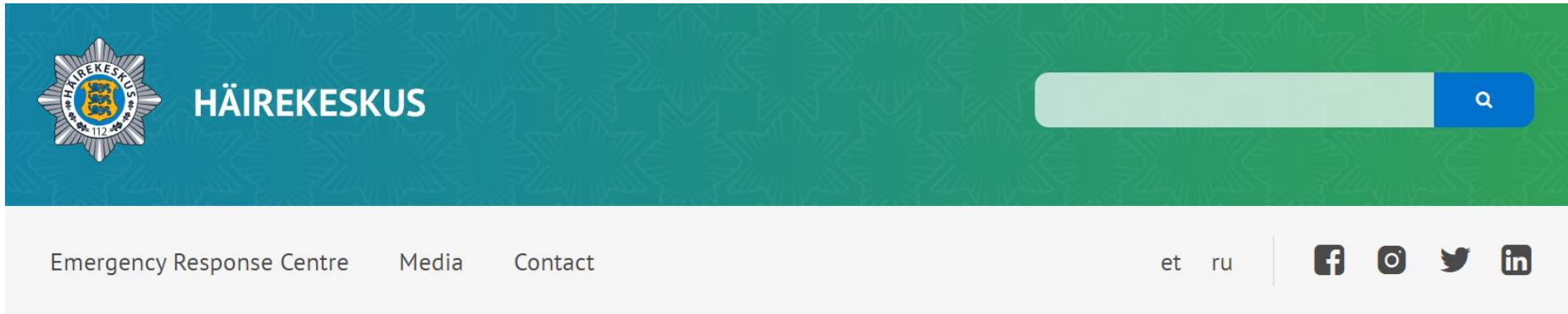
Commercial solution – IBMi2 (end phase 1)



Domestic solution – local enterprise/under development



# Quick links orchestration: external helpline+Social media



## State helpline 1247

1. State helpline 1247
2. Why was the State helpline set up?

## State helpline 1247

The state helpline is an information number open in Russian and English 24 hours a day in situations



# ROBOT FOR CALLS

Knows three languages, makes contact with those who have been in close contact with confirmed COVID -19 cases, gives important advice on how to proceed as a close contact.

- All over Estonia thousands of people are being monitored by the Health Board, but unfortunately the numbers are growing every day. Primary contact with the possible COVID-19 close contacts is the most important one, but The Health Board is lacking the human resources for this.
- In order to simplify the workload of "corona detectives" and reduce the time spent on phone calls, we have created a speech robot that shares notifications in three different languages to possible close contacts.

**The first version of a working robot was completed in one day.**

It would take an average of 30 hours to make all the phone calls by the Health Board. For comparison, it only takes a few minutes for the robot to make the calls.



# HOIA-Estonian corona app

Estonian corona app was created in collaboration **between the private and public sector** and implemented in the government cloud.

We used GAEN (Google/Apple Exposure Notification) as the main technology and implemented the DP-T3 back-end solution for the app.

The infection confirmation is based on the HIS data. Phones communicate with each other using Bluetooth signals and exchange anonymous codes that can't be traced back to the app user.

Special attention has been paid to the security of the application and the privacy of the users. The government, developers or even the phones manufacturers can't trace the information about who was in close contact with whom.

**The applications source code is available for everyone in Estonian e-government code repository**



# Estonian Society of Family Doctor's initiative – Isolation Calculator

TELE2 23:20 isolatsioonikalkulaator.netlify.app

CoV2 positiivne või SARS-CoV2 positiivse lähikontaktne?

SARS-CoV2 POSITIIVNE

või

SARS-CoV2 LÄHIKONTAKTNE

---

Kas patsiendil esinevad sümptomid?

JAH

või

EI

<https://isolatsioonikalkulaator.netlify.app/>

JAH või EI

Millal oli sümptomatilise SARS-CoV2 patsiendi esimeste sümptomite tekkimise kuupäev?

Vali kuupäev:

22.04.2021

Viimane isolatsioonipäev (kaasa arvatud):

02.05.2021

COVID-19-le iseloomulike sümptomite algusest on möödunud vähemalt 10 päeva. Sümptomite tekkepäev on päev 0.

\* Isolatsiooni võib lõpetada ainult siis, kui lisaks ajaliste kriteeriumitele on viimasest palavikust on möödas 72 tundi ja ägedad sümptomid on taandunud. **Isolatsiooni lõpetab arst. Kordustesti paranemise kinnitamiseks ei teostata ühelgi juhul.**

# Open Data

Allows forecast, calculations and solutions

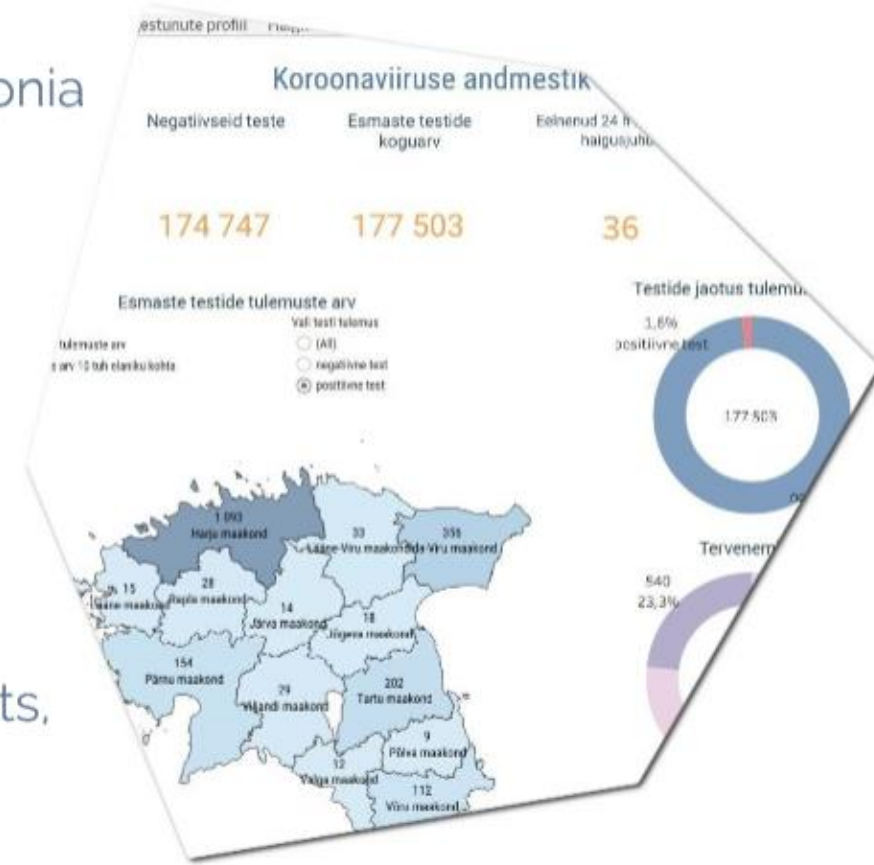
- We always publish up-to-date and automatically updated information once per day.
- In the field of health, open data has never been published in Estonia before.

