COVID-19 in Poland and in the World

Krzysztof Woźniak

- Our World in Data
  https://ourworldindata.org/coronavirus-source-data
  Hasell, J., Mathieu, E., Beltekian, D. et al. A cross-country database of COVID-19 testing. Sci Data 7, 345 (2020)

Epidemies in the past

- Plague of Athens (430 BC) - 25% of population died
- Black Death (1347 to 1351) - plague (pol. dżuma) - **30-60%** of population in Europe (75-200 M)
- Mexico smallpox (pol. ospa prawdziwa) epidemic (1520) - **40%** of population (5-8 M)
- **Spanish flu** (1918-1920) - died **1-6%** of population (17-100 M out of 500-1000 M infected)
- Swine flu pandemic (2009-2010) - est. 700-1400 M, died 284 000 (<0.04%)
- **SARS COV-1** (2002-2004) - 8000 infected, 774 died (~10%)
- **MERS CoV** - camel flu (2012-?) - 2500 cases, 35% died

Spanish flu 1918-1920

- caused by H1N1/09 influenza virus
- typical flu symptoms: fever, headache, sore throat, more severe cases lead to pneumonia, bleeding
- **basic reproduction number ~2.0**
- March 1918 - first case in military camp in Kansas, US
- April 1918 - spread to New York and Western front in France
- August 1918 - start of second wave, especially deadly for younger persons
- January-June 1919 - third wave, also deadly, but not as much as the second wave
- March-April 1920 - fourth wave in some isolated areas
- estimated cases 500 million, deaths 17-100 million
- **fatality: 1-6% of population**

SARS COV-1 2002-2004

- caused by coronavirus SARS-CoV-1 similar to SARS-CoV-2
- symptoms: fever (>38^{o}C, most common), muscle pain, lethargy, cough, sore throat
- Started in November 2002 in Guangdong province, China (near Hong Kong)
- one of super-spreadres was a fishmonger
- later a man from the hospital was in Metropole hotel in Hong Kong and infected 23 persons
- from there virus was carried to Toronto in Canada and Singapore
- in March 2003 WHO issued a global alert about a new infectious disease of unknown origin
- SARS was also transferred to Beijing, Shanghai, Taiwan, Vietnam, US, Philippines
- single cases were found in many other countries including Germany (9), France (7), Sweden (5), UK (4), Italy (4), India (3).
- in May 2004 last infections occurred (in Diarrhea Virus Laboratory in Beijing)

Total number of infected persons is 8110, **fatality rate** in China **6,6%,** in other countries **16,4%**
Detailed contact tracking, quarantines, closing of schools etc. allowed to stop the disease

- caused by betacoronavirus
- symptoms: fever (98%), cough (83%), shortness of breath (72%) and myalgia (32%)
- range: asymptomatic disease to severe pneumonia
- **basic reproduction number estimates: from <1 to 8**
- June 2012 - first patient in Saudi Arabia, so far 1029 infected and 452 deaths were registered
- May 2015 - outbreak in South Korea (186 infected, 36 died)
- numerous cases found in Middle East countries (United Arab Emirates, Jordan, Qatar)
- single persons travelling from Middle East found also in many other countries
- **MERS did not disappear**, also in recent years about 200 cases per year are recorded
- the current numbers are 2519 cases 866 associated deaths - **case-fatality rate: 34.3%** (http://www.emro.who.int/pandemic-epidemic-diseases/mers-cov/mers-situation-update-january-2020.html)

- caused by H1N1/09 influenza virus very similar to that which was responsible for Spanish flu
- typical flu symptoms: fever, "dry cough", headache, muscle or joint pain, sore throat, chills, fatigue, and runny nose
- **basic reproduction number - 1.75**
- April 2009 - new variant of virus was found in Mexico
- June 2009 - WHO announced new flu pandemic
- November 2009 - new vaccine available in 3 000 000 000 doses, but the pandemic started to decrease
- All EU countries, but Poland, bought new vaccine, but it was used by small fraction of population (5% in France, 4% in Italy, 10% in Germany)
- August 2010 - end of pandemic announced
- confirmed cases 490 000, estimated 700 million to 1 400 million
- confirmed deaths 18 449, estimated 284 000
- **fatality: 0.01–0.03%**

- seasonal flu infects similar or higher number of people, also fatality is sometimes higher (it is <0.1%)

Comparison SARS CoV-2, SARS CoV-1, flu

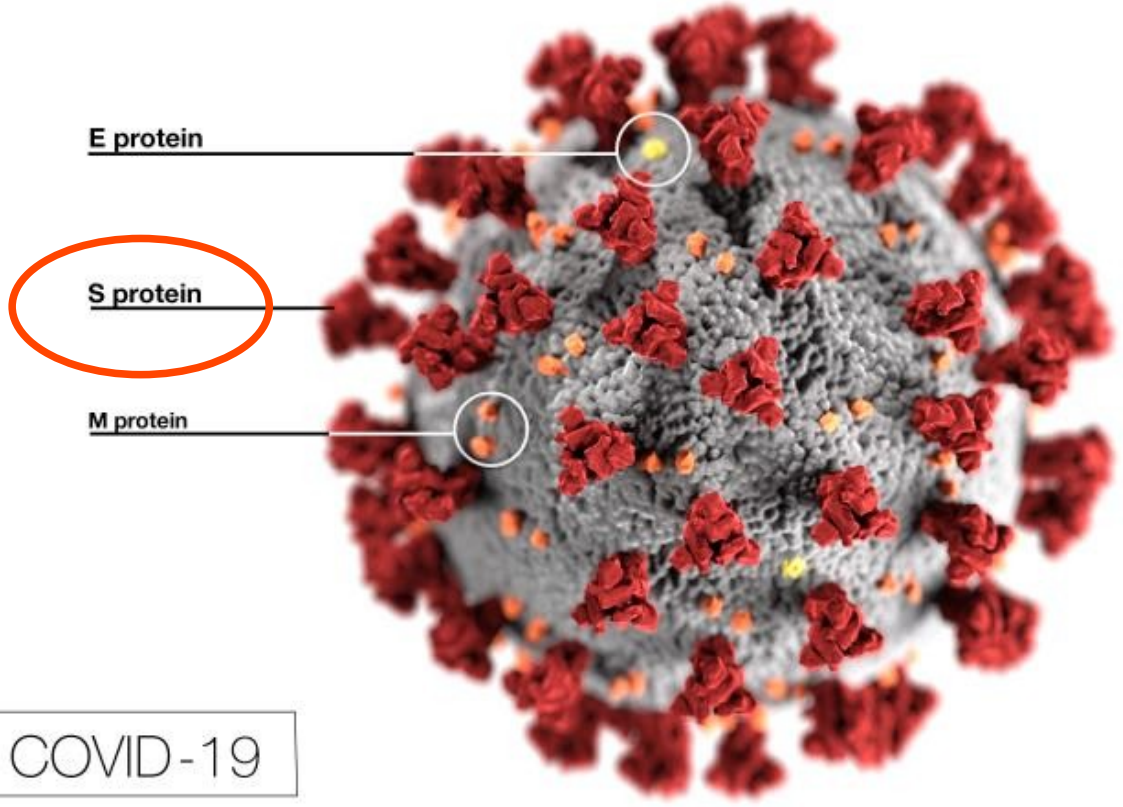
	SARS CoV-2	SARS CoV-1	flu 2018	flu 2009
R_0	2.5	2.4	2.0	1.7
Incubation period	**4-12**	2-7	unkn.	2
Maximal infectivity - incubation period	0	5-7	2	2
patients in hospitals	~20%	>70%	few	few
patients in intensive care	1/16 000	40%	unkn.	1/104 000

- large fraction of patients in hospital is a big problem for health care system
- long incubation period and maximal infectivity at the time of incubation make for CoV-2 tracking and quarantining more difficult than CoV-1
- SARS CoV-1 could be easier stopped as maximal infectivity was a few days after first symptoms

https://www.thelancet.com/journals/laninf/article/PIIS1473-3099(20)30484-9/fulltext

S proteins form a "corona"
play role in attaching a virus to a human cell
and can be detected by immunological system

virus RNA (Ribonucleic acid) is inside the grey membrane



Public Health Image Library (PHIL)
https://www.cdc.gov/media/subtopic/images.htm

Development of epidemic

- **R_0 - basic reproduction number** (also: reproduction ratio, reproductive rate)
  number of people which are infected by one already infected person (assuming that all people in a society are susceptible to infection)
  epidemic can start only when $R_0 > 1$
- **incubation period** - time between contact (thus infection) and first symptoms
- **latent period** - time between infection of a person and the moment when this person becomes infectious

- example for $R_0=2$, latent period = 7 days (previously infected persons can be infected again):
  - day 0 - one person infected
  - week 1 - two new persons infected
  - week 4 - 16 new cases
  - week 9 (2 months) - 512 new cases
  - week 18 (4 months) - 262 000 new cases
  - week 27 (6 months) - 537 000 000 new cases
  - week 31 (7 months) - 8 590 000 000 new cases (~all people on Earth)

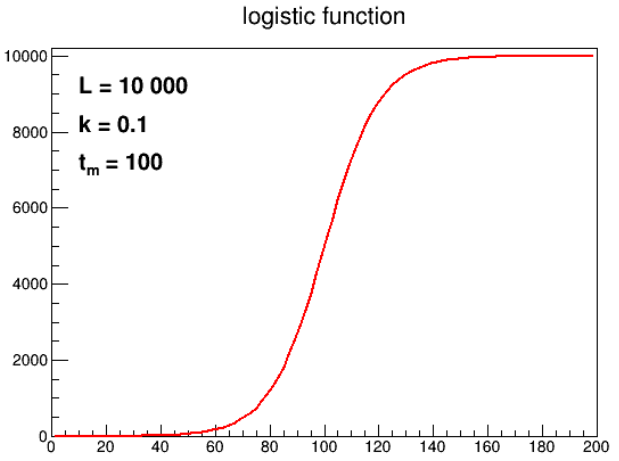
Obviously, R_0 depends on time (and decreases) thus exponential grows usually changes to a more moderate, mostly because infected persons become immune to a second infection (or die), but also because changes in behaviour (contacts become less frequent, quarantines)

Development of epidemic

- real epidemic evolution (total number of infected persons) usually can be described by **logistic function**

$$f(t) = \frac{L}{1 + e^{-k(t - t_m)}}$$

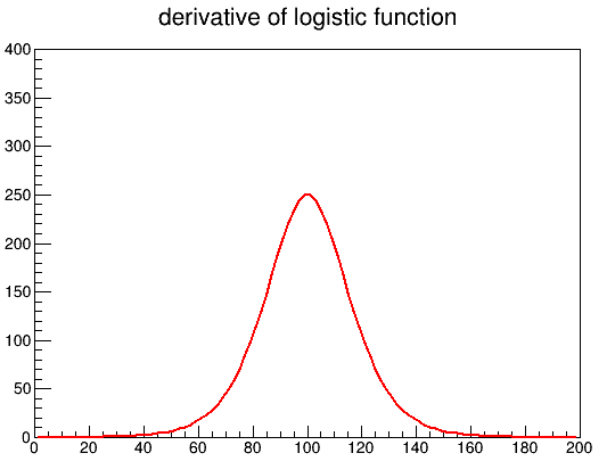
were **L** represents the final number of infected people, $\mathbf{t_m}$ is the time at which $f(t_m) = L / 2$, and **k** represents the logistic growth rate



- derivative of logistic function (representing the number of new cases) has a maximum at t_m
- the more realistic models explicitly take into account reduction of the number of susceptible persons (**S**) in a population (**N**), for example **SIR model**:

$$\frac{dS}{dt} = -\frac{\beta I S}{N}$$

where **I** is the number of infected persons and β is the number of contacts * probability of infection



Development of epidemic

Epidemic starts to decrease in two cases

- naturally, when the population reaches **herd immunity**, i.e. the fraction of immune persons **P** becomes

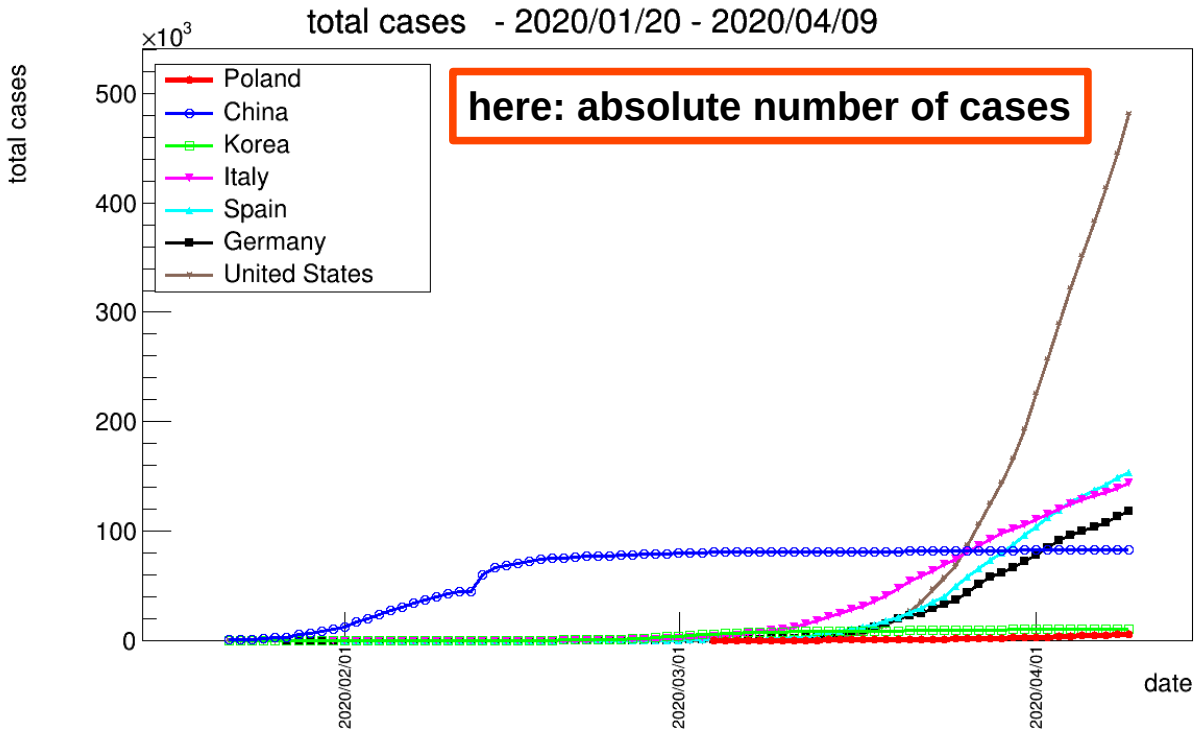
$$P > 1 - \frac{1}{R_0}$$

- some preventive measures lead to decrease R_0 below 1:
  - decrease of the number of contacts of infected (or all) persons (quarantines, lockdowns)
  - decrease of probability of infections

Three strategies:

