Scientific advice during Covid-19 pandemic in Estonia: combining local data with global knowledge

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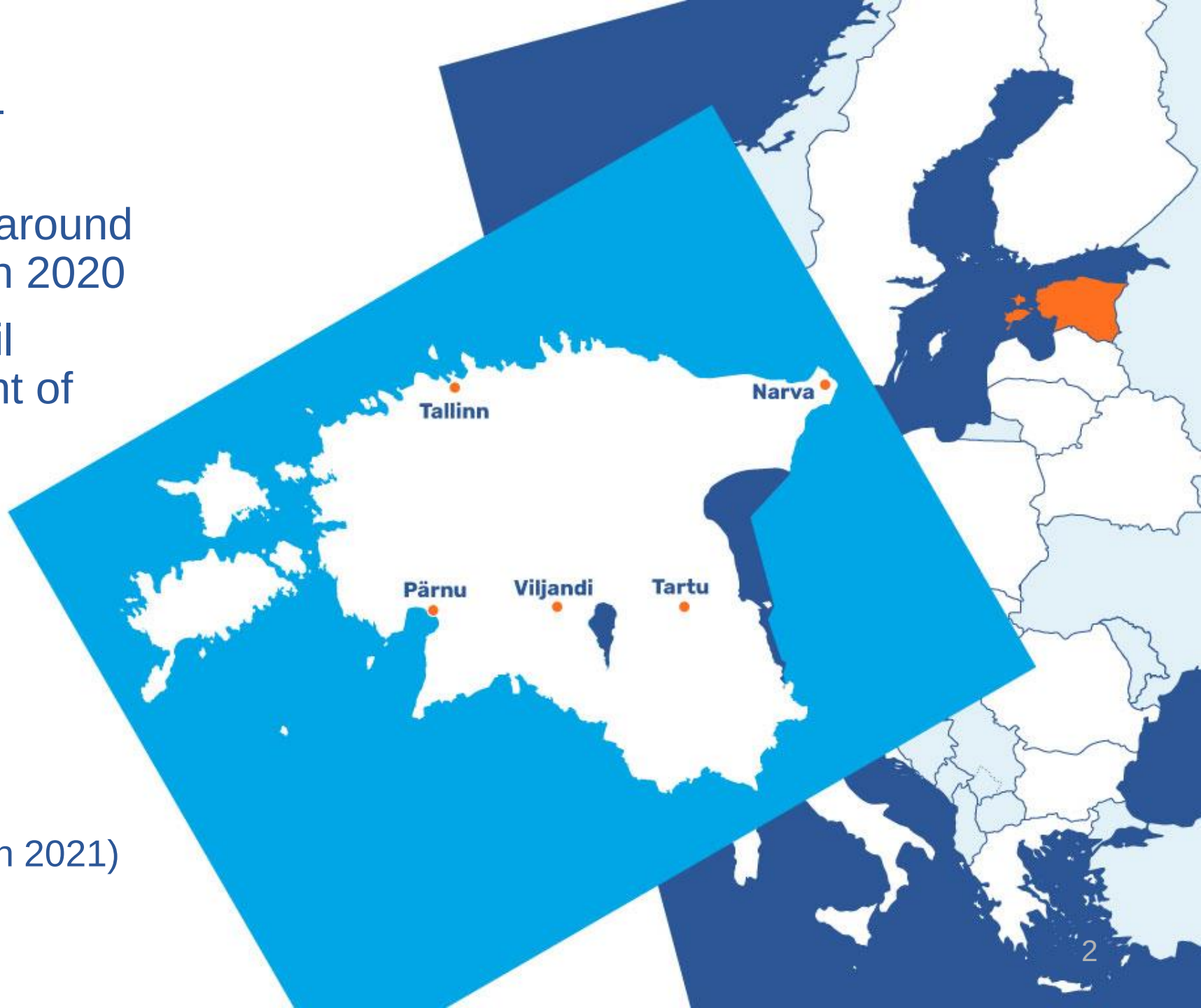
Some history:

- Feb 26th 2020: first Covid-positive case in Estonia
- First local transmissions: around the second week of March 2020
- Covid-19 Scientific council formed by the Government of Estonia: from March 20th