## Data is used by:

- crisis management teams
- public sector
- private sector,
- research institutions

Access to the data is an opportunity to make the necessary forecasts, calculations or create new solutions.

<https://opendata.digilugu.ee>



# Morning state of play – COVID dashboard

Koroonaviiruse andmestik seisuga 21.04.2021 07:00:00

Esmaseid positiivseid teste

118 789  
(+ 472)

Negatiivseid teste

1 125 353  
(+ 3783)

Testide koguarv

1 244 142  
(+ 4255)

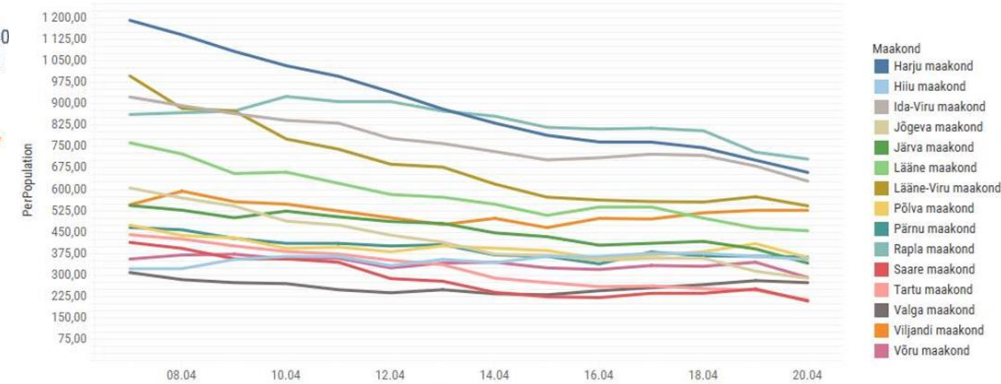
Viimase 14 päeva haigestumus 100 tuhande elaniku kohta kogu Eesti

19.04 20.04  
574,73 536,20 ▼

Vaktsineerimise hõlmatus

Vähemalt üks kord vaktsineeritud 21,930%  
Staatus- vaktsineerimiskuur pooleli 15,229%  
Staatus- vaktsineerimiskuur lõpetatud 6,701%

Viimase 14 päeva haigestumus 100 tuhande elaniku kohta (maakonniti)



Inimeste arv, keda on vaktsineeritud vähemalt üks kord

291 448  
(+1 944)

Staatusena - vaktsineerimiskuur pooleli

202 393  
(+1 944)

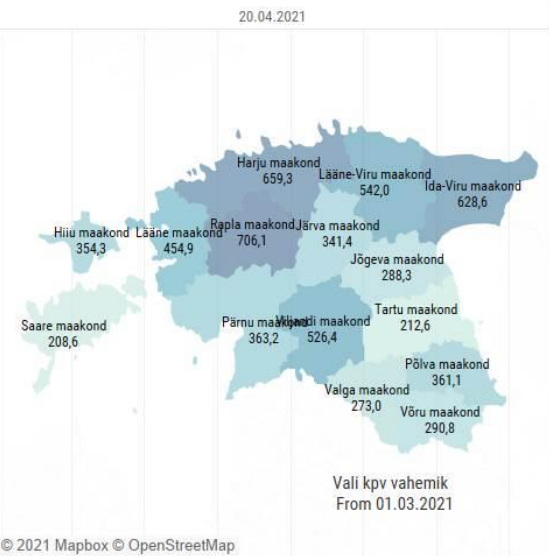
Staatusena - vaktsineerimiskuur lõpetatud

89 055  
(+2 289)

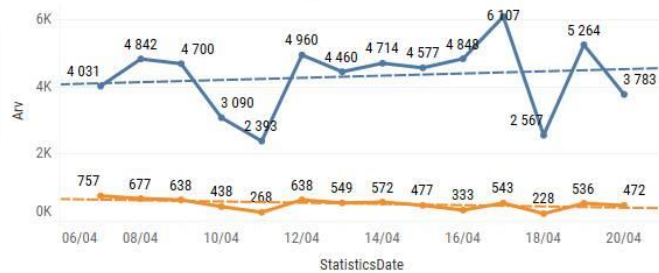
Manustatud dooside arv

380 503  
(+4 233)

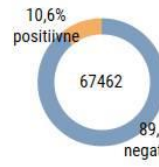
Viimase 14 päeva haigestumus 100 tuhande elaniku kohta (maakonniti)