- China, some other countries in East Asia:
  decrease R_0 at any cost to fully stop the epidemic
- most of the other countries:
  keep R_0 below 1 or close to 1 without implementing drastic measures, waiting for a vaccine
- Sweden:
  keep isolated only most vulnerable persons, let other to be infected to reach herd immunity in a natural way

SARS CoV-2 epidemic at the beginning



Asia:
- **China**
- **South Korea**
- **cruise ship**

Europe:
- **Italy**
- **Spain**
- **Germany**

USA

- real epidemic starts in China in the end of January 2020, practically ends in March 2020
- Italy was first in Europe (March 2020) followed by Spain, Germany
- rapid increase of the number of cases in US, starting mid-March 2020

SARS CoV-2 epidemic measures

Indicators of the epidemic dynamics

Number of **new infection cases** from tests:

- testing of all contacts needed, not always possible
- people may avoid testing, if they have mild symptoms (or none)
- with large number of test false positive tests become important

Number of **new death** cases:

- persons, who died without a test not counted
- only direct death reason (heart attack etc.) reported for infected persons
- large fluctuations (much fever cases than infection cases, mortality ~1%)

Number of **hospital patients**

- delayed, as patients usually admitted a few days after first symptoms
- different selection of hospital patients in different countries
- very important if health care system becomes saturated

SARS CoV-2 tests

Three types of tests:
- **molecular** (PCR, RT-PCR)
- **antigen**
- **antibody** (IgG, IgM)

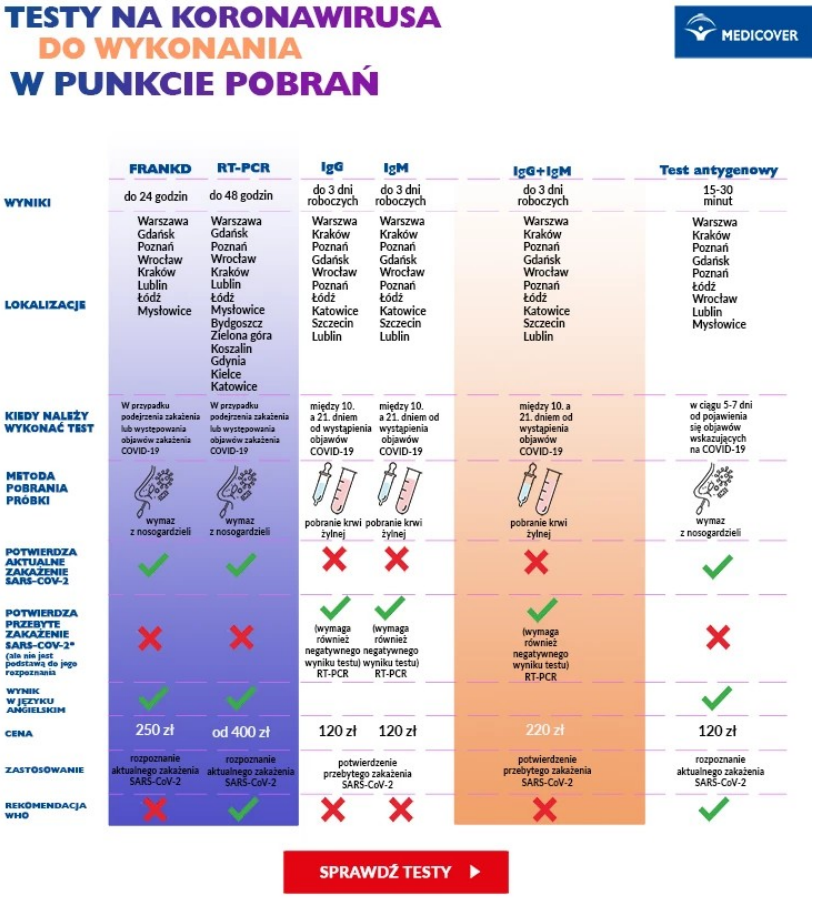
Key parameters:
- **sensitivity** - identification of infection true positive fraction
- **specificity** - true-positive ratio

only RT-PCR is used to confirm infection
actual sensitivity depends on the number of collected viruses RNA, so it is not sensitive just after infection
specificity is 100% (claimed)

https://www.medicover.pl/koronawirus/test/

SARS CoV-2 tests

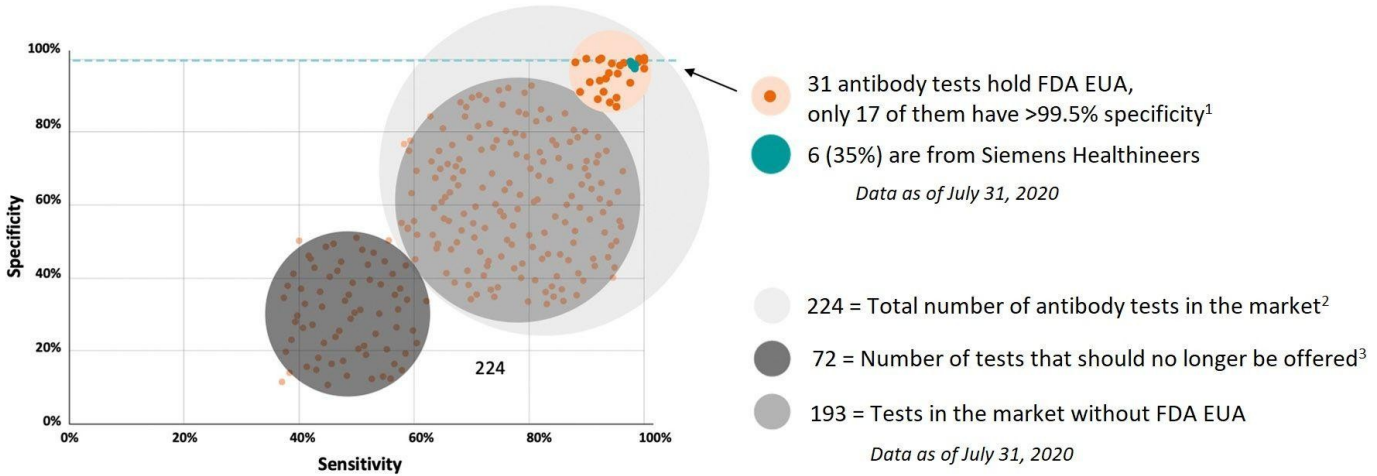
- **RT-PCR test** is most expensive and require about 24 hours
- **antigen tests** are fast (15-30 minutes), less expensive, but not very sensitive and give sometimes false positive results
- **antibody tests** require more time, confirm **earlier infection** (IgM - recent infection, IgG - infection in the past)



https://www.medicover.pl/koronawirus/test/

SARS CoV-2 tests

- antigen tests sensitivity and specificity



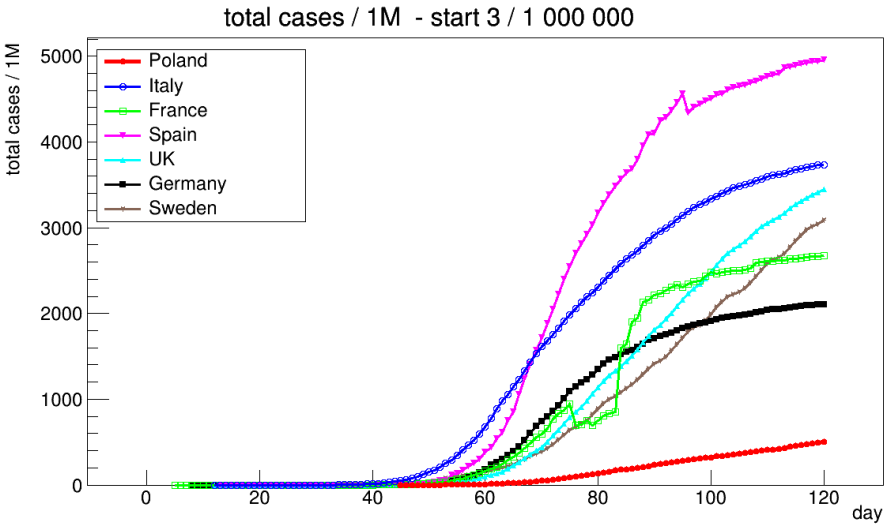
1. https://www.fda.gov/medical-devices/emergency-situations-medical-devices/eua-authorized-serology-test-performance
2. https://www.fda.gov/medical-devices/emergency-situations-medical-devices/faqs-testing-sars-cov-2#offeringtests
3. https://www.fda.gov/medical-devices/emergency-situations-medical-devices/faqs-testing-sars-cov-2#nolonger

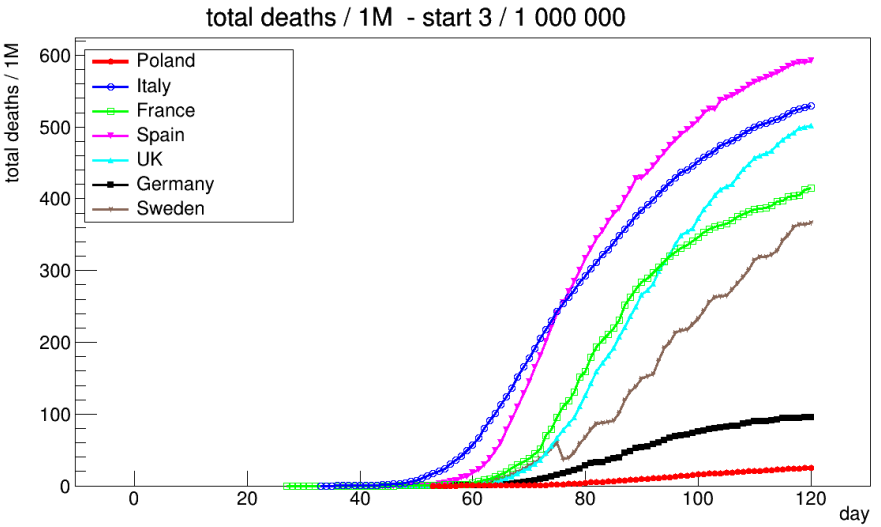
https://www.siemens-healthineers.com/laboratory-diagnostics/assays-by-diseases-conditions/infectious-disease-assays/specificity-matters

SARS CoV-2 epidemic at the beginning

Europe: big countries

numbers scaled to 1 million of citizens
day0: when 3 cases per 1 M were found



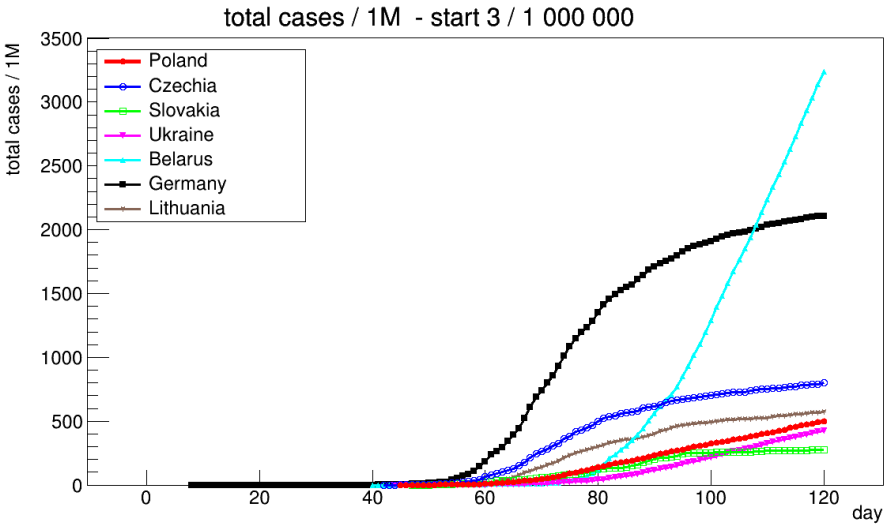


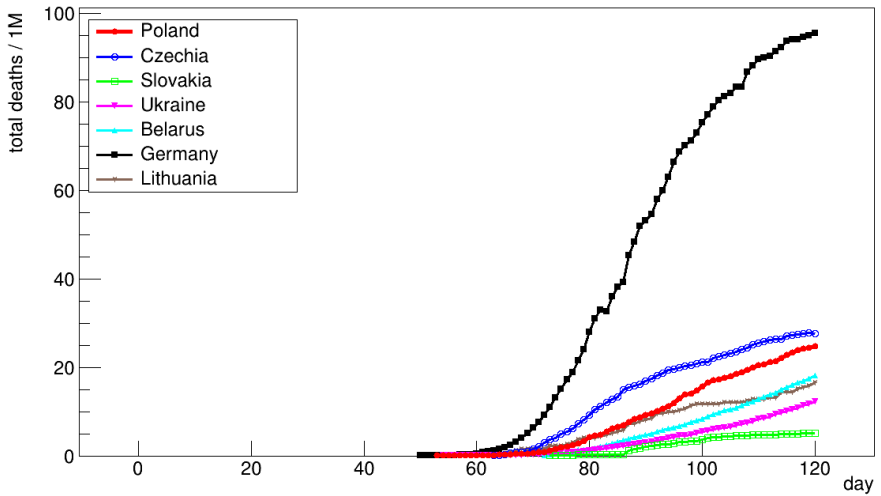
- in all big European countries fast increase of the number of cases about 60 days after finding first few cases (the very first case can be a few weeks earlier)
- the death rate of ~1% follows the infections, with 1-2 weeks delay
- much lower death rate in Germany