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prof. Peep Talving

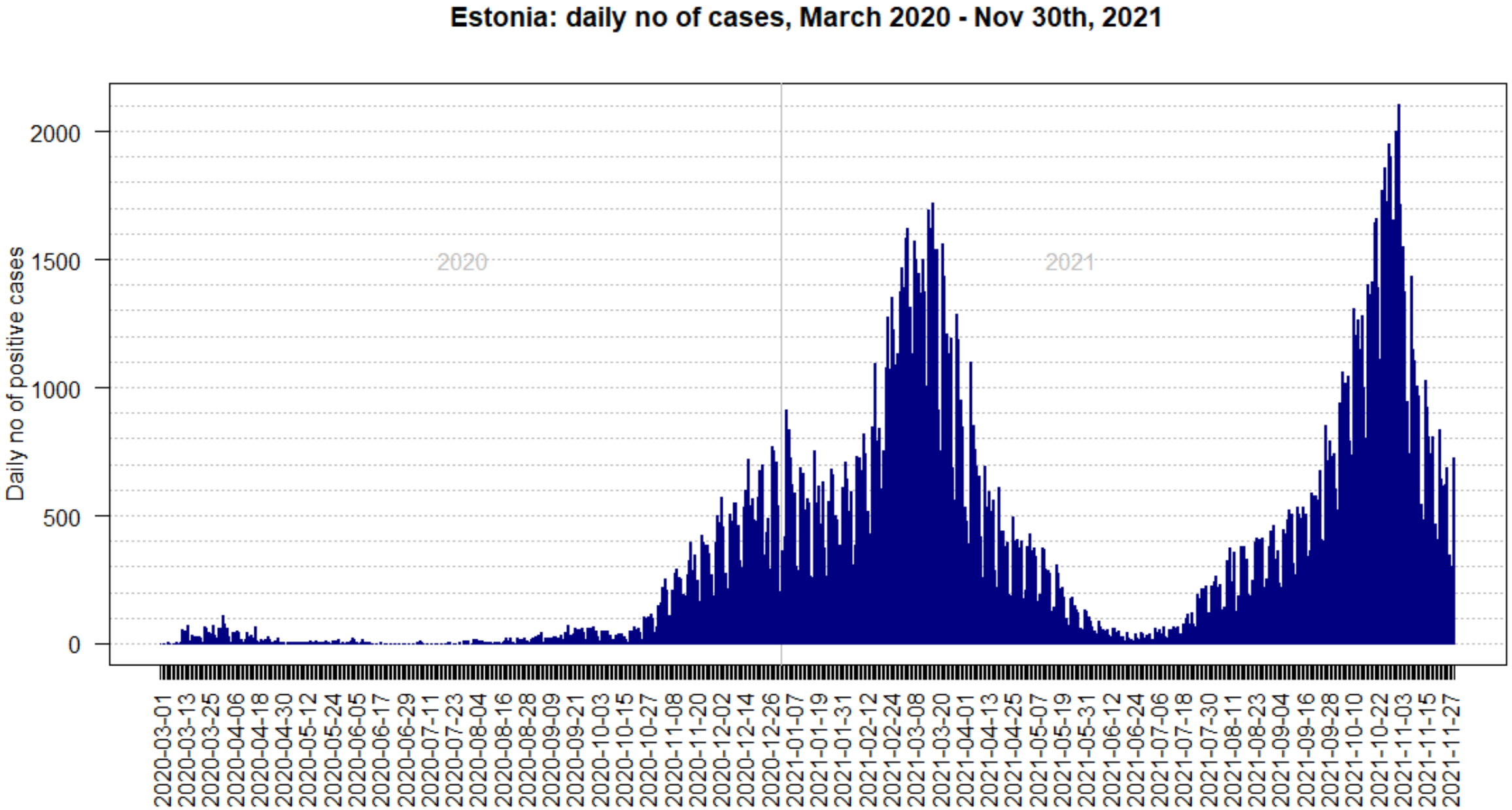
dr. Pilleriin Soodla

ass.prof. Andero Uusberg (from Jan 2021)

dr. Kristi Rüütel (until Dec 2020)

Data analytic tasks to support political decision-making:

- Nowcasting – accurate overview of the current situation
  - New infections
  - Hospitalization
  - Deaths
  - Regional view
  - Infections in agegroups
  - Time trends
  - Absolute and relative measures
  - Vaccinations and vaccine effect
- Forecasting
  - Potential trends in new infections
  - Need for hospital and critical care beds
  - Mortality predictions

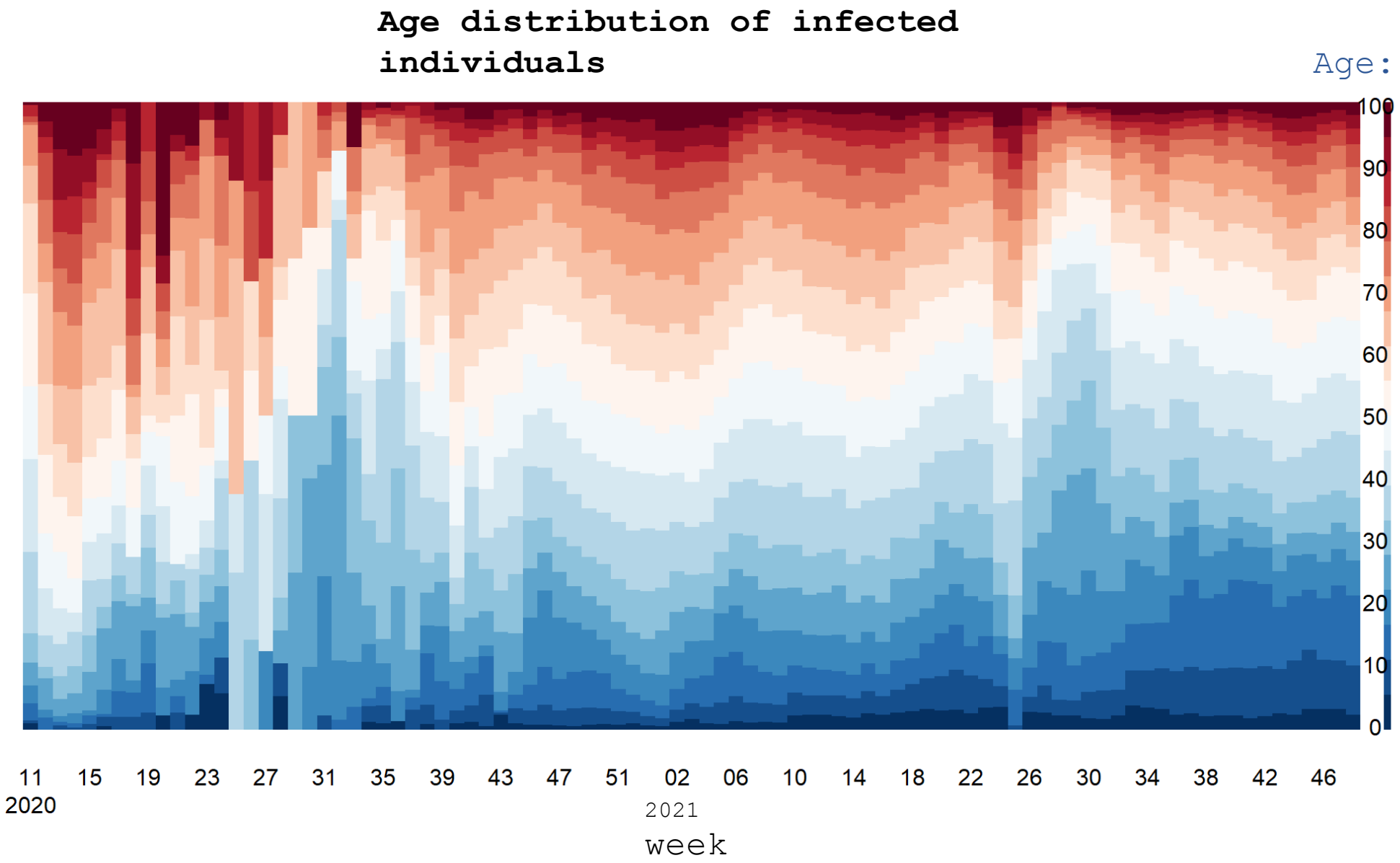

Estonia: daily no of cases, March 2020 - Nov 30th, 2021
Daily no of positive cases
2000
1500
1000
500
0
2020
2021
2020-03-01
2020-03-13
2020-03-25
2020-04-06
2020-04-18
2020-04-30
2020-05-12
2020-05-24
2020-06-05
2020-06-17
2020-06-29
2020-07-11
2020-07-23
2020-08-04
2020-08-16
2020-08-28
2020-09-09
2020-09-21
2020-10-03
2020-10-15
2020-10-27
2020-11-08
2020-11-20
2020-12-02
2020-12-14
2020-12-26
2021-01-07
2021-01-19
2021-01-31
2021-02-12
2021-02-24
2021-03-08
2021-03-20
2021-04-01
2021-04-13
2021-04-25
2021-05-07
2021-05-19
2021-05-31
2021-06-12
2021-06-24
2021-07-06
2021-07-18
2021-07-30
2021-08-11
2021-08-23
2021-09-04
2021-09-16
2021-09-28
2021-10-10
2021-10-22
2021-11-03
2021-11-15
2021-11-27