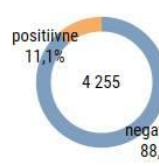
Viimase 14 päeva testide arv



Viimase 14 päeva testide jaotus tulemus- löikes kokku



24 h testide jaotus tulemus- löikes

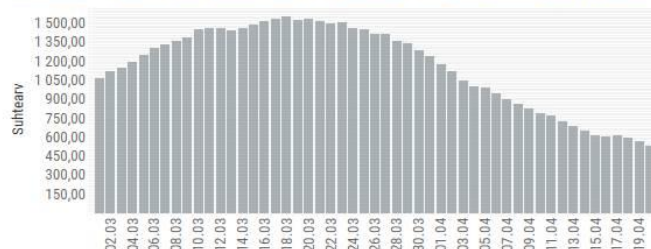


Testide jagunemine liike löikes

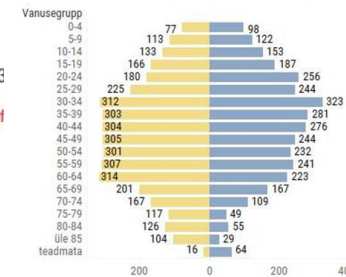
	Esmaseid positiivseid teste	Negatiivseid teste	Testide koguarv
Kokku	118 789	1 125 353	1 244 142
Ninaneeluksaabe RNA	116 140	1 094 366	1 210 506
Kurguloputusvedelik RNA	2 388	11 558	13 946
Antigeen	231	15 869	16 100
Kurguloputusvedelik (ise kogutud)	30	3 560	3 590



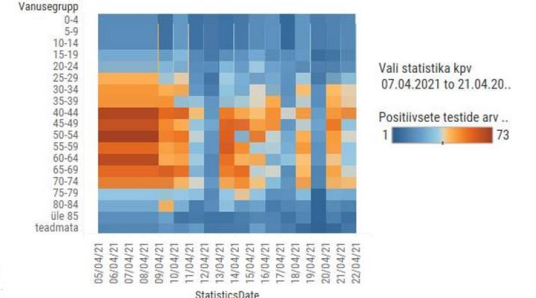
Viimase 14 päeva haigestumus 100 tuhande elaniku kohta kogu Eesti



Positiivsed testid 14 p vanuse ja soo löikes



Positiivsed testid 14 p vanusegruppide löikes



Vali statistika kpvt 07.04.2021 to 21.04.20..

Positiivsete testide arv .. 1 73

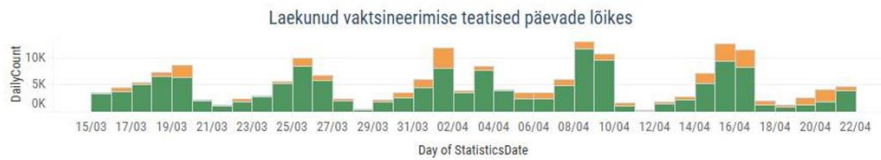
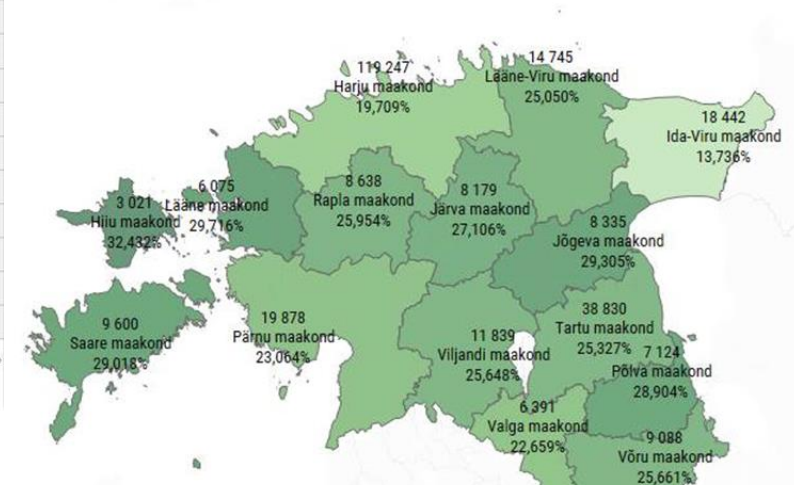
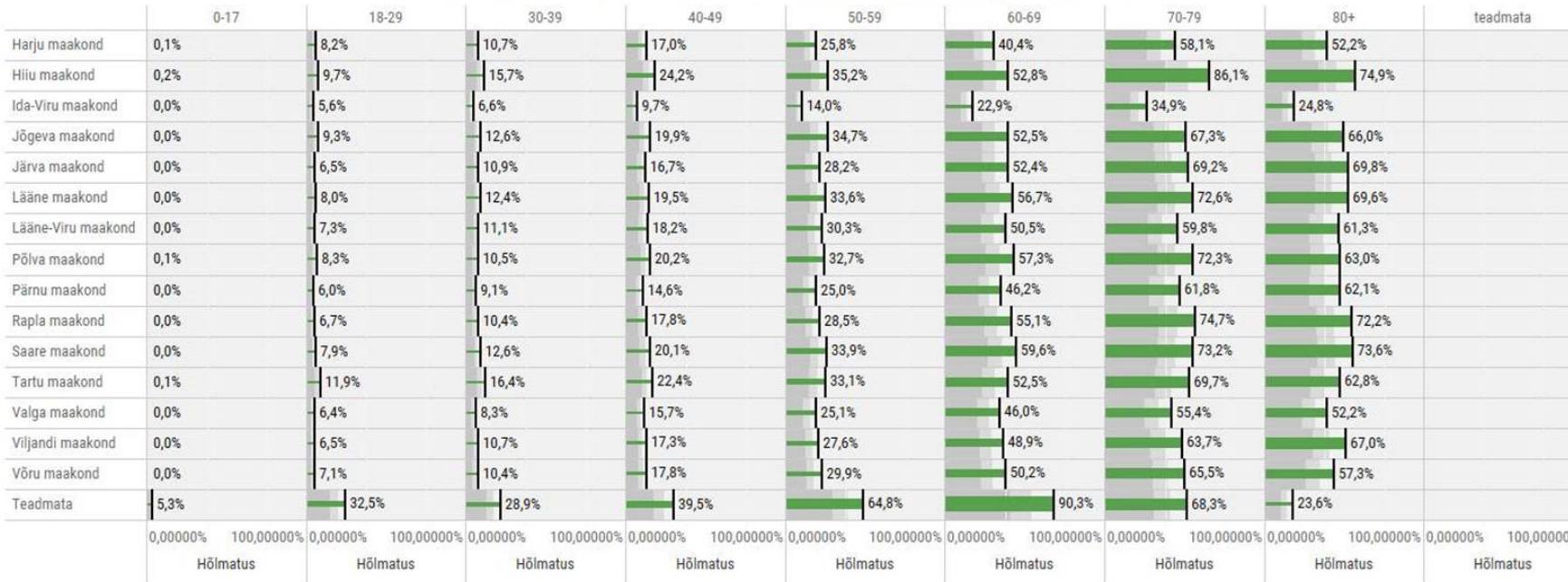
© 2021 Mapbox © OpenStreetMap

Aruandes võib sisalduda eriliiki isikuandmetena käsitletavaid terviseandmeid/eraelulisi andmeid ja aruande sisu on mõeldud üksnes kirja adressaatidele tööalaseks kasutamiseks. Inf avaldamine meediale või kolmandatele osapooltele enne ametliku statistika avaldamist ei ole lubatud.