SARS CoV-2 epidemic at the beginning

Poland and neighbours

numbers scaled to 1 million of citizens
day0: when 3 cases per 1 M were found



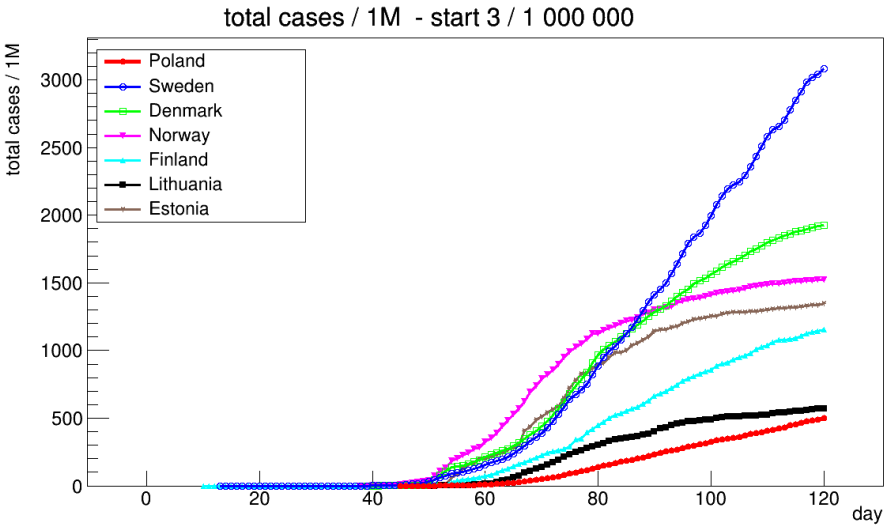


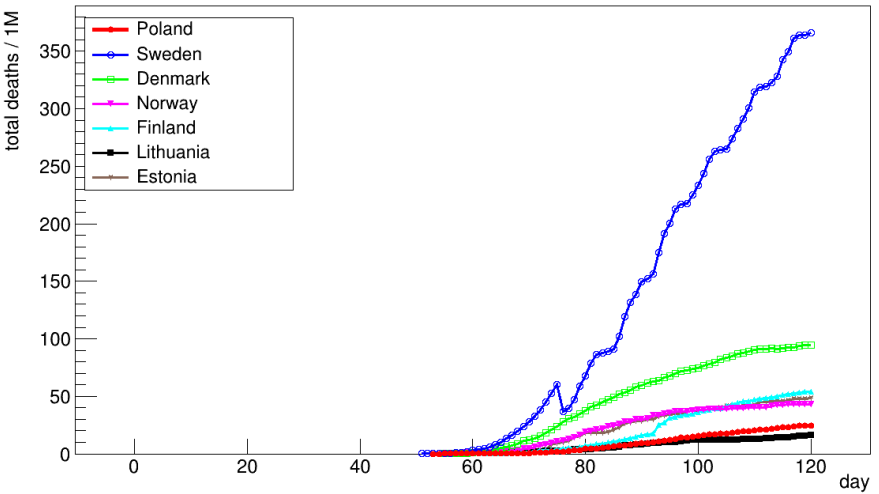
- in the neighbours of Poland similar trends observed, with exceptions:
- Germany: much more infections and deaths
- Belarus: rapid increase of infections starting at day 80

SARS CoV-2 epidemic at the beginning

Northern Europe

numbers scaled to 1 million of citizens
day0: when 3 cases per 1 M were found



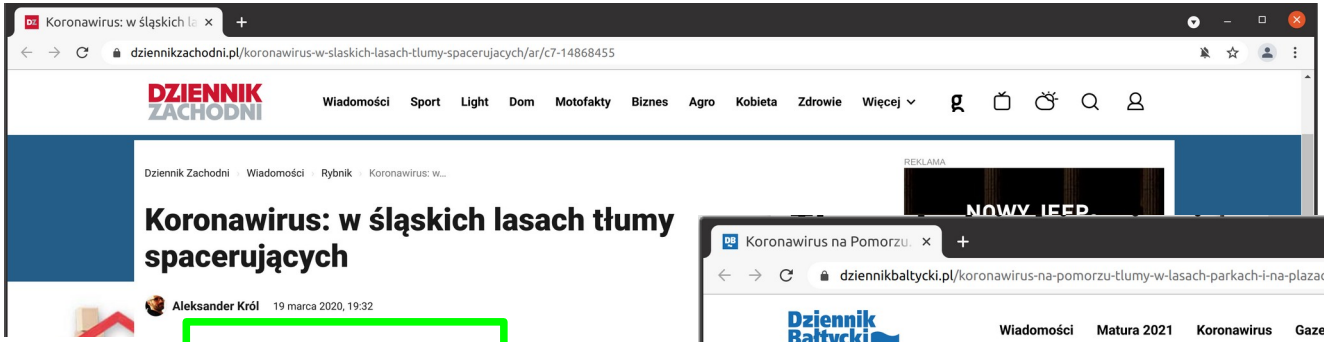


- in Northern Europe countries more cases and deaths than in Poland,
- Sweden "leading" in infections and especially deaths

First months of 2020 - increasing fear

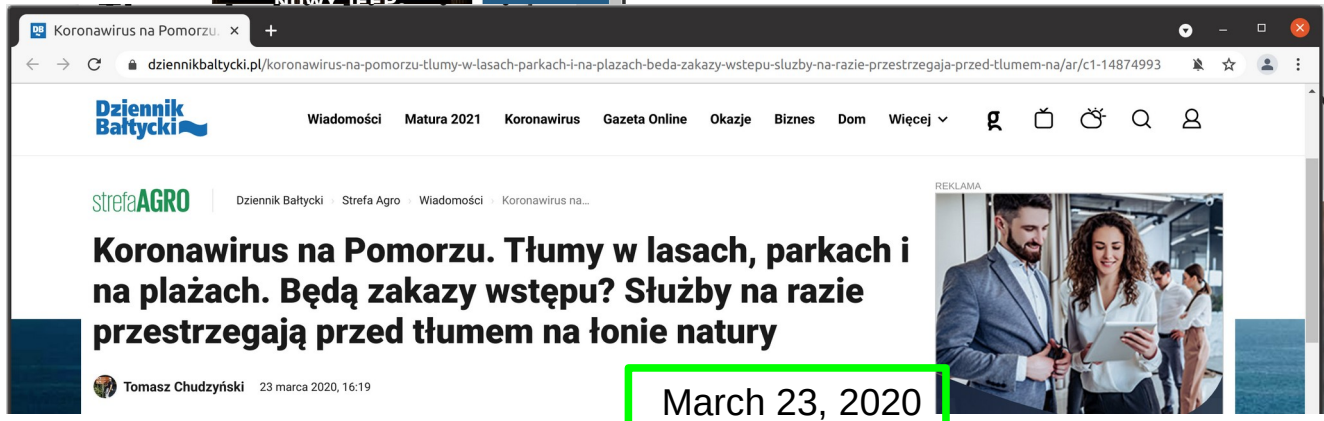
- **Attempts to introduce lockdown like in China**
- **Lack of equipment (masks, protective suits, respiratory devices)**
- **Contradictory recommendations from experts**

Crowds in forests



March 19, 2020

https://dziennikzachodni.pl/koronawirus-w-slaskich-lasach-tlumy-spacerujacych/ar/c7-14868455



March 23, 2020

https://dziennikbaltycki.pl/koronawirus-na-pomorzu-tlumy-w-lasach-parkach-i-na-plazach-beda-zakazy-wstepu-sluzby-na-razie-przestrzegaja-przed-tlumem-na/ar/c1-14874993

March 24, 2020

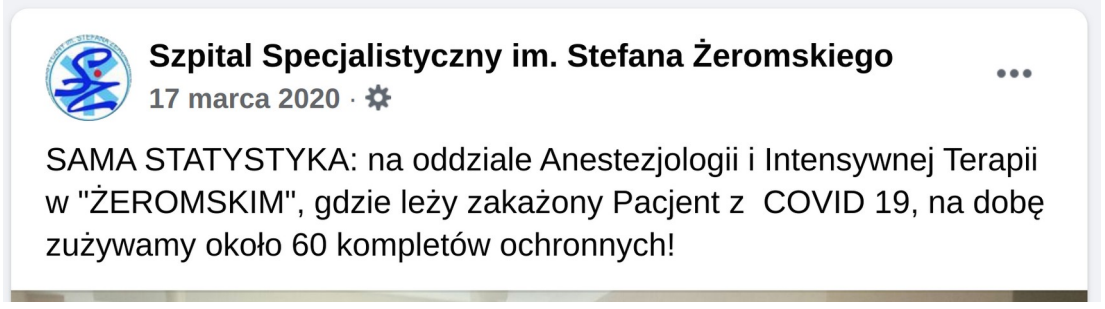
https://wiadomosci.radiozet.pl/Polska/Warszawa/Ursynow-tlumy-ludzi-zbieraja-sie-w-Lesie-Kabackim-Radny-chce-wprowadzic-zakaz-wstepu

ENTRANCE TO THE FOREST PROHIBITED

(April 2020)

Lack of equipment

STATISTICS: In Żeromski Hospital, where one infected patient is treated, 60 protective suits are used each day!

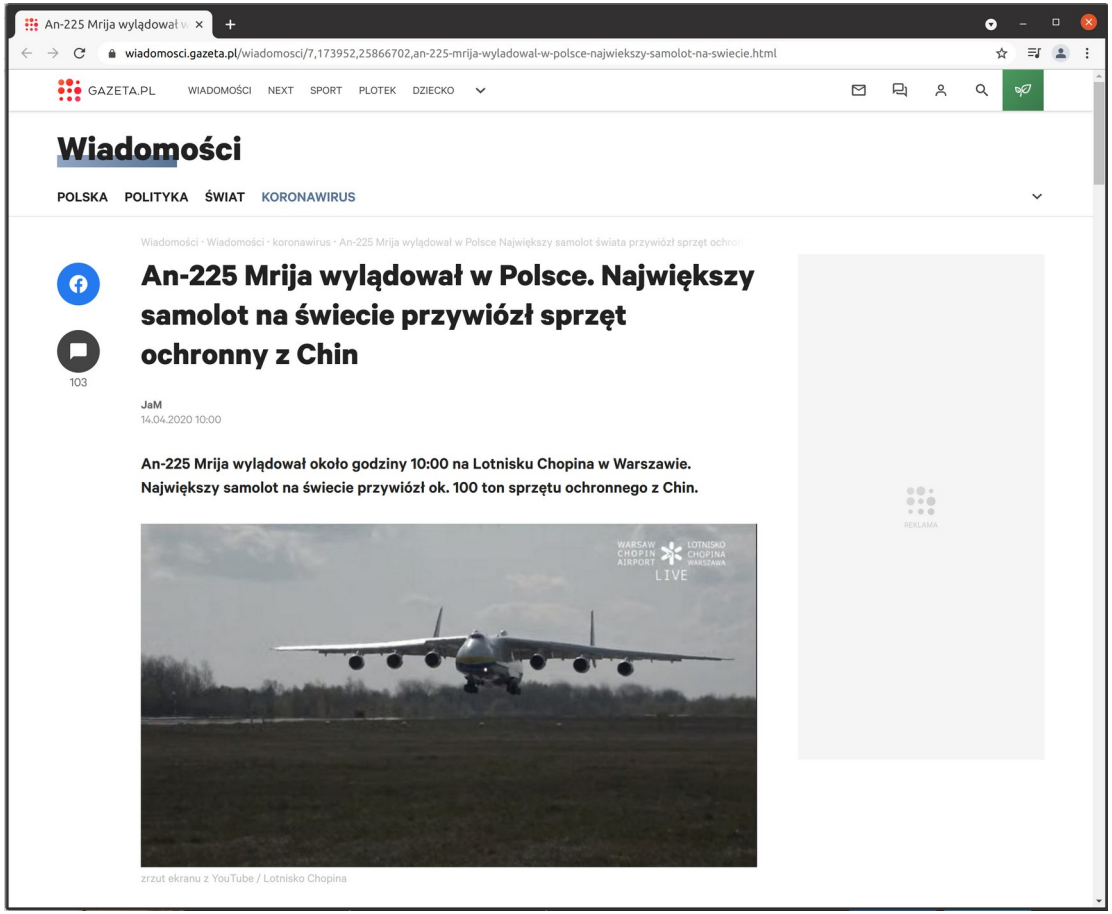


Race to buy protective equipment in 2020

An-225 Mrija landed in Poland. The largest airplane in the world delivered protective equipment from China

(4.06.2021)

The cost and quality of this equipment was later questioned.

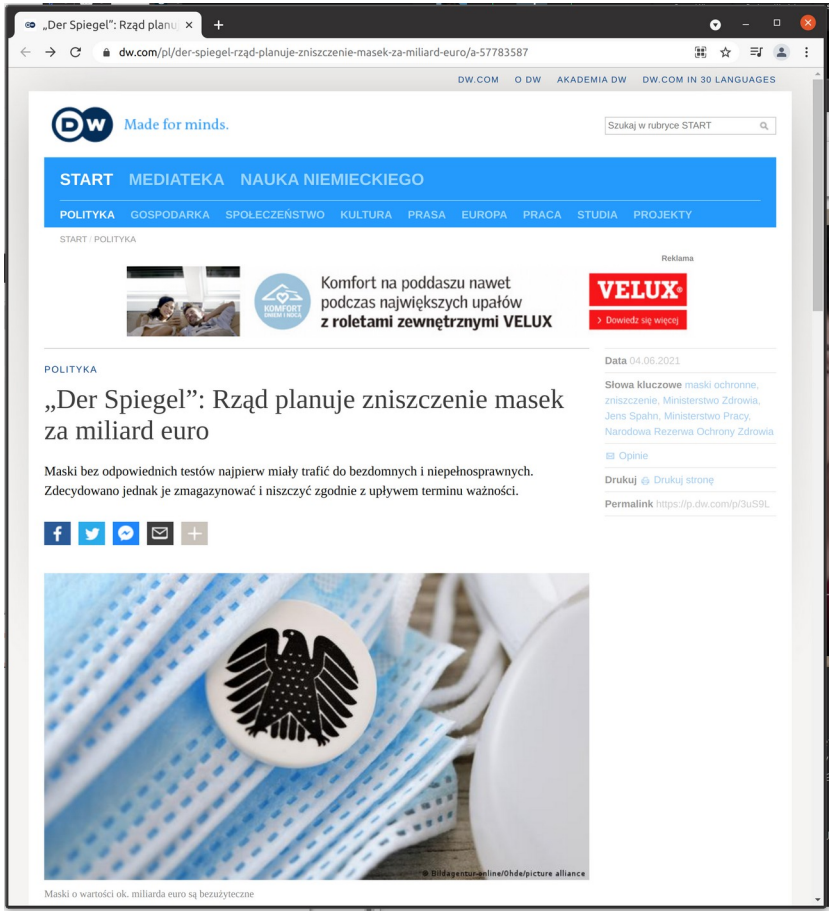


https://wiadomosci.gazeta.pl/wiadomosci/7,173952,25866702,an-225-mrija-wyladowal-w-polsce-najwiekszy-samolot-na-swiecie.html

Race to buy protective equipment in 2020

German government plans to destroy unused protective masks worth 1 billion euro

masks bought in spring 2020 lacked laboratory tests, can not be officially distributed and will be kept until their validity date ends
(4.06.2021)



Deutche Welle:
https://www.dw.com/pl/der-spiegel-rz%C4%85d-planuje-zniszczenie-masek-za-miliard-euro/a-57783587