Important points for science-based crisis-communication

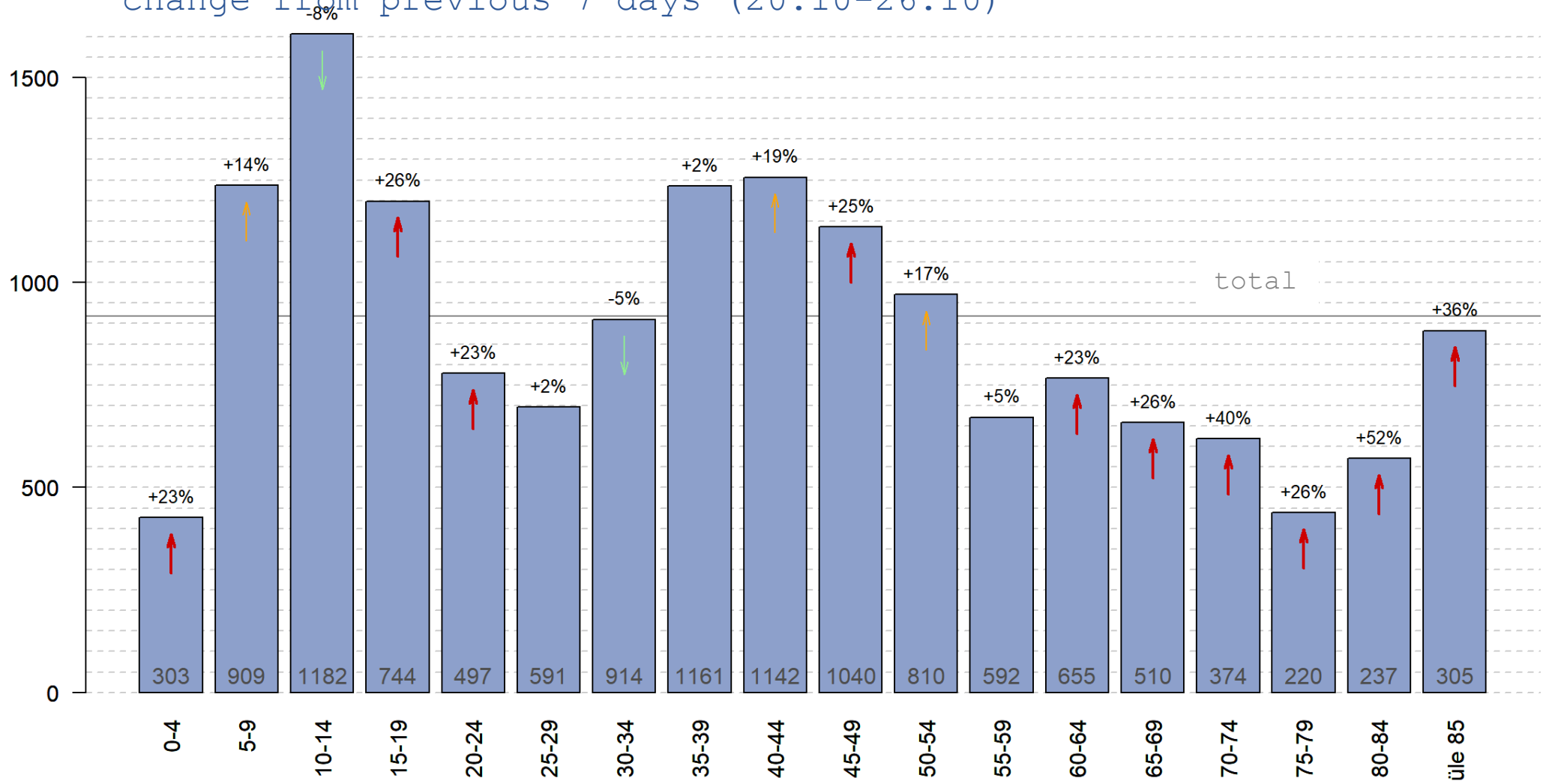
- The message needs to be short and clear
- Importance of good visualization!

- Dilemmas:
  - Decision-making is binary, scientific arguments include uncertainty
  - Scientific knowledge is constantly changing, scientists do not agree in every detail – very hard to communicate to decision-makers and general public
  - Communication with politicians and with media, also with politicians via media – a lot of “broken telephone” effects
  - Predictive models and “what-if” scenarios (scenarios avoided by actions -> models were “wrong”)
  - How to communicate with “alternative views” (anti-vax and others)?

Age structure through time



7-day infection rate by 100000 individuals in the age group 27.10-02.11.2021, change from previous 7 days (20.10-26.10)



Bringing together age groups and regions (counties): percentage infected in October 2021