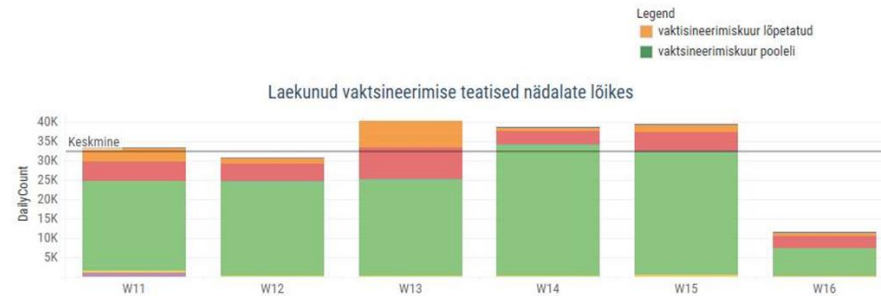
Uuendamise aeg: 21.04.2021 07:20:3

# Evening state of play – Vaccination dashboard

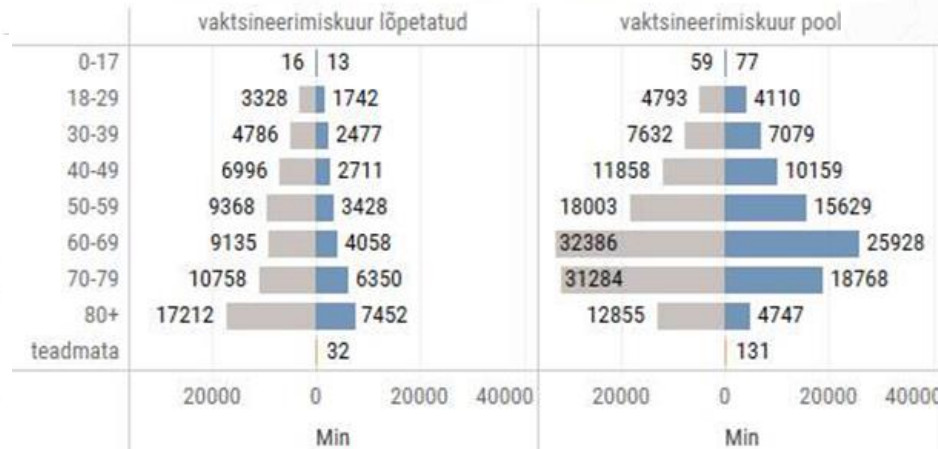
Hõlmatus (vähemalt üks kord vaktsineeritud) maakonniti eri vanusegruppide lõikes



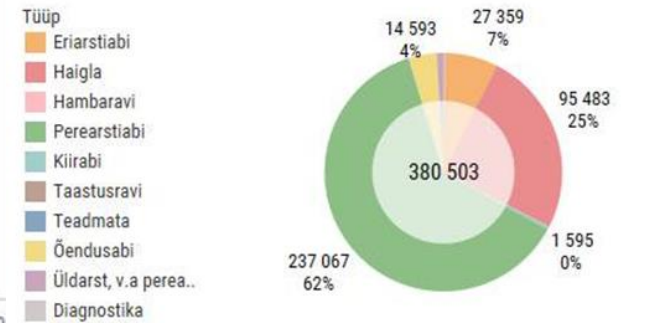
Vali statistika päevade vahemik  
From 15. märts 2021