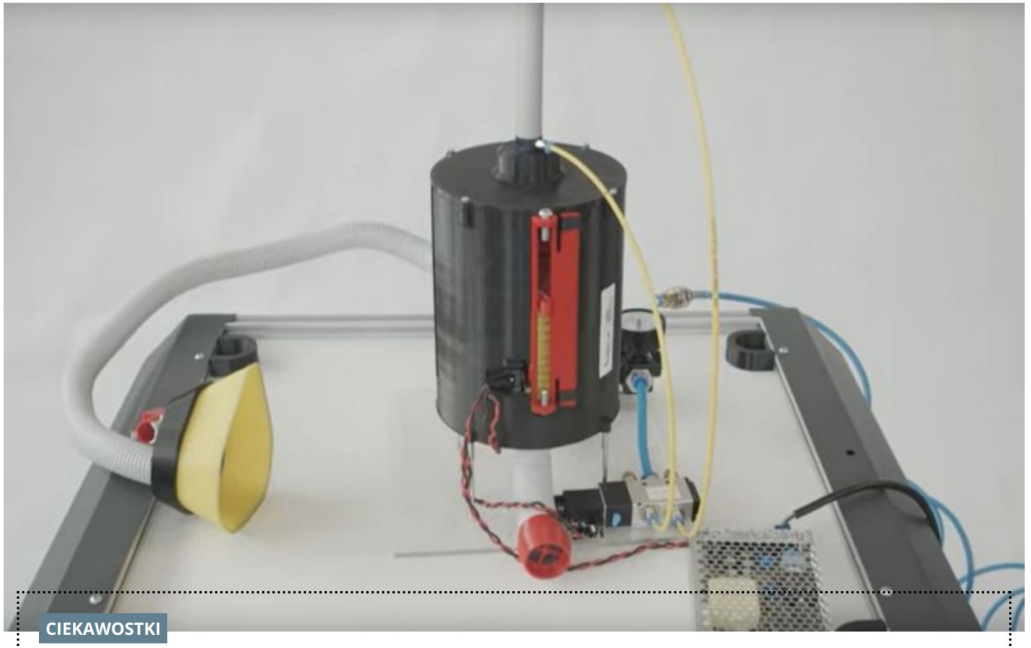
False or unconfirmed beliefs and recommendations

Simple and inexpensive ventilators can help patients with COVID-19

- ventilators treated as the most desired equipment in the fight with COVID-19
- projects of ventilation machines with parts from 3D printers emerged in early days of pandemic

but unfortunately

- proper adjustment of air pressure is crucial for patients
- even using professional devices 60-90% patients treated this way die



CIEKAWOSTKI

Polscy inżynierowie opracowali VentilAid - respirator z drukarki 3D za 200 zł

26 marca 2020

https://www.benchmark.pl/aktualnosci/respirator-z-drukarki-3d-za-200-zl-wynalazek-polakow-uratuje-swia.html

False or unconfirmed beliefs and recommendations

COVID-19 spreads through contaminated surfaces

Recommendations:

- wearing disposable gloves
- disinfection of everything with 70% alcohol
- quarantine of books in libraries

This week, the C.D.C. acknowledged what scientists have been saying for months: The risk of catching the coronavirus from surfaces is low.
(April 8, 2021)

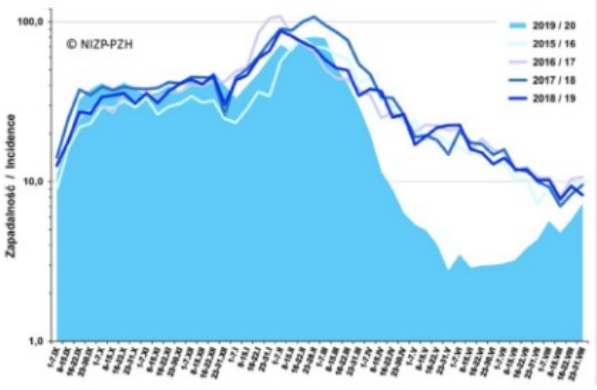
https://www.nytimes.com/2021/04/08/health/coronavirus-hygiene-cleaning-surfaces.html?smid=em-share

False or unconfirmed beliefs and recommendations

Flu vaccination crucial in fight against COVID-19

- in fact in 2020/2021 fewer flu cases than COVID-19 cases

https://oko.press/szczepionki-przeciwko-grypie-ministerstwo-zdrowia-nie-zamawia/



Przeczytaj także:

Szczepionki przeciw grypie będą kluczowe, a rząd umywa ręce. Miliony Polaków bez szans na szczepienie

8 WRZEŚNIA 2020

False or unconfirmed beliefs and recommendations

Tuberculosis vaccination protects against COVID-19

- first half of 2020: lower infection numbers in countries with tuberculosis vaccination programmes
- later in 2020/2021 the spread of COVID-19 in these countries similar to overall trends

False or unconfirmed beliefs and recommendations

Drugs which might prevent/cure COVID-19 illness

- remdesivir (recommendation against: weak)
- hydroxychloroquine (against: strong)
- amantadine (studied in Poland)
  (https://www.bmj.com/content/370/bmj.m3379)

Foto: Bernard Chantal / Shutterstock

False or unconfirmed beliefs and recommendations

There are many asymptomatic cases

Results of studies:

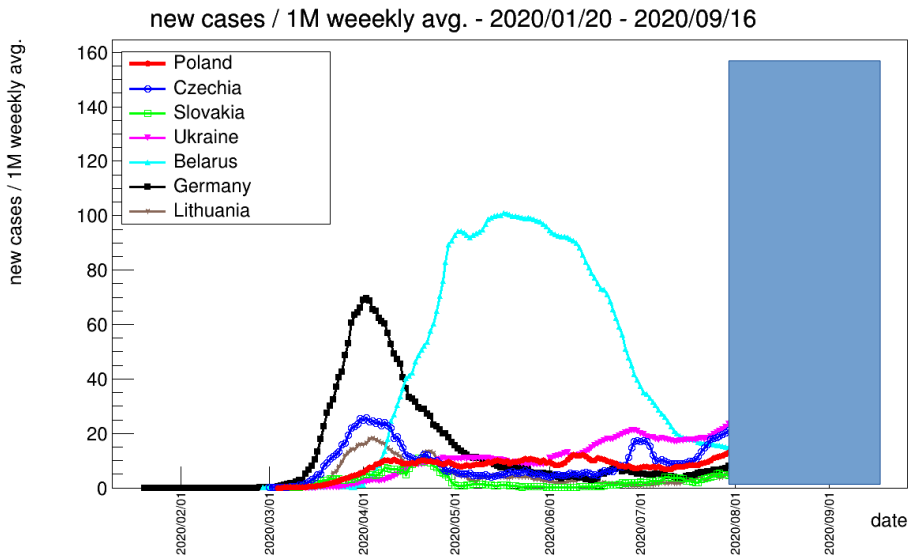
- **estimates based on IgG antibody test**
  ~80% of COVID-19 cases are asymptomatic
- **direct analysis of persons with positive RT-PCR test**
  ~20% cases are asymptomatic
  https://www.bmj.com/content/371/bmj.m4851

The later however does not account for people, who had mild symptoms and were never tested

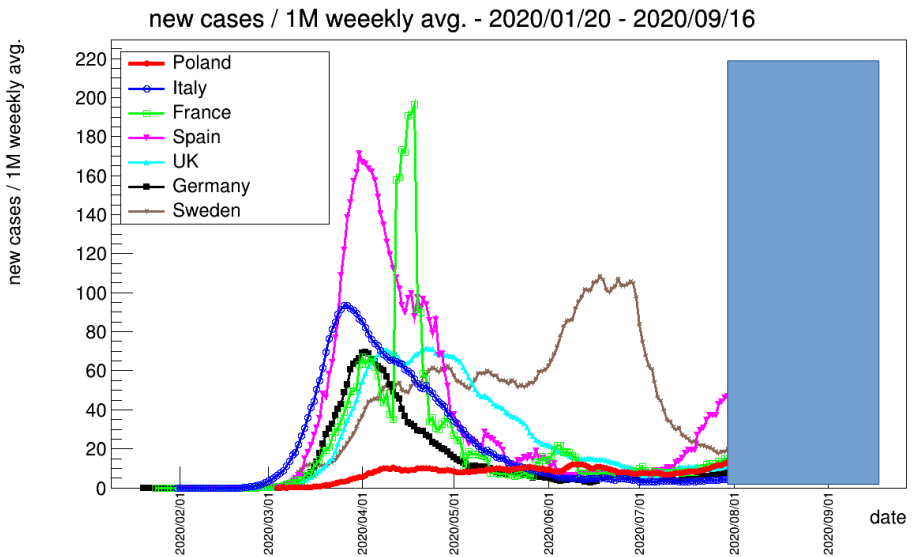
Status in the end of summer 2020

number of new COVID-19 cases

Poland and neighbours



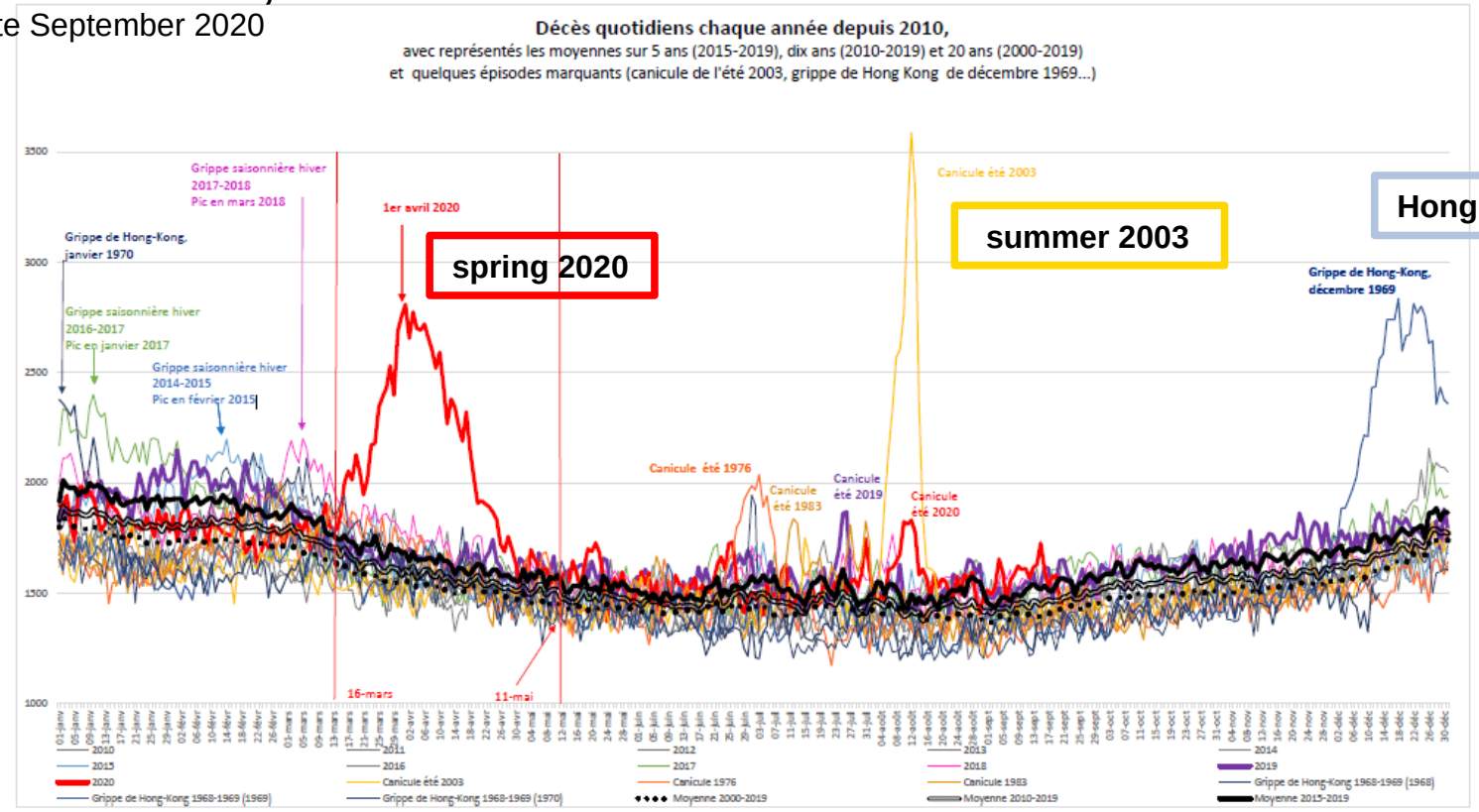
Europe: big countries



- everywhere a minimum in July

Deaths in France,

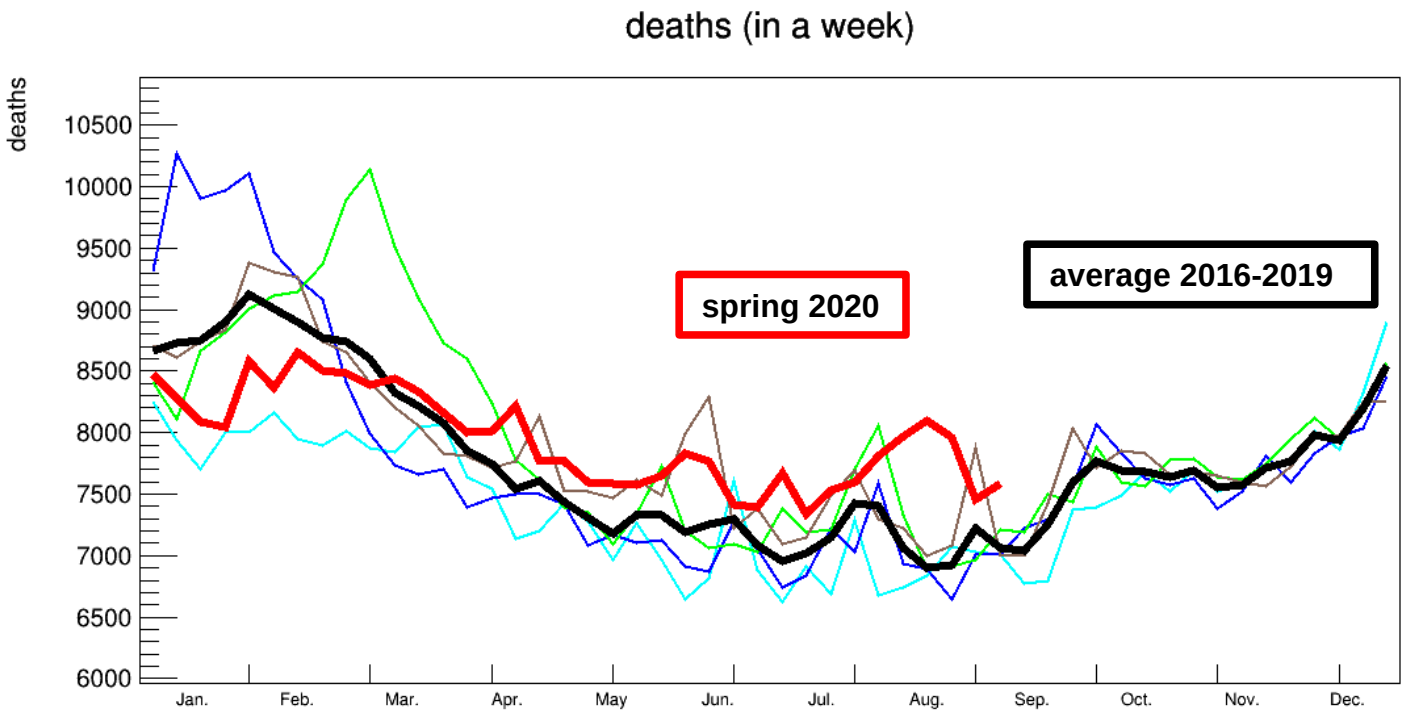
update September 2020



https://blog.insee.fr/statistiques-sur-les-deces-le-mode-demploi-des-donnees-de-linsee-en-7-questions-reponses/