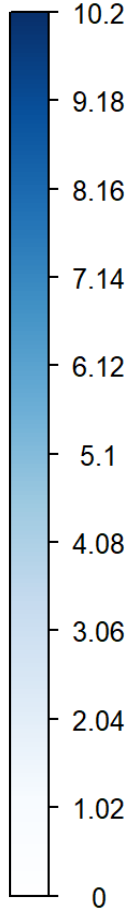
Population 24000

Population 154000

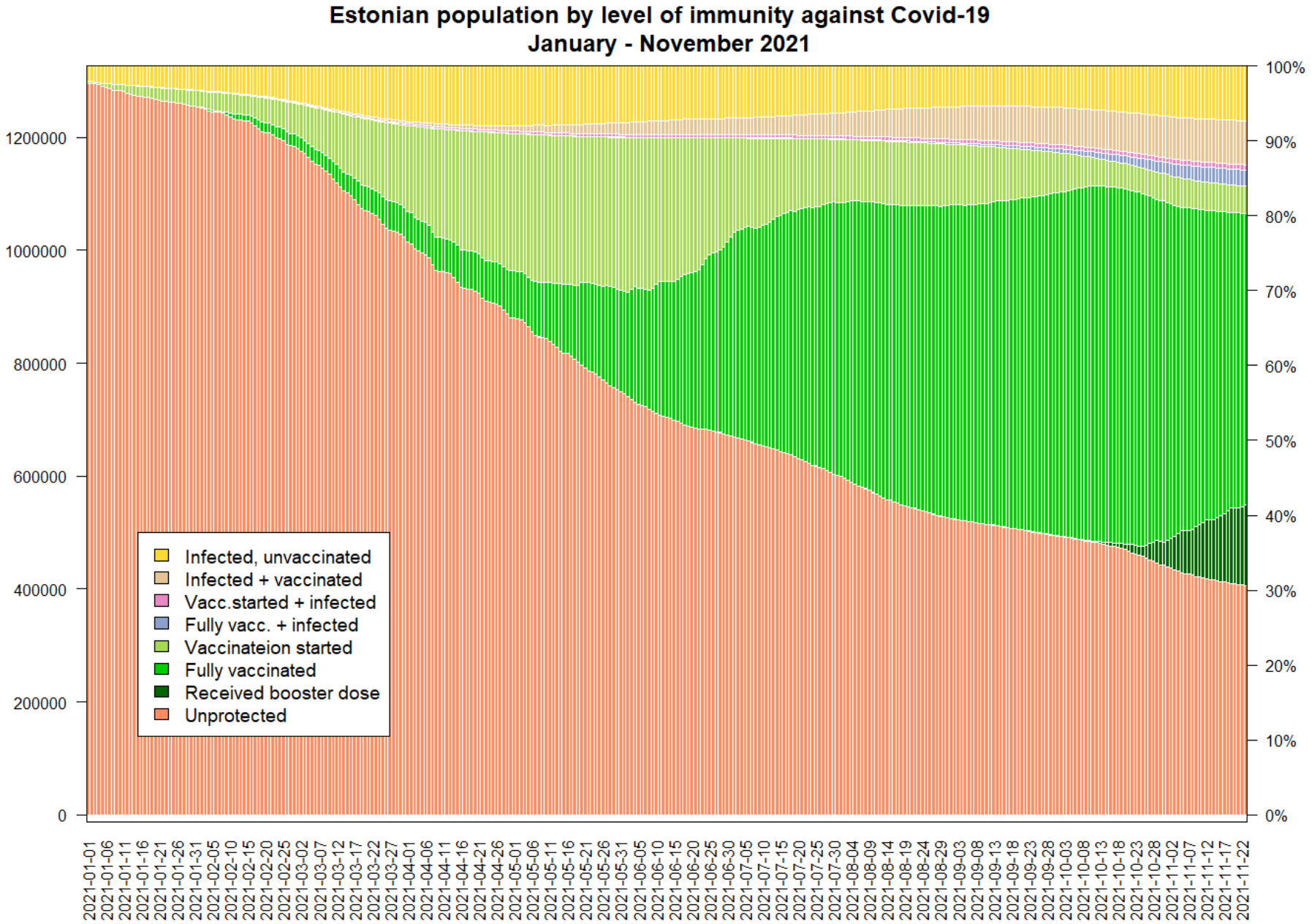
Population 609000

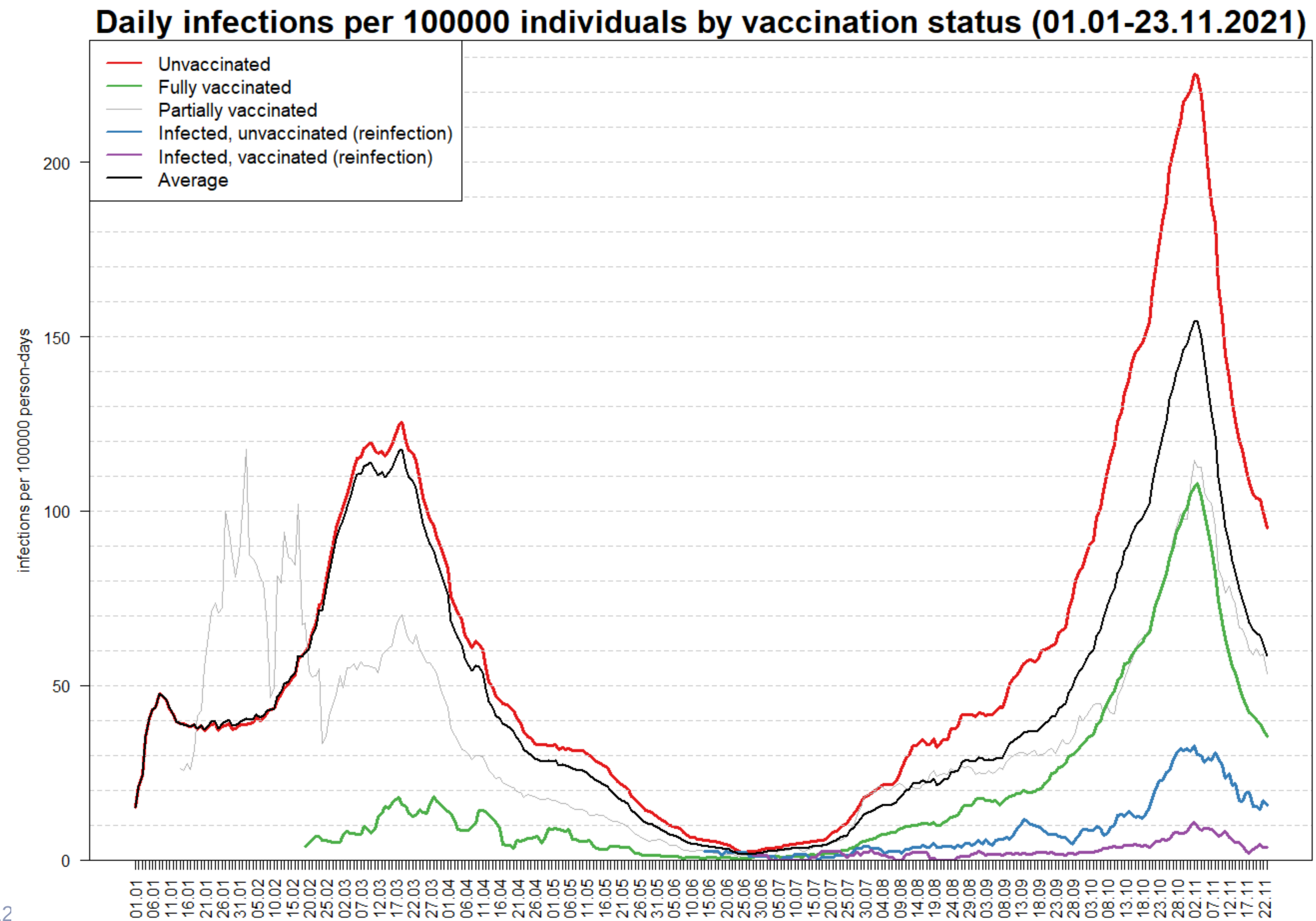
Population 9000

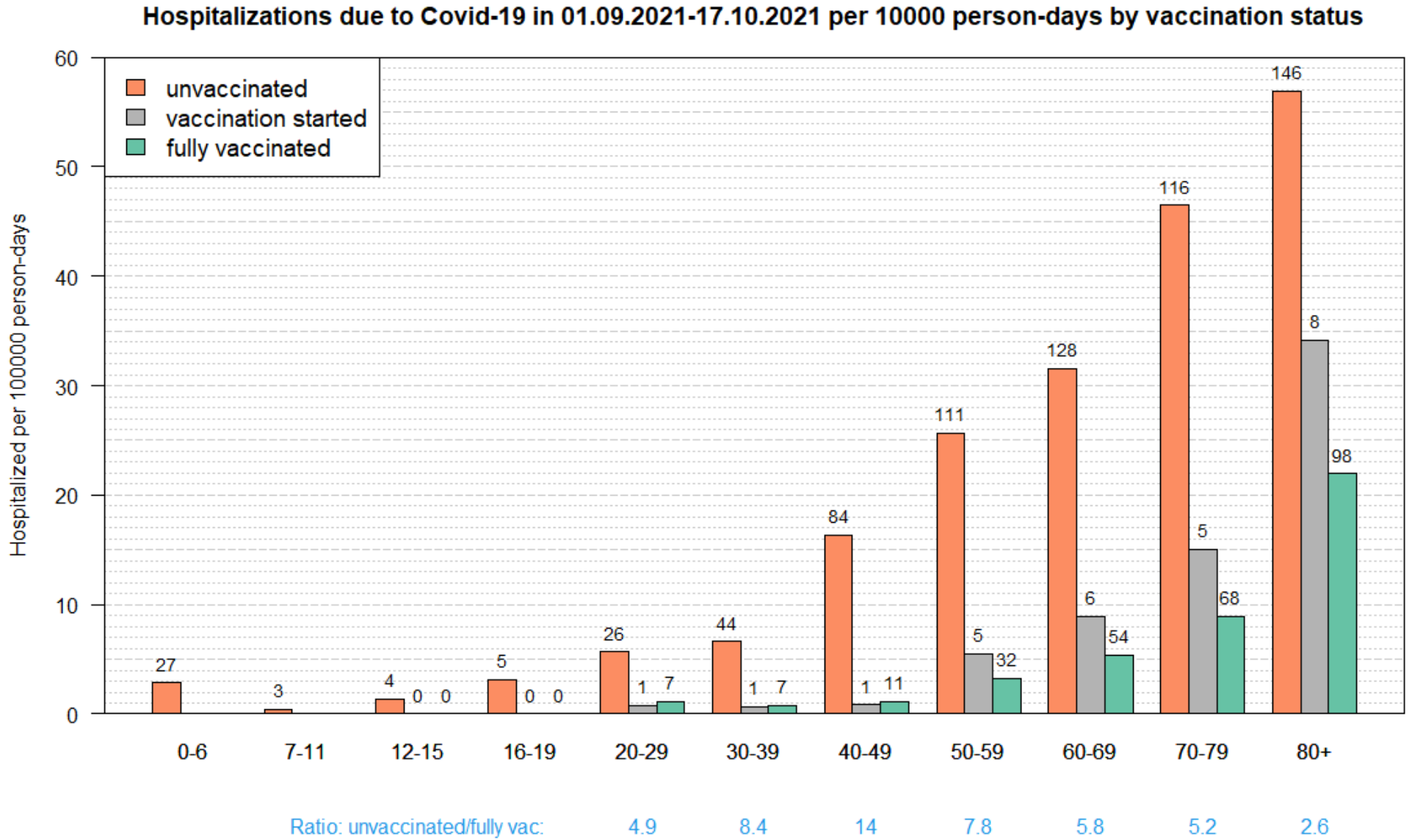
	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	üle 85
Põlva maakond (1294)	2.8	9.7	10.1	6.9	3.3	4.7	6.5	7.2	7.4	5.5	5.6	3.4	4.2	3.6	3.2	3.6	3	3.9
Pärnu maakond (3995)	1.6	6.9	10.2	4.5	4.2	4.7	6.5	7.5	7.1	5.6	4.1	3.4	3.4	2.8	2.1	1.3	1.7	2.5
Viljandi maakond (1811)	0.9	5.3	9.5	3.9	3.4	4.2	4.6	6.8	4.4	5.2	4.1	3.5	3.5	2.7	1.7	1.5	1.4	2
Võru maakond (1337)	1.2	4.1	6.3	5.6	3	3.8	4.2	5.7	5.7	4.1	3.9	3.4	3.8	3.1	2.5	1.8	2	3
Järva maakond (1090)	1.7	5.8	6.9	4.8	3.1	3.3	4.1	4.8	4.7	4.3	3.2	3.2	2.3	2.3	2.3	2.4	2.7	4.5
Lääne-Viru maakond (1995)	2	4.8	6.3	3.5	3	3.1	4.5	4.8	4.4	3.7	4	2.9	3	2.6	1.4	1.5	1.7	2