## Vaktsineeritute jaotus vanusegrupi ja soo lõikes



## Laekunud vaktsineerimisteatiste arv ja osakaal teenuseosutaja tüüpide lõikes

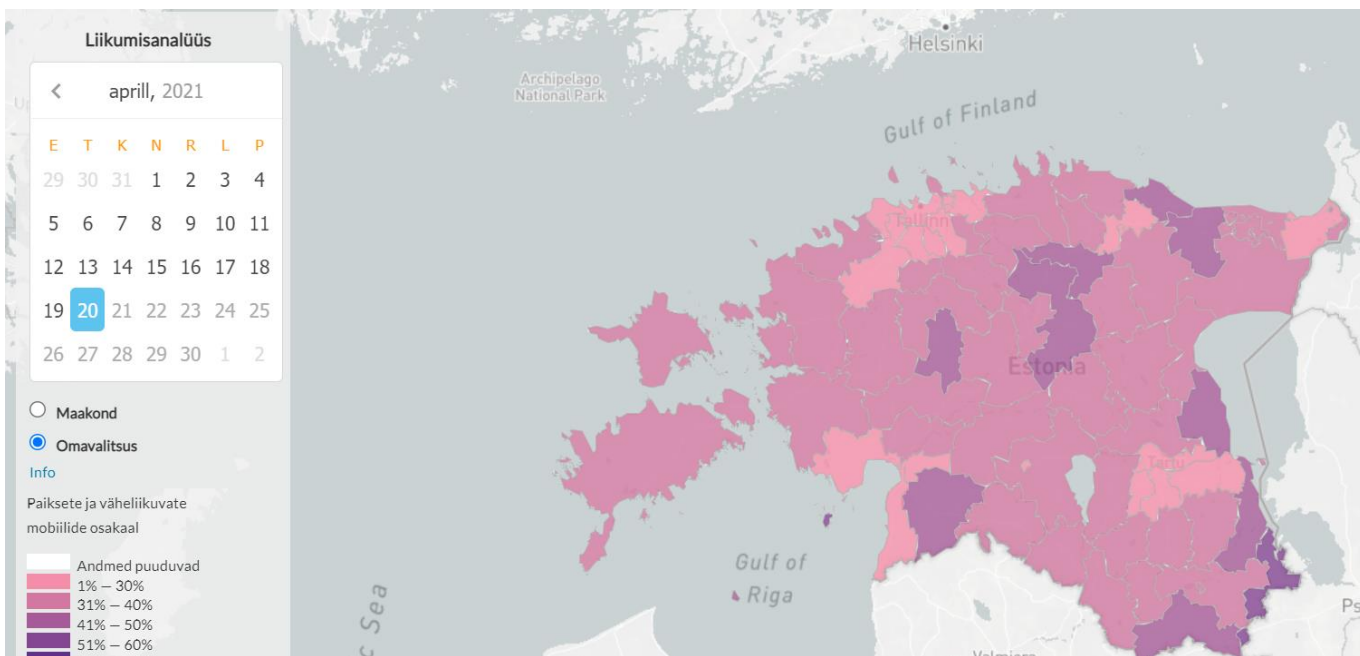




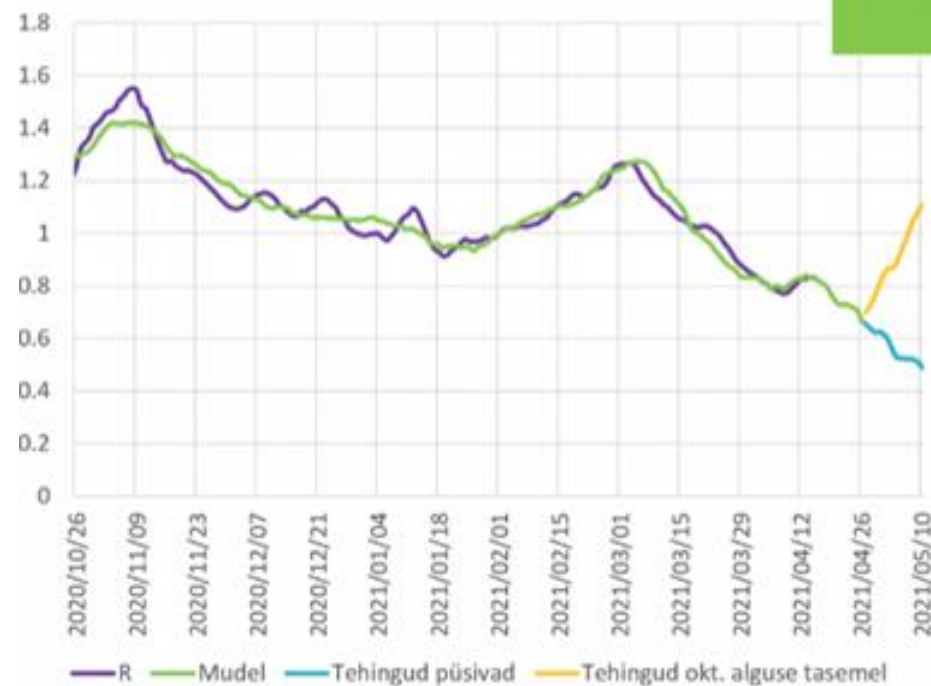
# Data support via banking and telco's

## Anonymous GSM's are divided into 3 groups:

- Fully fixed mobile phones - remains in your area at all times during the day.
- infrequent or 95% fixed mobiles - during the day, remains in its area 95% of the time.
- mobile phones - a mobile number is at least 5% of the day, ie 72 minutes a day, away from your area