Deaths in Poland,

till September 2020

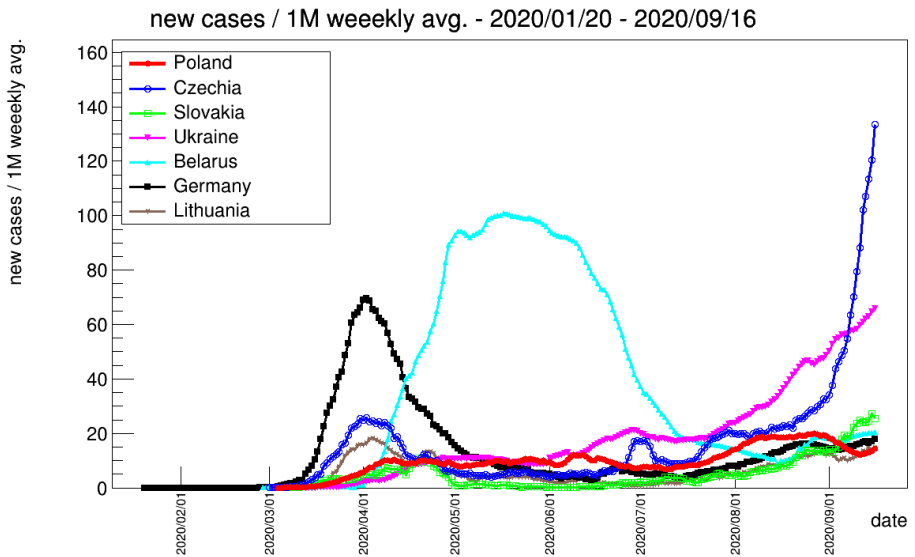


https://dane.gov.pl/pl/dataset/1953,liczba-zgonow-zarejestrowanych-w-rejestrze-stanu-cywilnego

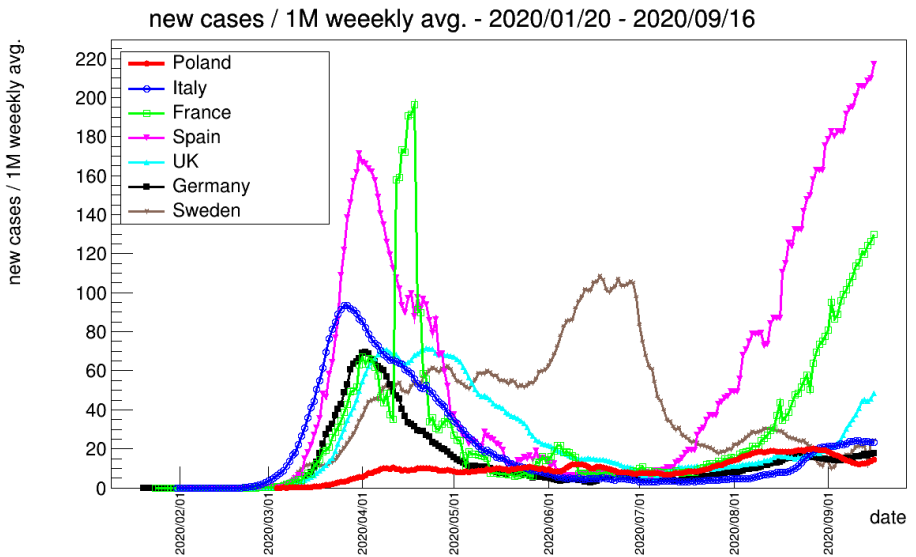
Start of the "second wave"

number of new COVID-19 cases

Poland and neighbours



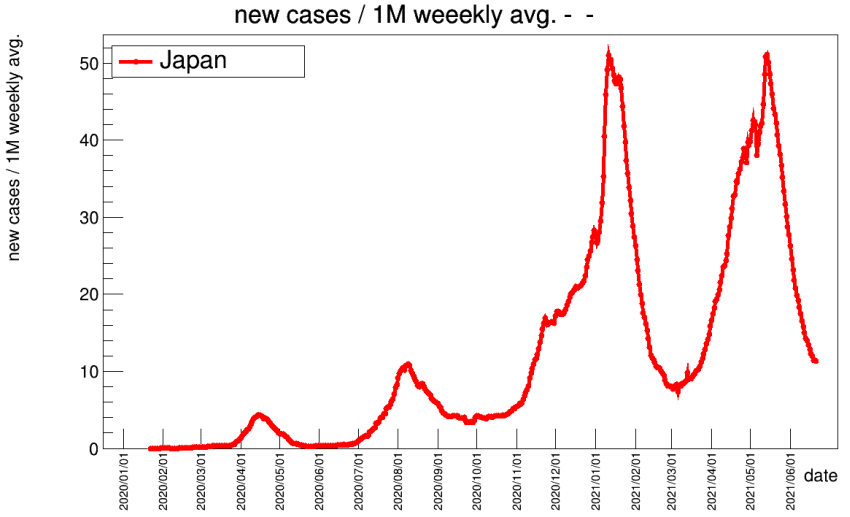
Europe: big countries

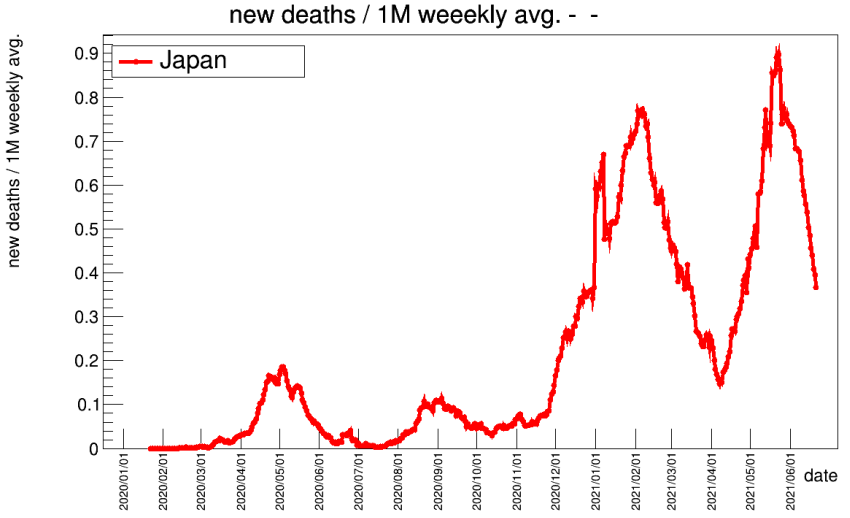


- everywhere a minimum in July
- significant increase only in Spain (August) and Czechia (in September)
- in Poland: some decrease of cases in September

Examples - Japan

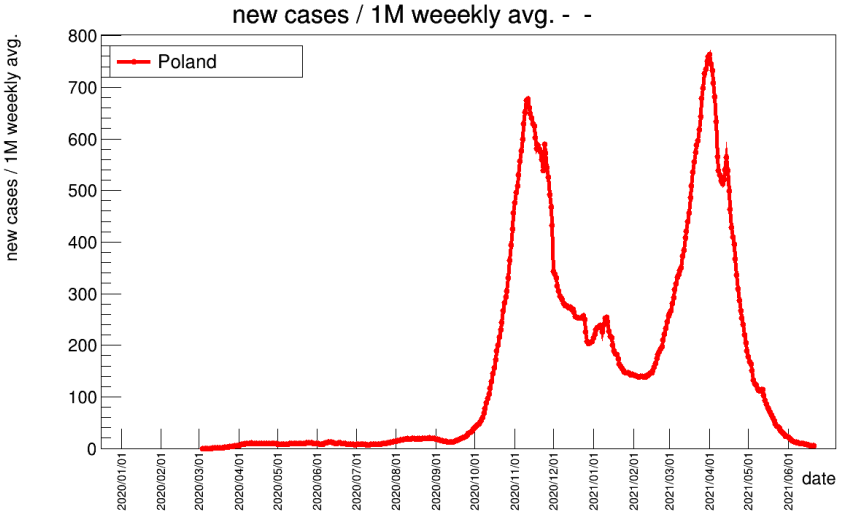
- **clear four waves: April, August (2020) January, May (2021)**
- **deaths maximum 2-4 weeks after infections maximum**

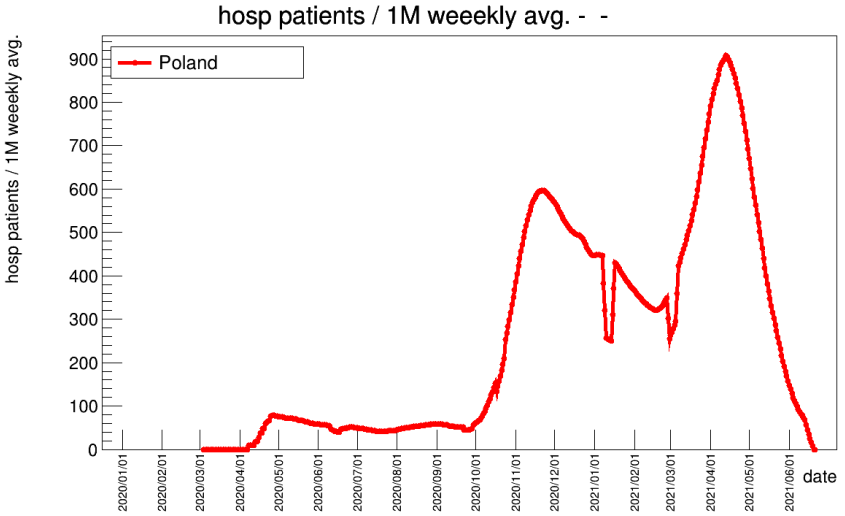


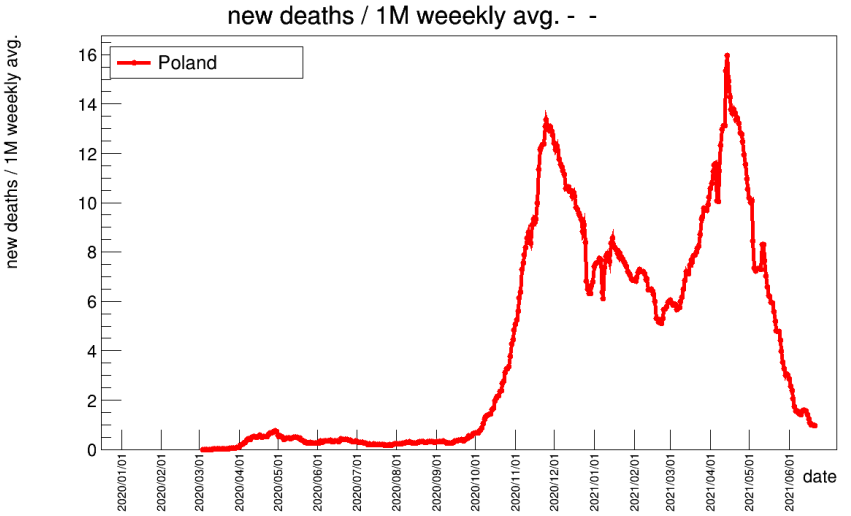


Examples - Poland

- **significant only second (November 2020) and third (April 2021) wave**
- **more patients in the third wave - probably more places in hospitals**