Valga maakond (931)	1.4	5.3	4.8	4.4	2.5	2.8	4.8	3.8	5.1	4	3.8	3.4	2.8	2.4	1.8	1.4	1.8	1.9
Rapla maakond (1048)	1.6	3.9	7.5	3.4	4.1	3.8	3.9	4	4.6	3.7	2.5	2.1	1.8	1.7	1.4	1.1	1.9	1.2
Jõgeva maakond (840)	1.6	5.5	5.7	3.8	2.9	3.2	4.2	3.7	4	2.7	2.9	2.3	2.7	1.4	1.3	1.5	2.6	2.7
Tartu maakond (4592)	1.6	4.9	6.5	2.6	2	2.8	3.2	4.1	4.1	3.4	2.7	2.3	2.3	1.8	1.3	0.8	1.1	2.2
Ida-Viru maakond (3766)	1.7	3.3	6.9	4.5	2.8	2.7	3.2	4	4.1	3.2	2.9	2.1	2.1	1.9	1.7	1.2	1.3	1.6
Harju maakond (15993)	1	3.7	5.6	3.4	1.9	2.2	2.5	3.4	3.5	3	2.6	2.1	2	1.7	1.5	1.2	1.2	2
Lääne maakond (466)	0.6	4.6	4.4	1.6	2	2.4	3.2	3.8	3	3.4	2.2	1.4	1.3	1.4	1.6	0.6	1.1	2.1
Saare maakond (488)	0.2	1.4	2.7	2.4	1.7	1.5	2	3	1.6	1.5	1.4	1.1	0.9	0.9	0.6	0.6	1.4	1.6
Hiiu maakond (120)	0.3	0.9	1.2	1.5	1.4	2.6	2.5	2.3	1.9	2.2	1.3	0.8	0.5	0.5	0.5	0.3	0.3	0