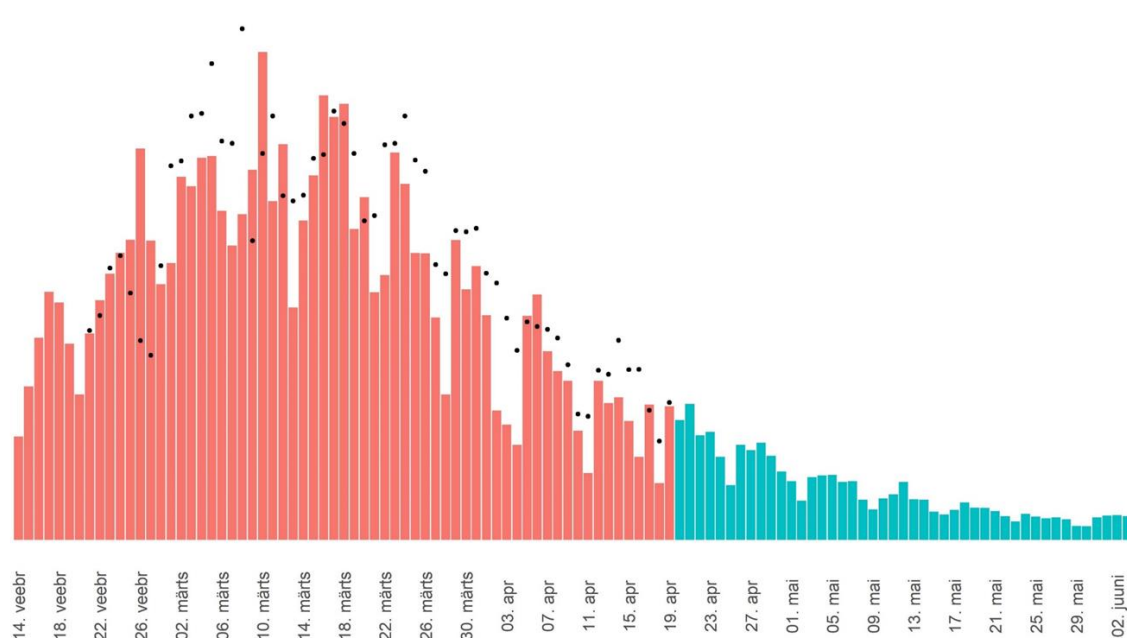


## R dynamics in correlation to credit card use



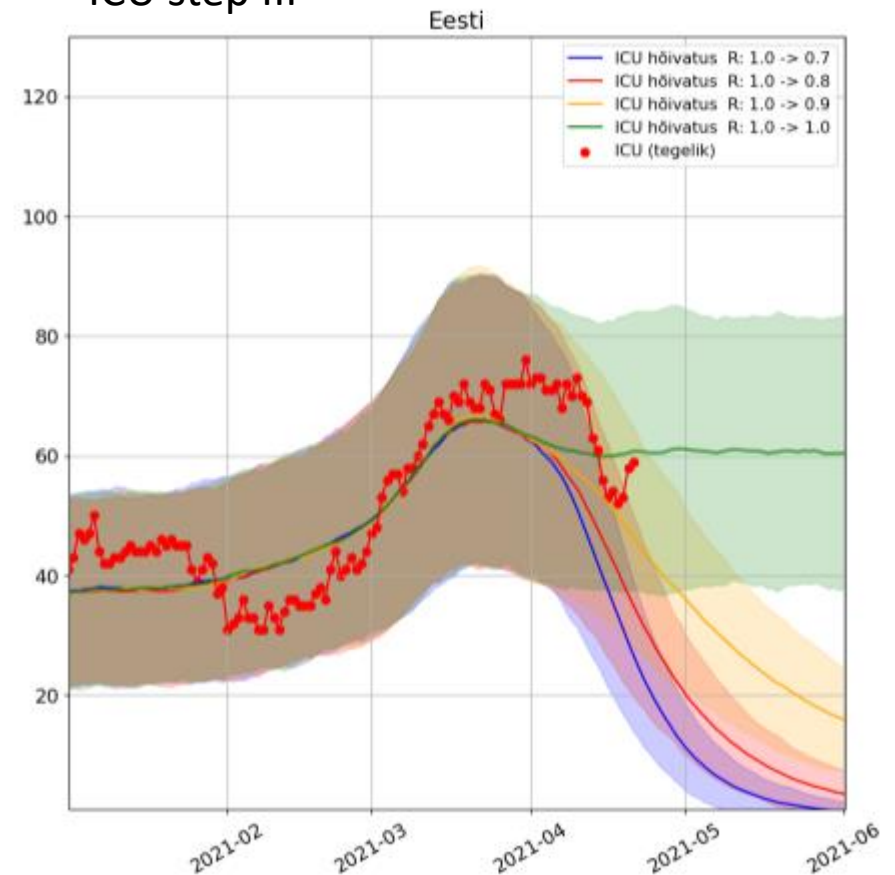
# Future estimation support via TOP analysts/scientists

Daily C-19 pos. rate estimate via R scenarios



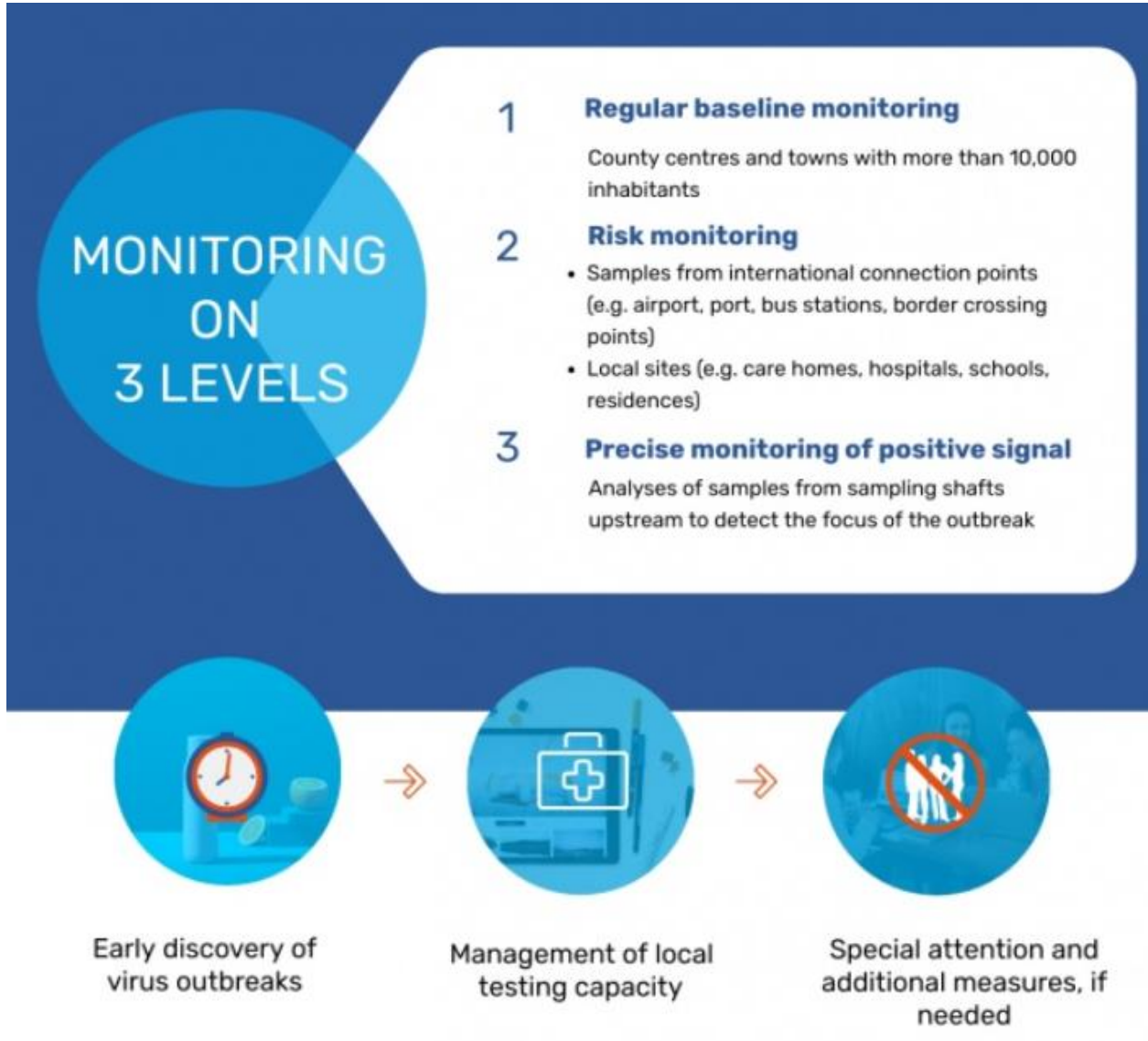
[http://www-1.ms.ut.ee/krista/covid/covid\\_pildid.html](http://www-1.ms.ut.ee/krista/covid/covid_pildid.html)