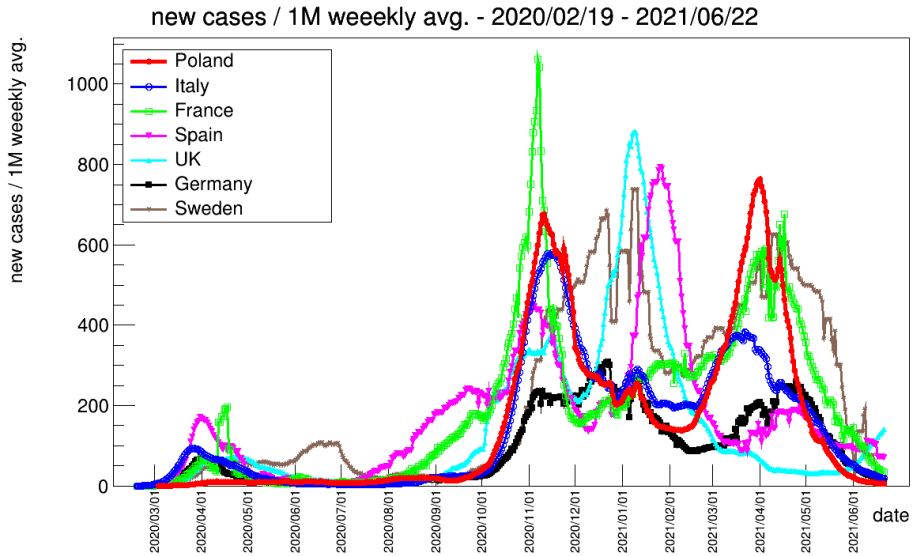


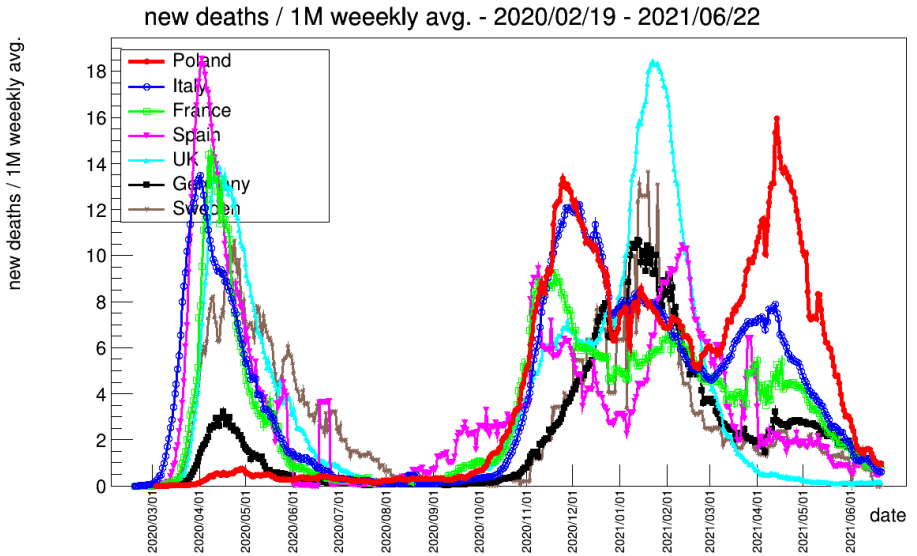




Epidemic development

Europe: big countries

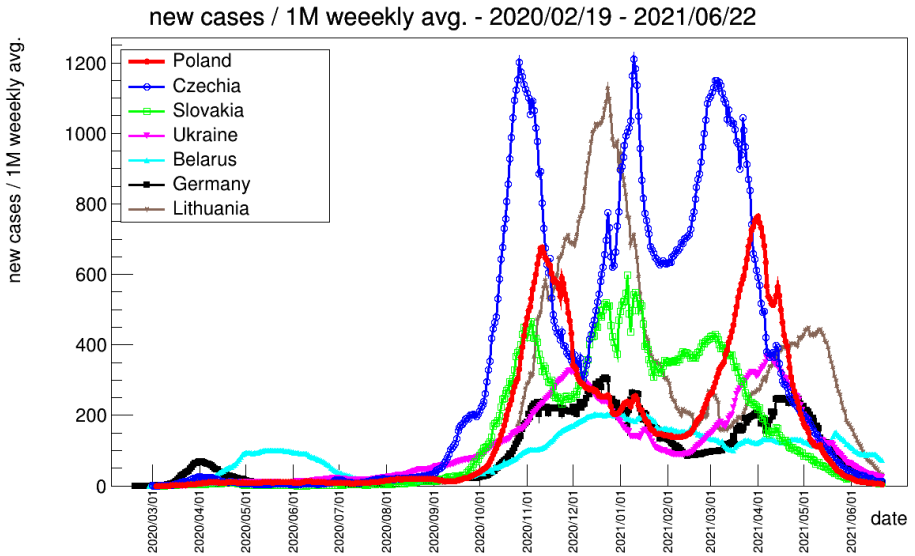


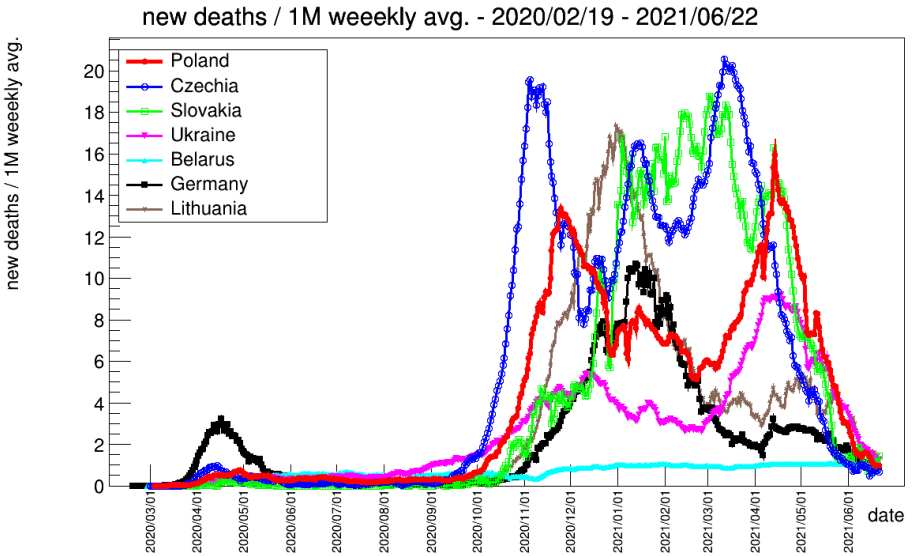


- in Poland: negligible first wave, but large second and third wave
- more deaths/cases in the first wave - insufficient testing?
- second wave in Germany and UK delayed
- fast decrease of COVID-19 cases in UK in spring - more advanced vaccination

Epidemic development

Poland and neighbours

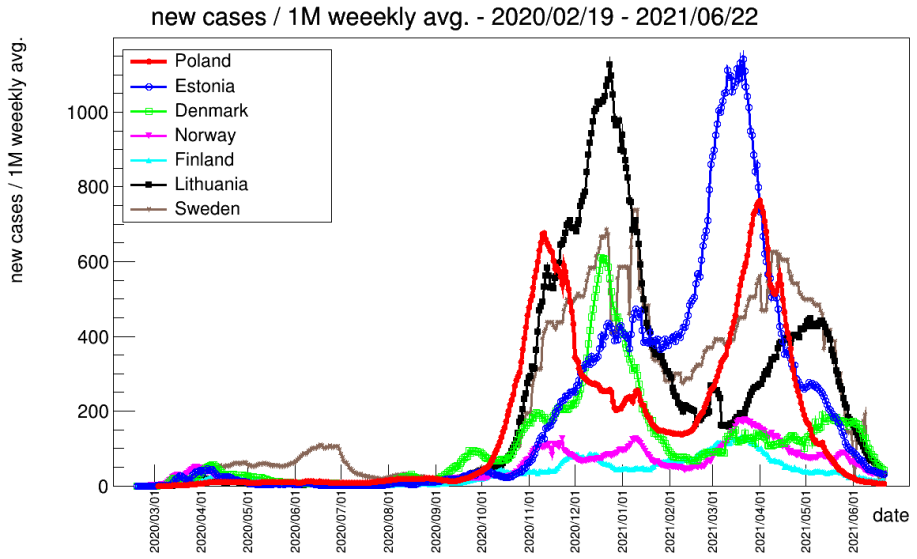


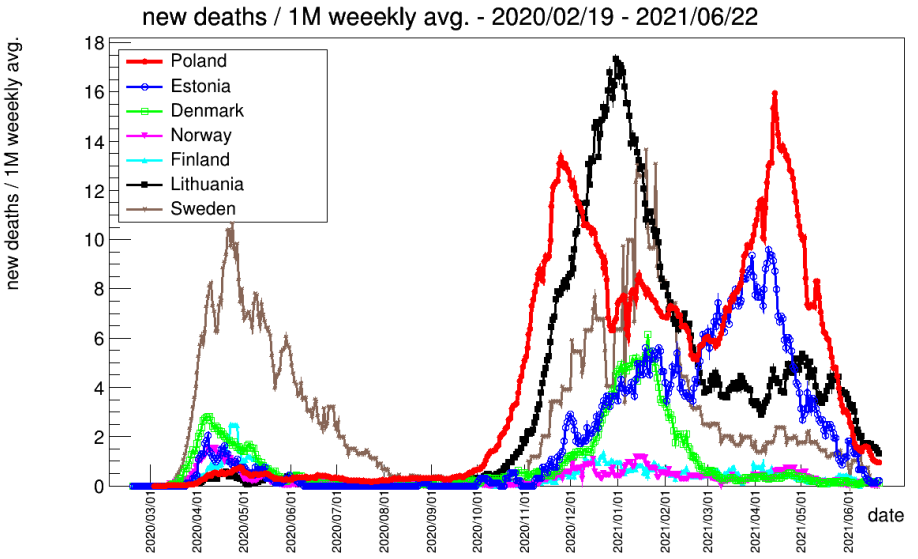


- larger than in Poland number of cases and deaths in Czechia and Slovakia
- Germany: fewer cases and deaths in second-third wave

Epidemic development

Northern Europe



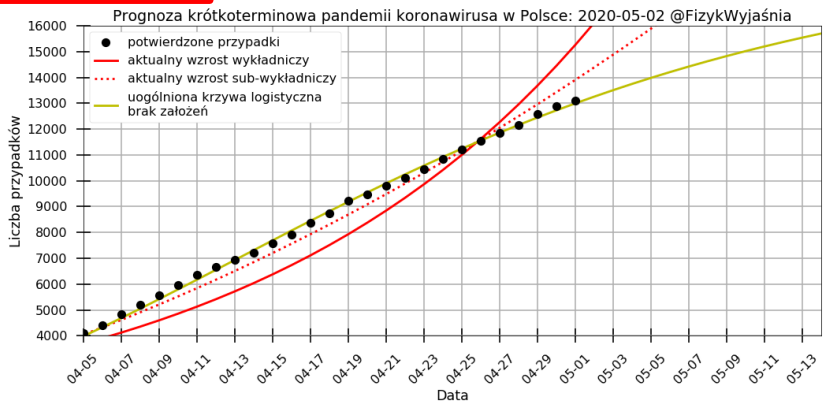


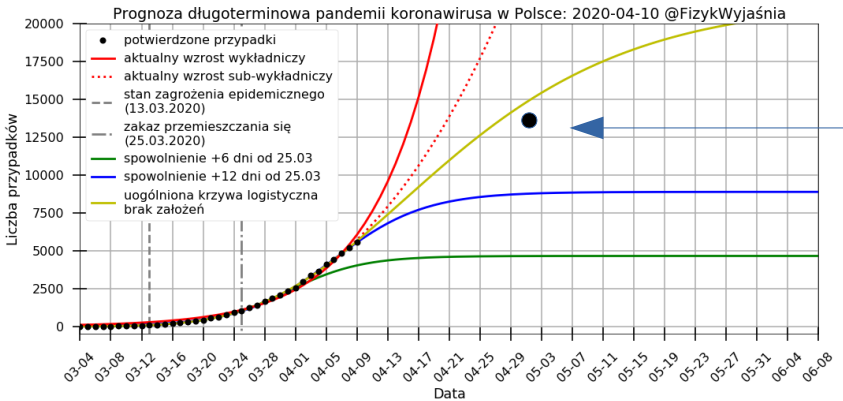
- in Northern Europe most affected were Sweden (first wave) and baltic countries (second-third wave)

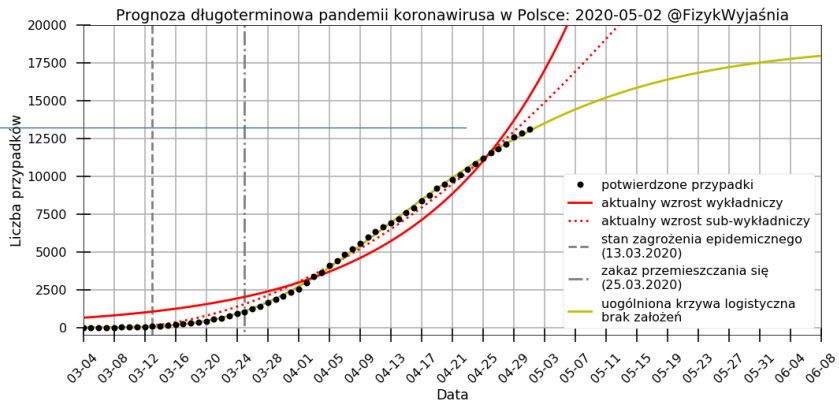
Models of epidemic development

Krzysztof Woźniak

3 weeks difference





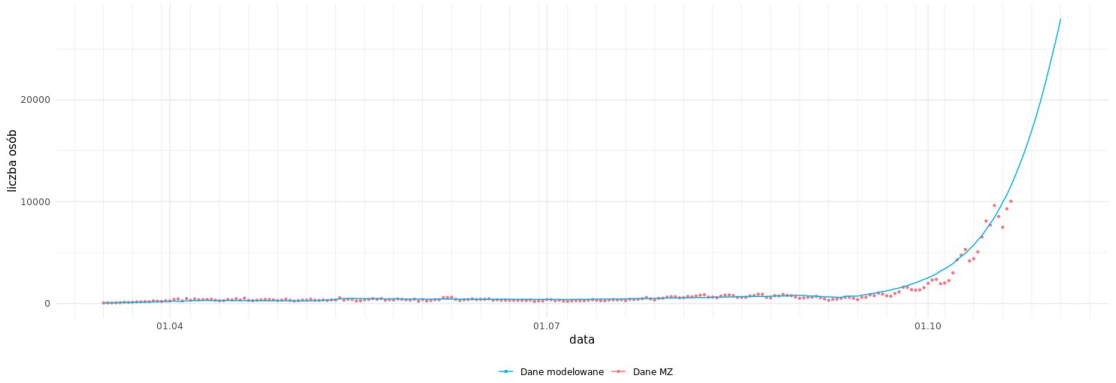


Variety of simple predictions
http://www.fizykwyjasnia.pl/na-biezaco/prognozy-rozwoju-epidemii-koronawirusa/

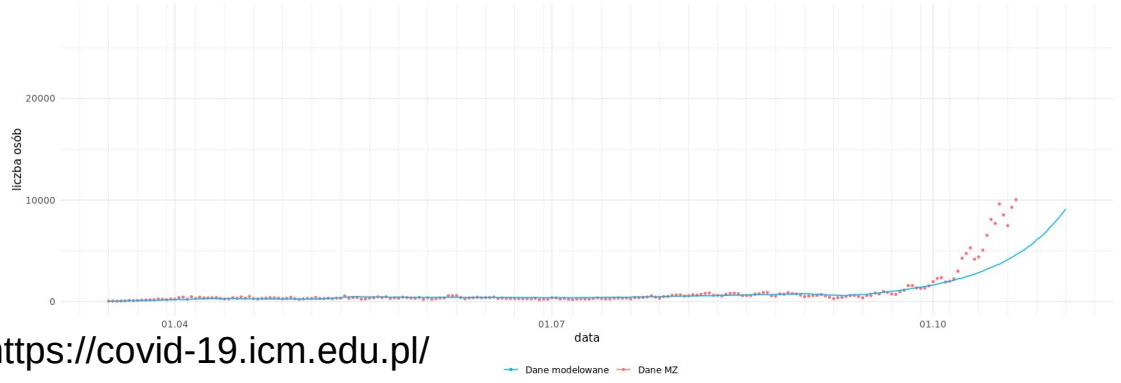
Models of epidemic development

ICM Model (Interdyscyplinarne Centrum Modelowania Matematycznego i Komputerowego UW)