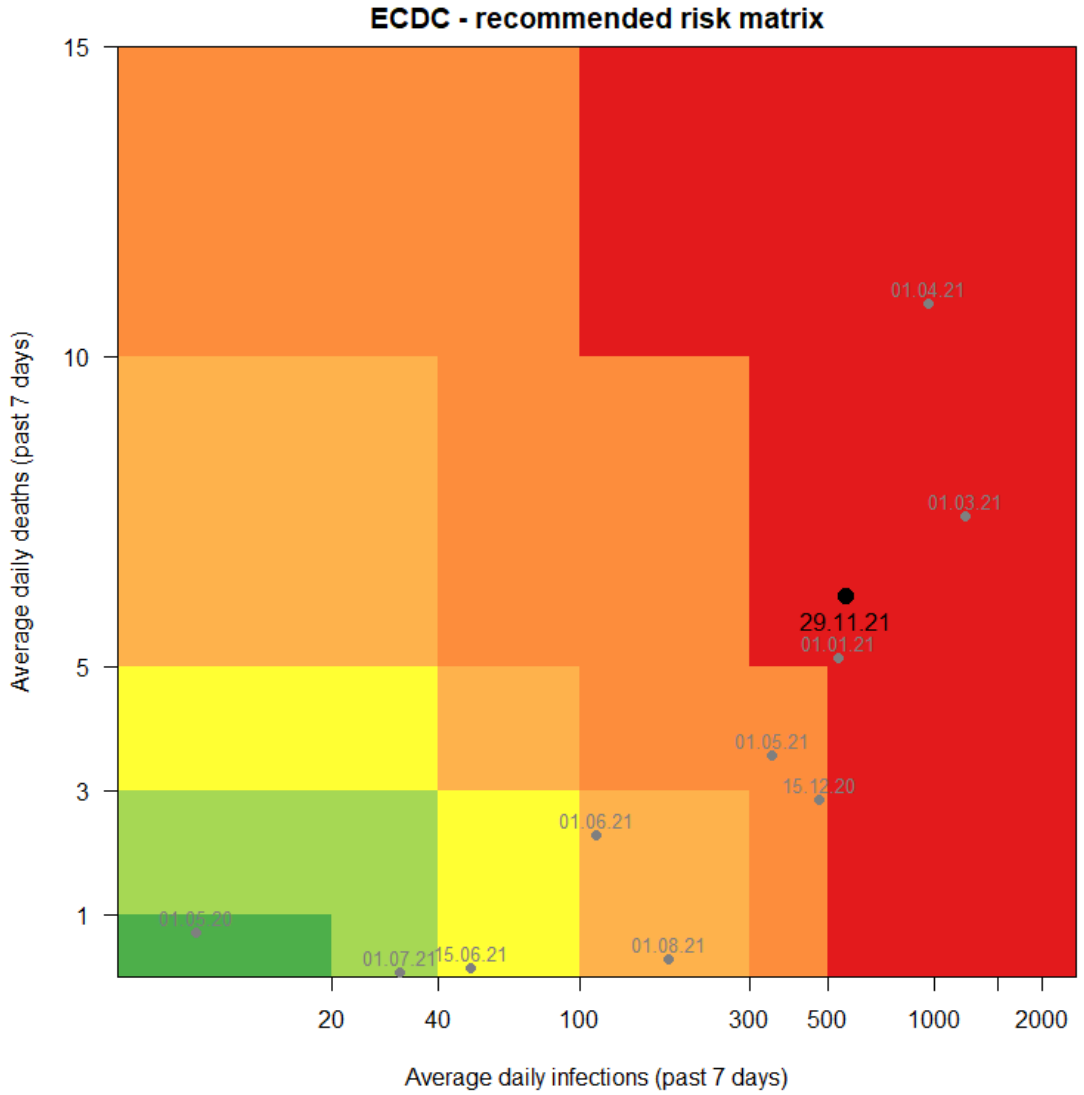
Vaccination



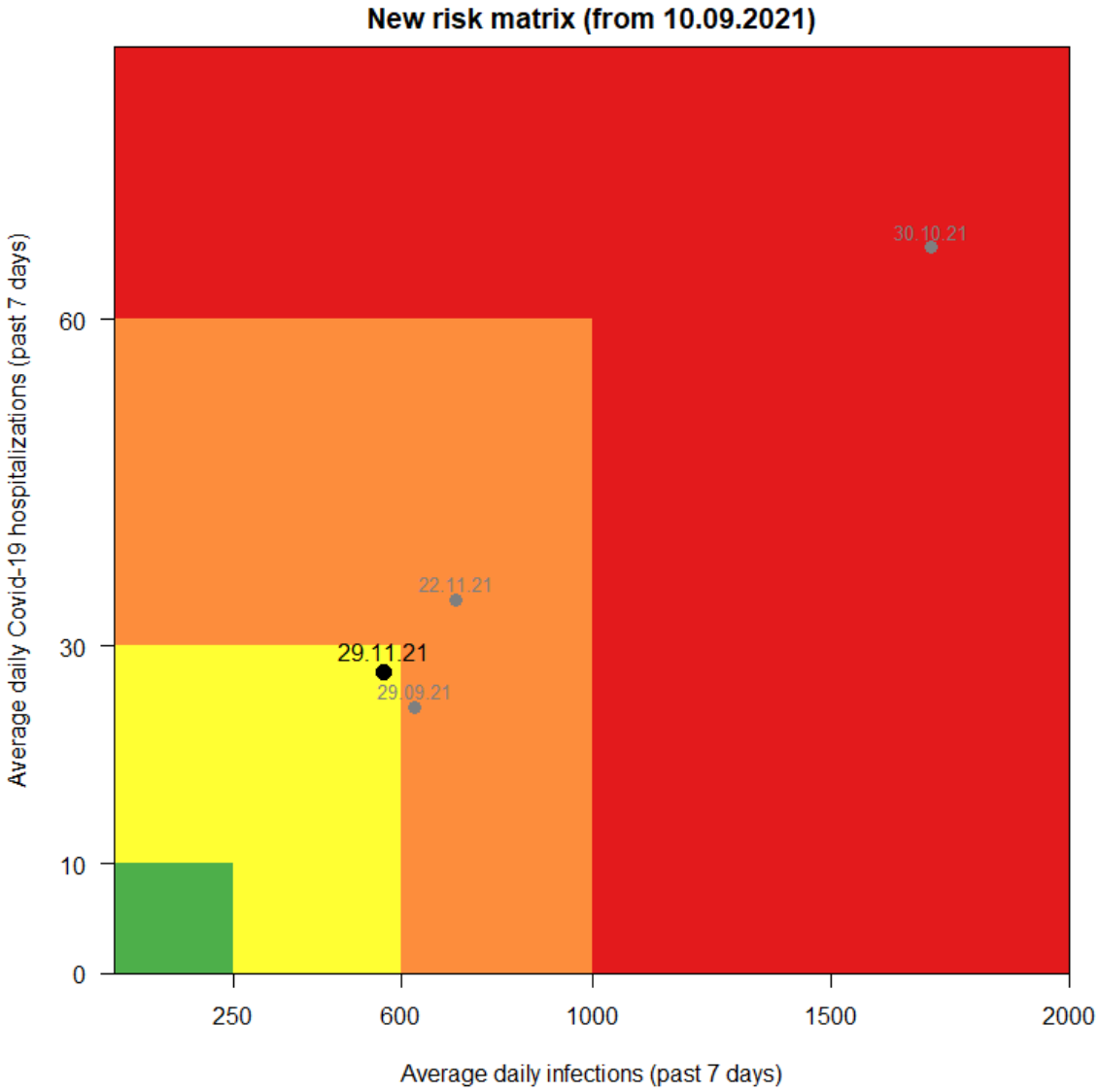

Daily infections per 100000 individuals by vaccination status (01.01-23.11.2021)
Unvaccinated
Fully vaccinated
Partially vaccinated
Infected, unvaccinated (reinfection)
Infected, vaccinated (reinfection)
Average
infections per 100000 person-days
0
50
100
150
200
01.01
06.01
11.01
16.01
21.01
26.01
31.01
05.02
10.02
15.02
20.02
25.02
02.03
07.03
12.03
17.03
22.03
27.03
01.04
06.04
11.04
16.04
21.04
26.04
01.05
06.05
11.05
16.05
21.05
26.05
31.05
05.06
10.06
15.06
20.06
25.06
30.06
05.07
10.07
15.07
20.07
25.07
30.07
04.08
09.08
14.08
19.08
24.08
29.08
03.09
08.09
13.09
18.09
23.09
28.09
03.10
08.10
13.10
18.10
23.10
28.10
02.11
07.11
12.11
17.11
22.11