ICU step III

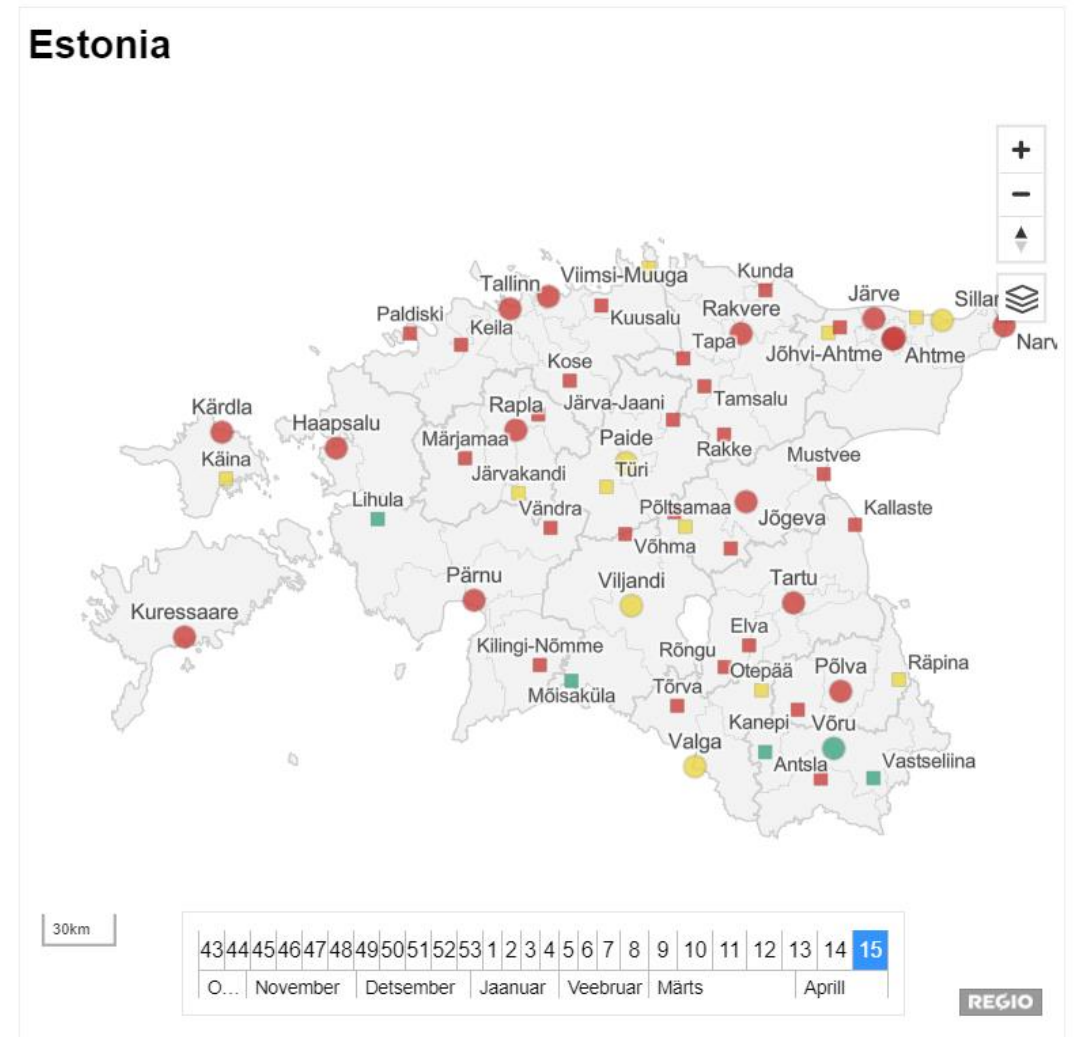


<https://covid.hep.kbfi.ee/>

# Detecting coronavirus in waste water



Interactive map of waste water surveillance results:



# Electronic data exchange with the police helping with the self-isolation inspections

The solution allowed police departments to have real-time information about patients who had tested positive for COVID-19 and had to stay at self-isolation.



# The Health Board's self-service portal

Passenger locator forms can be submitted via the Health Board's self-service environment.

Properly provided information will immediately allow us to notify passengers about the risk of infection and how to implement measures which help stop the spread of COVID-19.

The passenger locator form must be filled in before the arrival to Estonia



TERVEISEAMET

The Health Board's self-service portal

## A passenger locator form to aid in the prevention of the spread of COVID-19

Passenger locator forms can be submitted via the Health Board's self-service environment. Properly provided information will immediately allow us to notify you of any risk of infection and to implement measures which help to stop the spread of COVID-19.

[Log into the self-service environment >](#)

[Not an Estonian citizen >](#)

[The passenger locator form must be filled in before arrival in Estonia](#)

Get acquainted with who is not subject to the restriction on the freedom of movement according to the Government of the Republic of Estonia orders [no.282](#) and [no.169](#). Please fill in the declaration even if the exceptions specified in the above-mentioned orders apply to you.