- first predictions shown in October 2020
- horizon of predictions - 3 weeks
- large differences depending on assumptions applied



https://covid-19.icm.edu.pl/

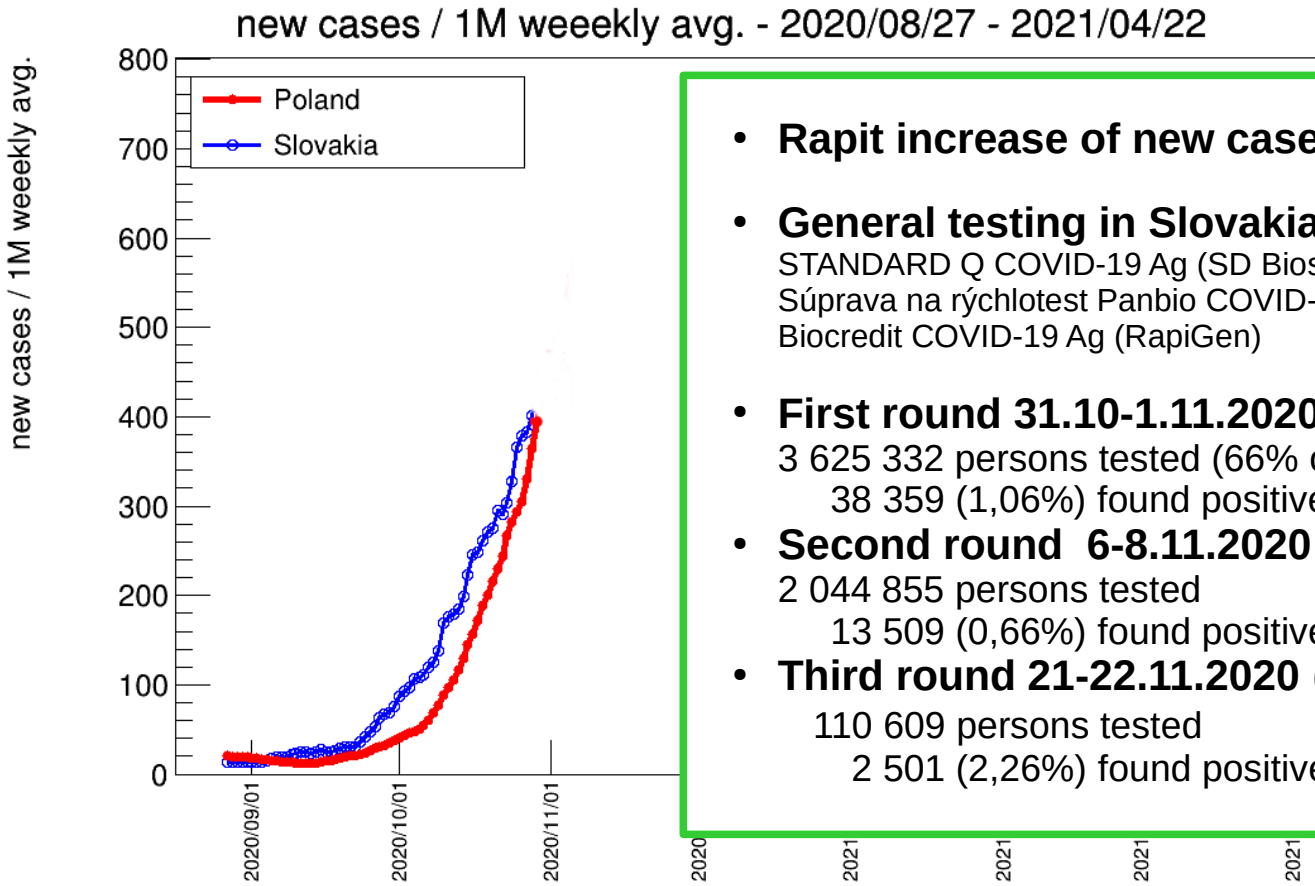


https://covid-19.icm.edu.pl/

Testing as a method of fight against COVID-19

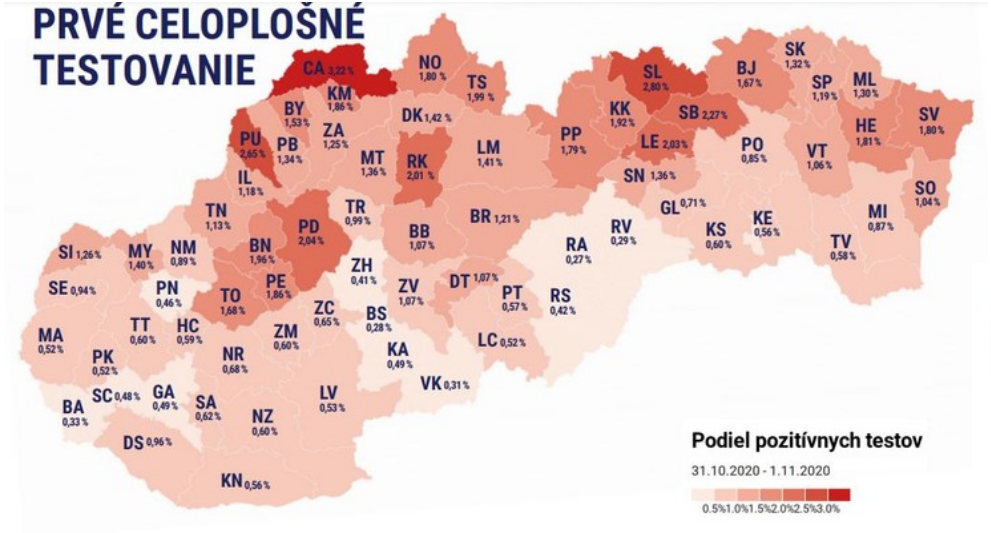
General testing in Slovakia

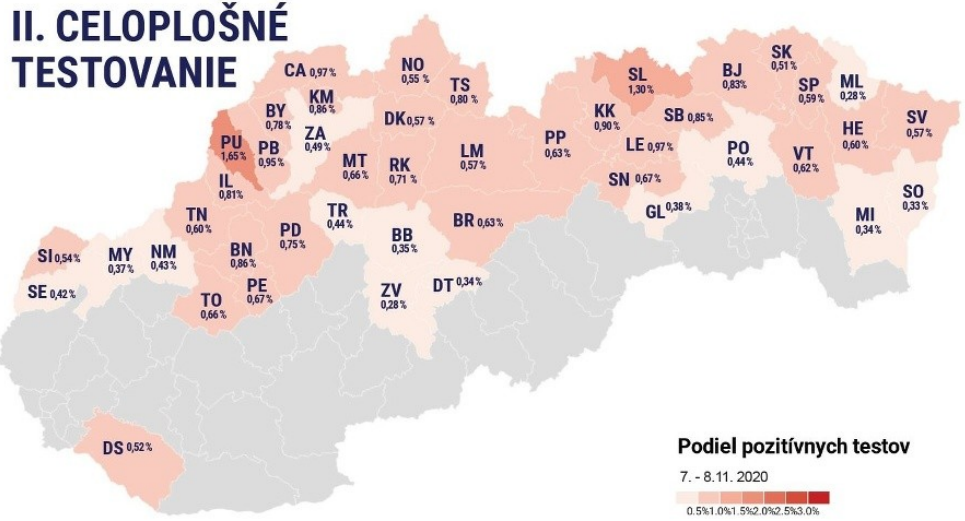
Krzysztof Woźniak



- **Rapit increase of new cases from October 1**
- **General testing in Slovakia (antigen tests):**
  STANDARD Q COVID-19 Ag (SD Biosensor),
  Súprava na rýchlotest Panbio COVID-19 Ag (Abbott)
  Biocredit COVID-19 Ag (RapiGen)
- **First round 31.10-1.11.2020**
  3 625 332 persons tested (66% of population of 5459643)
  38 359 (1,06%) found positive
- **Second round 6-8.11.2020** (458 regions with > 1%)
  2 044 855 persons tested
  13 509 (0,66%) found positive
- **Third round 21-22.11.2020** (458 regions with > 1%)
  110 609 persons tested
  2 501 (2,26%) found positive

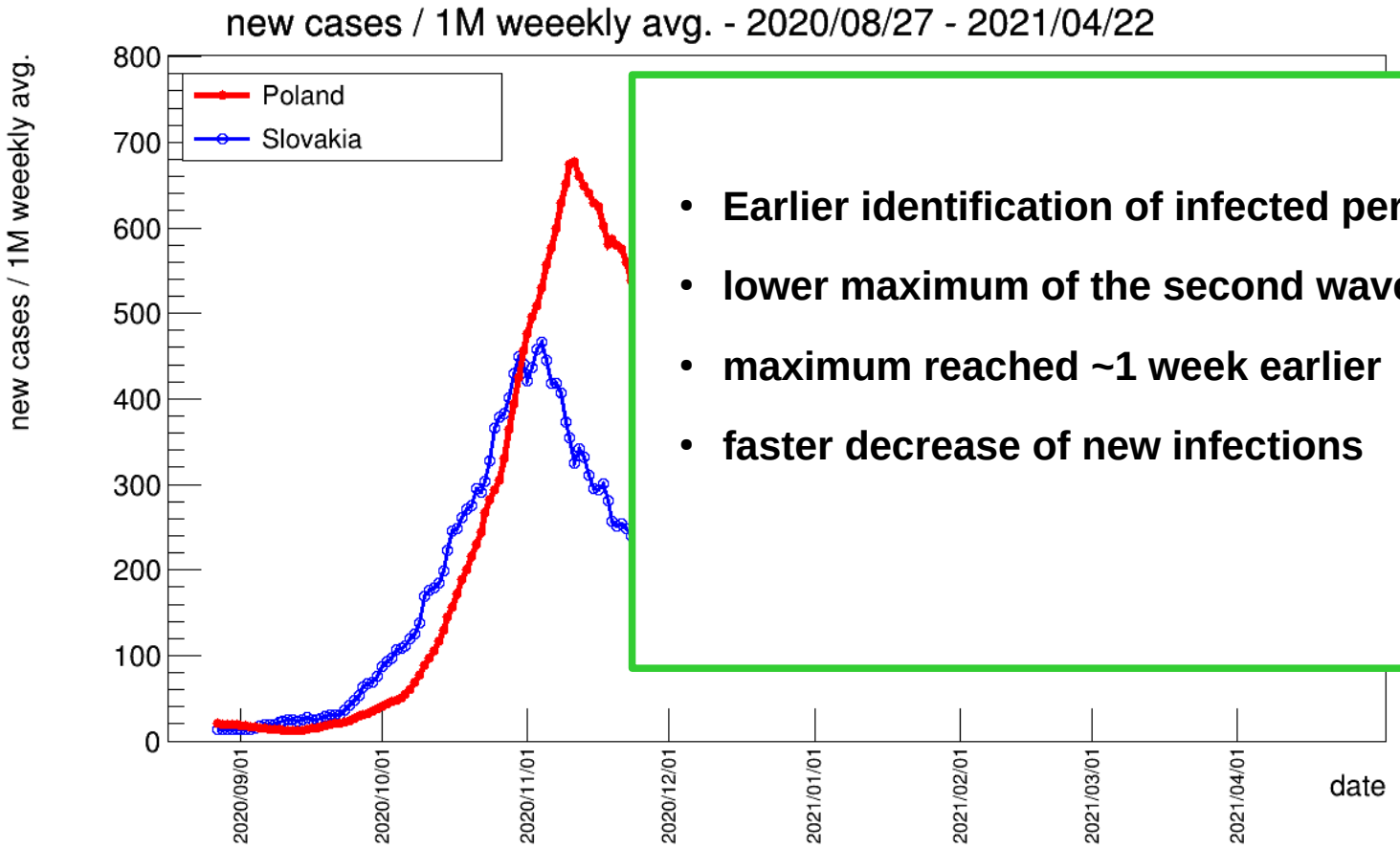
General testing in Slovakia





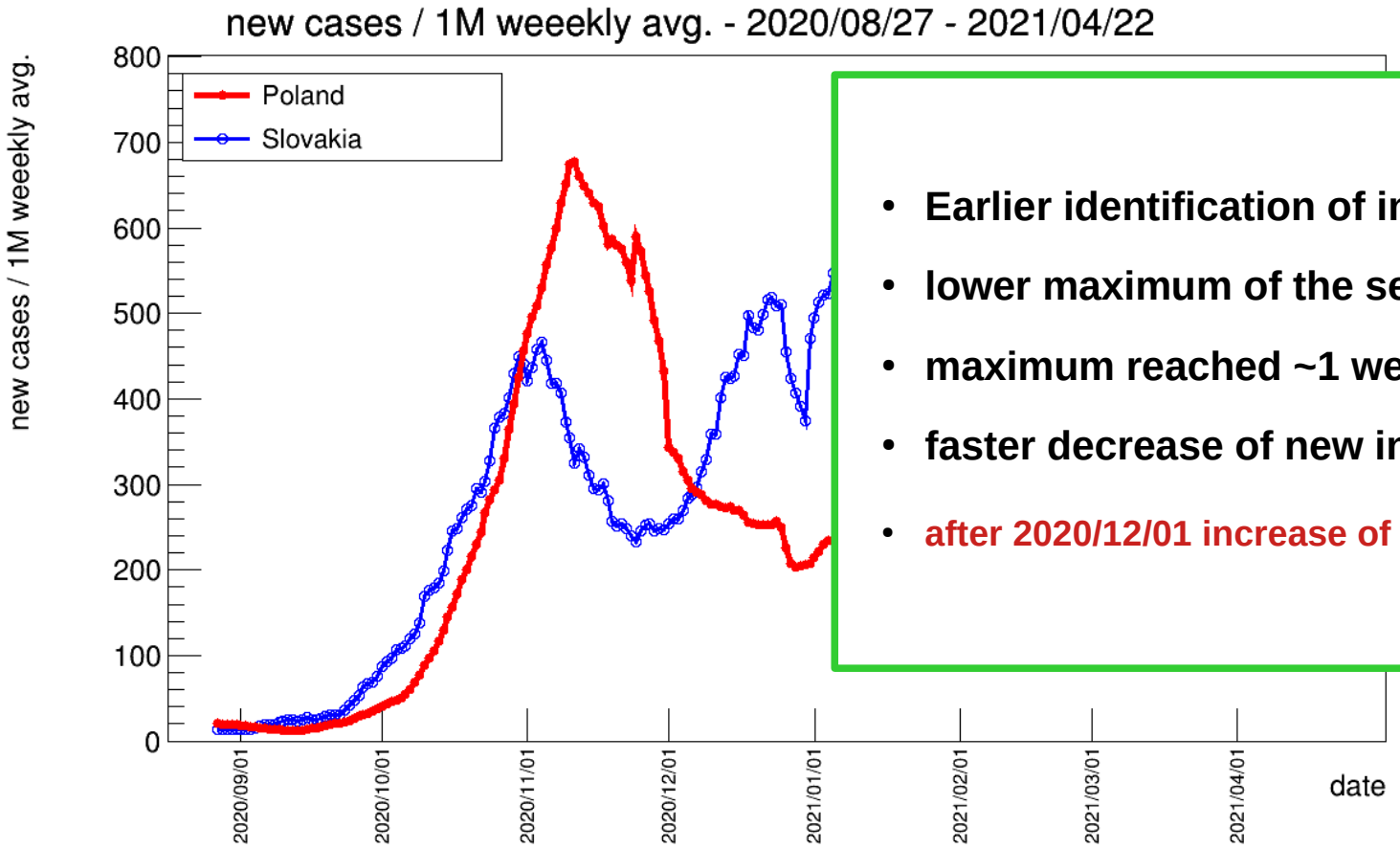
https://slovensko.hnonline.sk/2240753-druhe-kolo-testovania-bude-pozrite-si-ktore-okresy-sa-mu-vyhnu
https://www.topky.sk/gl/713671/2779173/Druhe-kolo-mame-za-sebou--Toto-su-VYSLEDKY--Caka-nas-tazka-zima--v-hre-je-pravidelne-testovanie