Hospitalizations due to Covid-19 in 01.09.2021-17.10.2021 per 10000 person-days by vaccination status
unvaccinated
vaccination started
fully vaccinated
Hospitalized per 100000 person-days
0
10
20
30
40
50
60
27
3
4
0
0
5
0
0
26
1
7
44
1
7
84
1
11
111
5
32
128
6
54
116
5
68
146
8
98
0-6
7-11
12-15
16-19
20-29
30-39
40-49
50-59
60-69
70-79
80+
Ratio: unvaccinated/fully vac:
4.9
8.4
14
7.8
5.8
5.2
2.6

Risk matrices as aid for decision-making: infections vs deaths

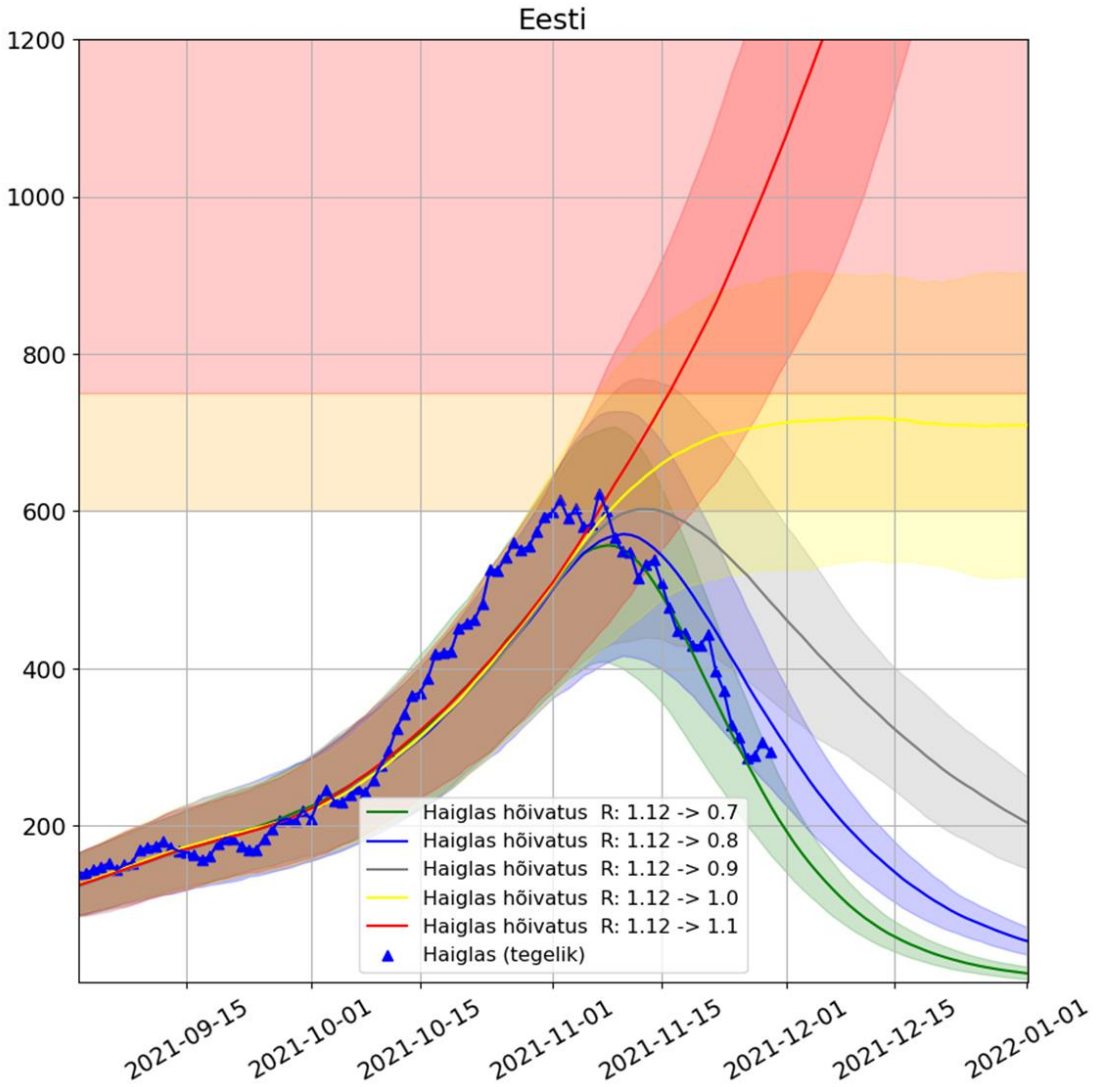


infections vs hospitalizations



Predictive models for hospitalization – a Monte-Carlo based approach (with Mario Kadastik)

Model for hospital occupancy:



Effect of mitigation measures?

RESEARCH ARTICLE

Inferring the effectiveness of government interventions against COVID-19

Jan M. Brauner[1,2,*,†], Sören Mindermann[1,*,†], Mrinank Sharma[2,3,4,*,†], David Johnston[5,6], John Salvatier[6], ...