By logging into the environment, you agree to the [terms and conditions for the processing of personal data](#)

# Health Information System – Vaccination Certificate

## Täna digilugu.ee-s

Identity check



LAADI ALLA IMMUNISEERIMISPASS PDF-FORMAADIS

Nimi: K...  
Sünniaeg või isikukood: 3

[Näita kõiki andmeid](#)

**PÕHIVAADE** [Täiendvaade](#)

Haigus mille vastu immuniseeriti	Immuniseerimise kuupäev	Immuunpreparaat	Partii number	Manustatud annus	Mitmes annus	Järgmine immuniseerimine alates	Immuniseerija	Vaata allikat
teetanus, difteeria	22.06.2020	IMOVAX d.T. ADULT	R3M753V	0.5 ML	0	Immuniseerimine lõpetatud	KAAREL UBA	<input type="text"/>
Puukentsefaliidi	13.07.2016		VNPR1P16F	0.5 ml			MARET MISSAMOU	<input type="text"/>

[Printi](#)

[Üles](#)

## IMMUNISEERIMISPASS

Nimi:  
Sünniaeg või isikukood:

Haigus mille vastu immuniseeriti	Immuniseerimise kuupäev	Immuunpreparaat	Partii number	Manustatud annus	Mitmes annus	Järgmine immuniseerimine alates	Immuniseerija
teetanus, difteeria	22.06.2020	IMOVAX d.T. ADULT	R3M753V	0.5 ML	0	Immuniseerimine lõpetatud	KAAREL UBA
Puukentsefaliidi	13.07.2016		VNPR1P16F	0.5 ml			MARET MISSAMOU

Dokument koostatud: 31.03.2021 15:49:31

Dokumendi koostaja: Tervise ja Heaolu Infosüsteemide Keskus





# QR code – Verification of Vaccination Certificate

## Immuniseerimise tõendi pdf

Scan Certificate QR Code

### Covid Certificate Verification

Certificate Identifier	(01)123(02)EE(03)TIS(04)1617091026
Certificate Issuer	Estonia API
Disease	COVID-19
Vaccine Type	covid-19 vaccine
Vaccine Medical Product	Comirnaty
Vaccination Date	Thu Mar 04 2021
Country Of Vaccination	EST
No In A Series Of Vaccination	1
Identifier	ID Card 39012110092



- Document/Signature hash
- Signature consistency
- Signature is trusted in blockchain
- Health authority authenticity
- Person Identifiers Verified



DISEASE OR AGENT TARGETED MILLE VASTU IMMUNISEERITI БОЛЕЗНЬ, ПРОТИВ КОТОРОЙ ВАКЦИНИРОВАЛИ	COVID-19
VACCINE/PROPHYLAXIS TOIMEAINED ТИП ВАКЦИНЫ	covid-19 vaccine
VACCINE MEDICINAL PRODUCT IMMUNIFREPARAAT ПРЕПАРАТ	Comirnaty
MARKETING AUTHORIZATION HOLDER MÜÜGILOA HOIJA ДЕРЖАТЕЛЬ ТОРГОВОЙ ЛИЦЕНЗИИ	BioNTech Manufacturing GmbH
NUMBER IN A SERIES OF VACCINATIONS MANUSTAMISE KORDSUS КОПИЧЕСТВО ВВЕДЕНИЙ	2 out of 2 doses kaks doosi kahest обе дозы из двух
VACCINATION STATUS IMMUNISEERIMISE SEIS СТАТУС ИММУНИЗАЦИИ	Completed Lõpetatud Завершено
DATE OF VACCINATION IMMUNISEERIMISE KUUPÄEV ДАТА ВАКЦИНАЦИИ	2021-03-04
COUNTRY OF VACCINATION RIIK, KUS IMMUNISEERITI СТРАНА ВАКЦИНАЦИИ	EST



### Vaccination Certificate

IMMUNISEERIMISE TÕEND  
ДОКАЗАТЕЛЬСТВО ИММУНИЗАЦИИ



12345678901234567890123456  
78901234567  
CERTIFICATE ID - TÕENDI NR - NO ДОКАЗАТЕЛЬСТВА

Laurentius, Gustav Johann	PEREKONNA- JA EESNIMI - ФАМИЛИЯ И ИМЯ
39012110092	ISIKUKOOD - ЛИЧНЫЙ КОД
1990-12-11	SÜNNIAEG - ДАТА РОЖДЕНИЯ

Estonian Health Information System  
Health and Welfare Information Systems Centre  
Центр информационных систем  
здравоохранения и социального  
обеспечения

HELPDESK  
KASUTAJATUGI  
СЛУЖБА ПОДДЕРЖКИ

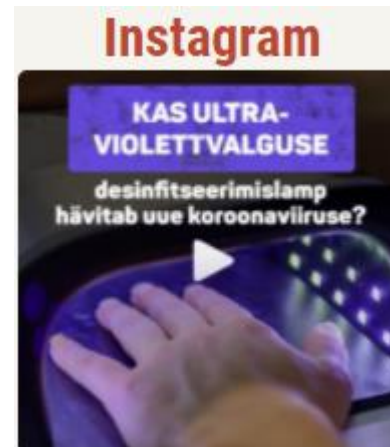
+372 7943 943  
abi@tehik.ee

Estonian Health Information System  
Tervise infosüsteem  
Инфосистема здоровья

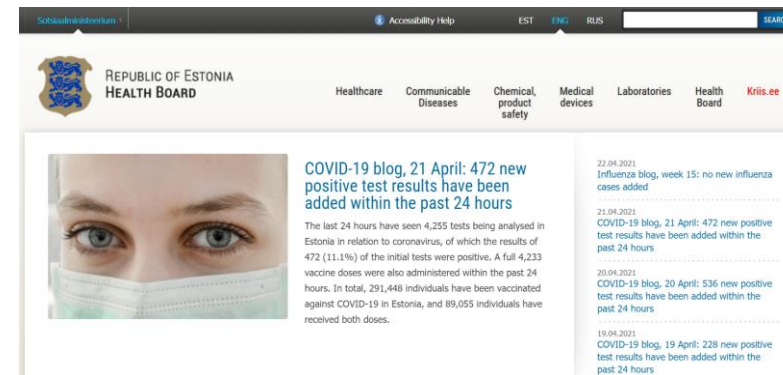
CERTIFICATE ISSUER  
TÕENDI VÄLJASTAJA  
ДОКАЗАТЕЛЬСТВО ВЫДАНО



# Thank You!



## WEB



<https://www.terviseamet.ee/en>