+ See all authors and affiliations

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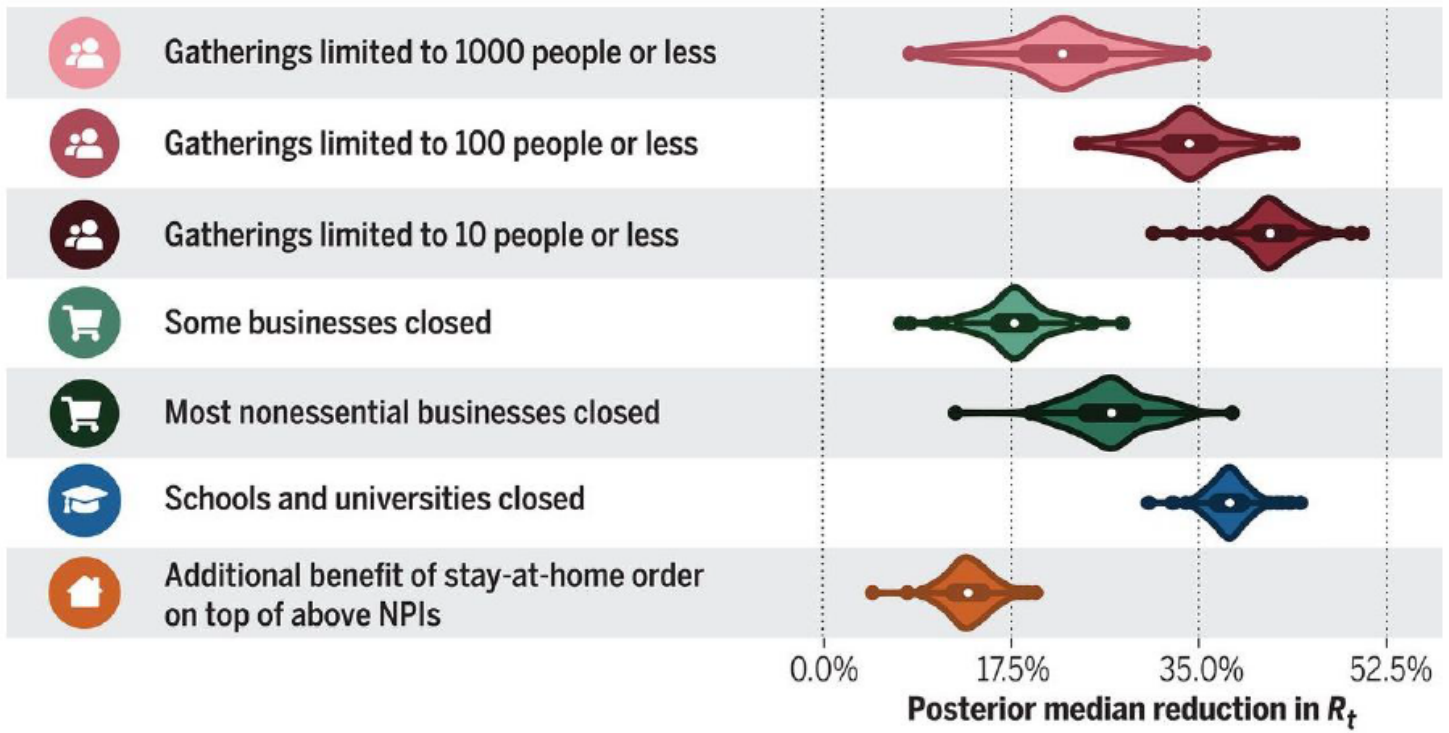
https://science.sciencemag.org/content/371/6531/eabd9338



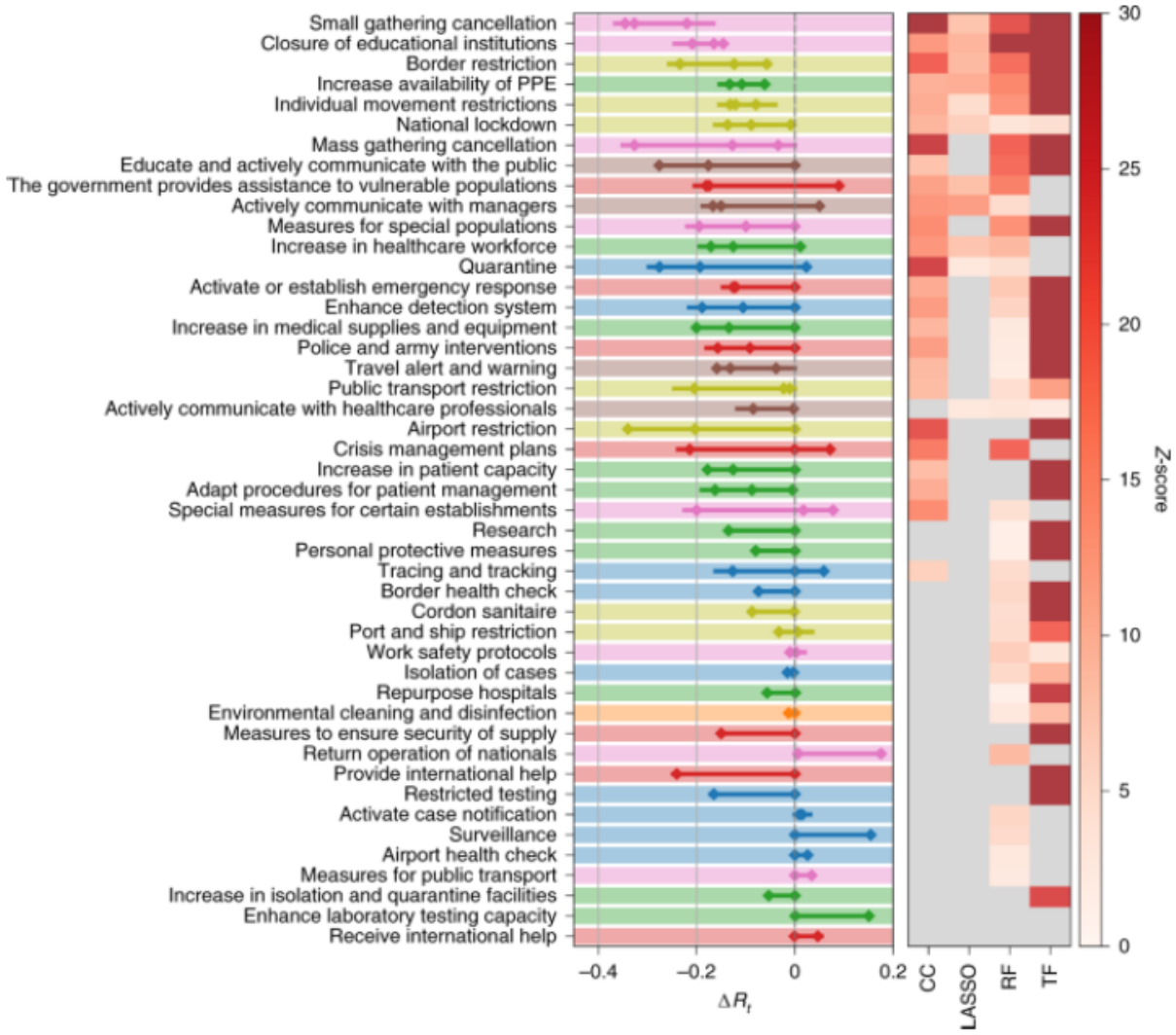
https://www.nature.com/articles/s41562-020-01009-0

Article | Published: 16 November 2020

Ranking the effectiveness of worldwide COVID-19 government interventions

Nils Haug, Lukas Geyrhofer, Alessandro Londei, Elma Dervic, Amélie Desvars-Larrive, Vittorio Loreto, Beate Pinior, Stefan Thurner & Peter Klimek

Nature Human Behaviour **4**, 1303–1312(2020) | Cite this article



Summary

- Scientific communication during the Covid-19 crisis has proven to be challenging and very different from what most of the scientists had been used to before
- More international collaboration is needed not only in data analysis and sharing, but also in sharing efficient communication strategies
- There is always something good in an unfortunate situation – scientists have received much more public attention and appreciation than before

UNIVERSITY OF TARTU

Thank you!

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