General testing in Slovakia



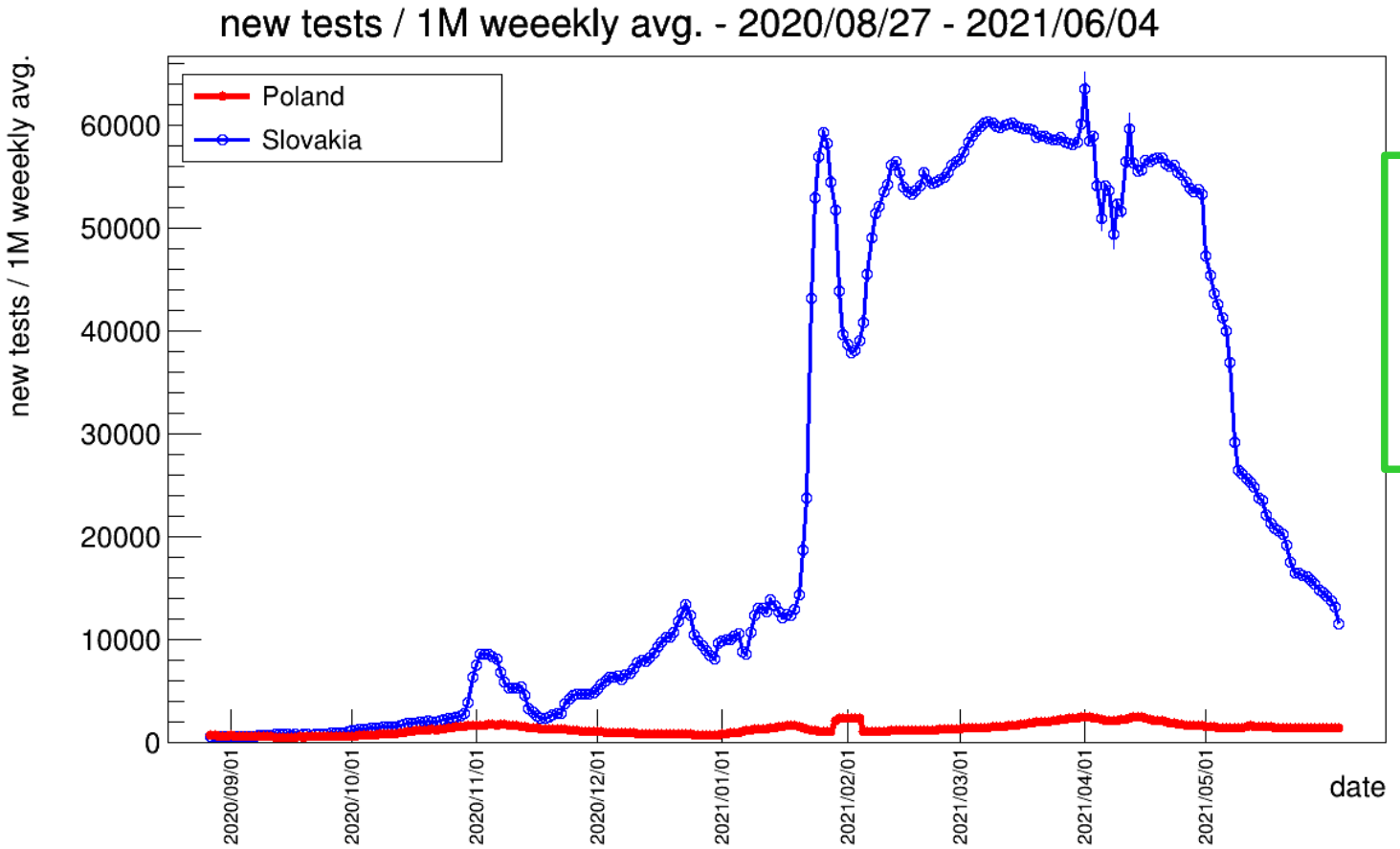
- **Earlier identification of infected persons**
- **lower maximum of the second wave**
- **maximum reached ~1 week earlier**
- **faster decrease of new infections**

General testing in Slovakia



- **Earlier identification of infected persons**
- **lower maximum of the second wave**
- **maximum reached ~1 week earlier**
- **faster decrease of new infections**
- **after 2020/12/01 increase of new cases started again**

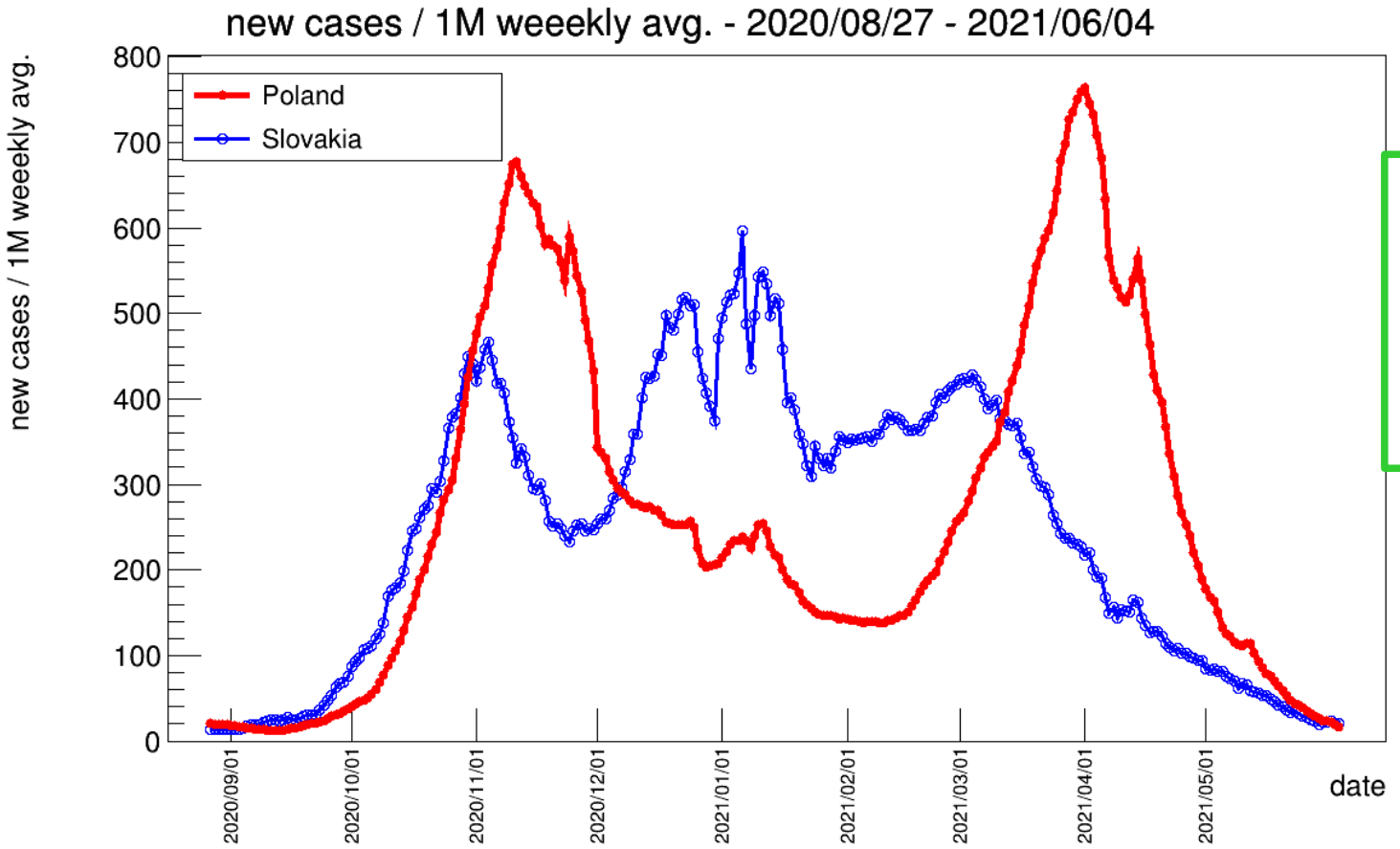
General testing in Slovakia



Testing continued in 2021 from January 15

(up to ~15 Jan antigen tests not counted)

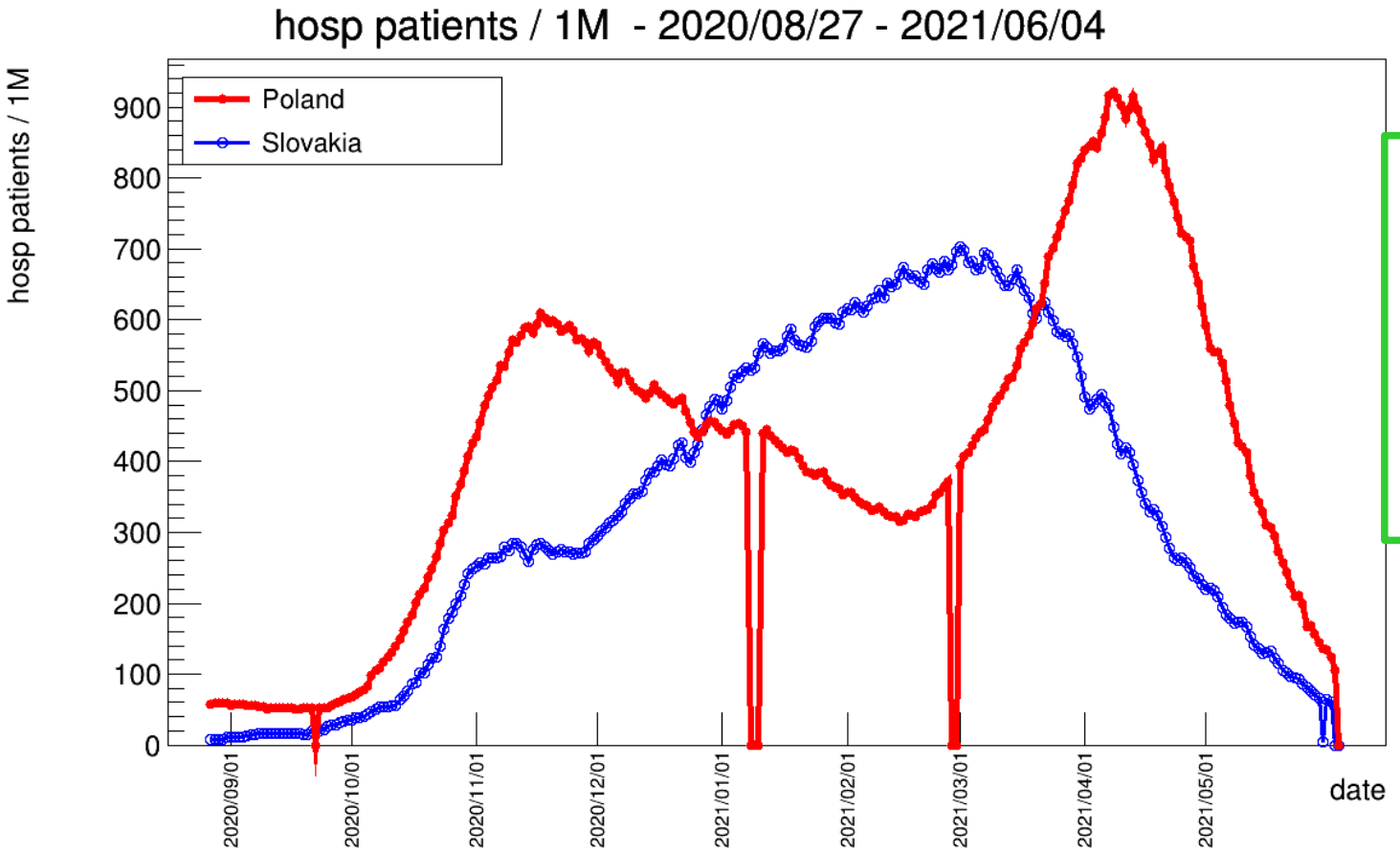
General testing in Slovakia



Testing continued in 2021 from January 15

earlier decrease of "third wave"

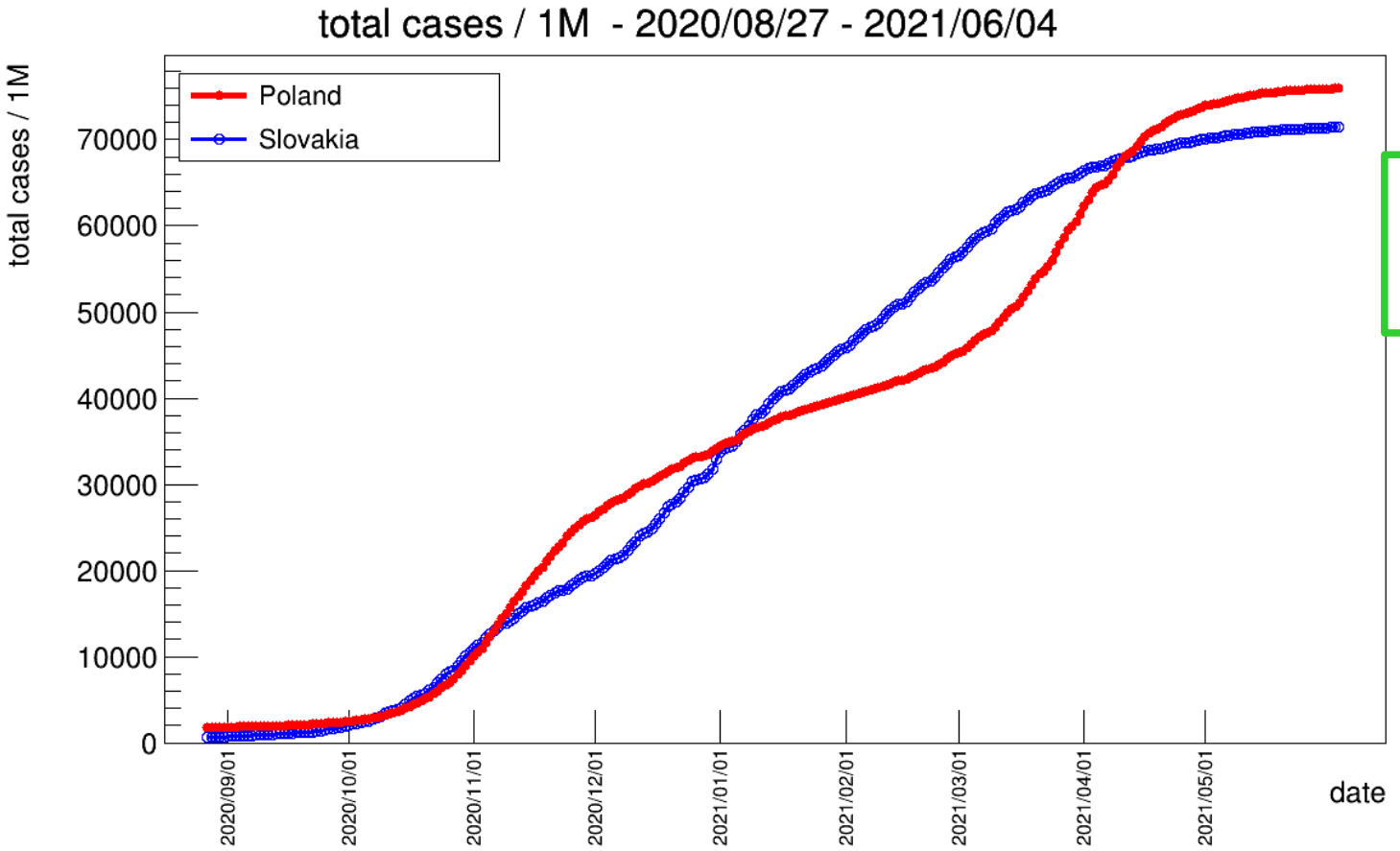
General testing in Slovakia



at some point more problems with large number of patients in hospitals in Slovakia

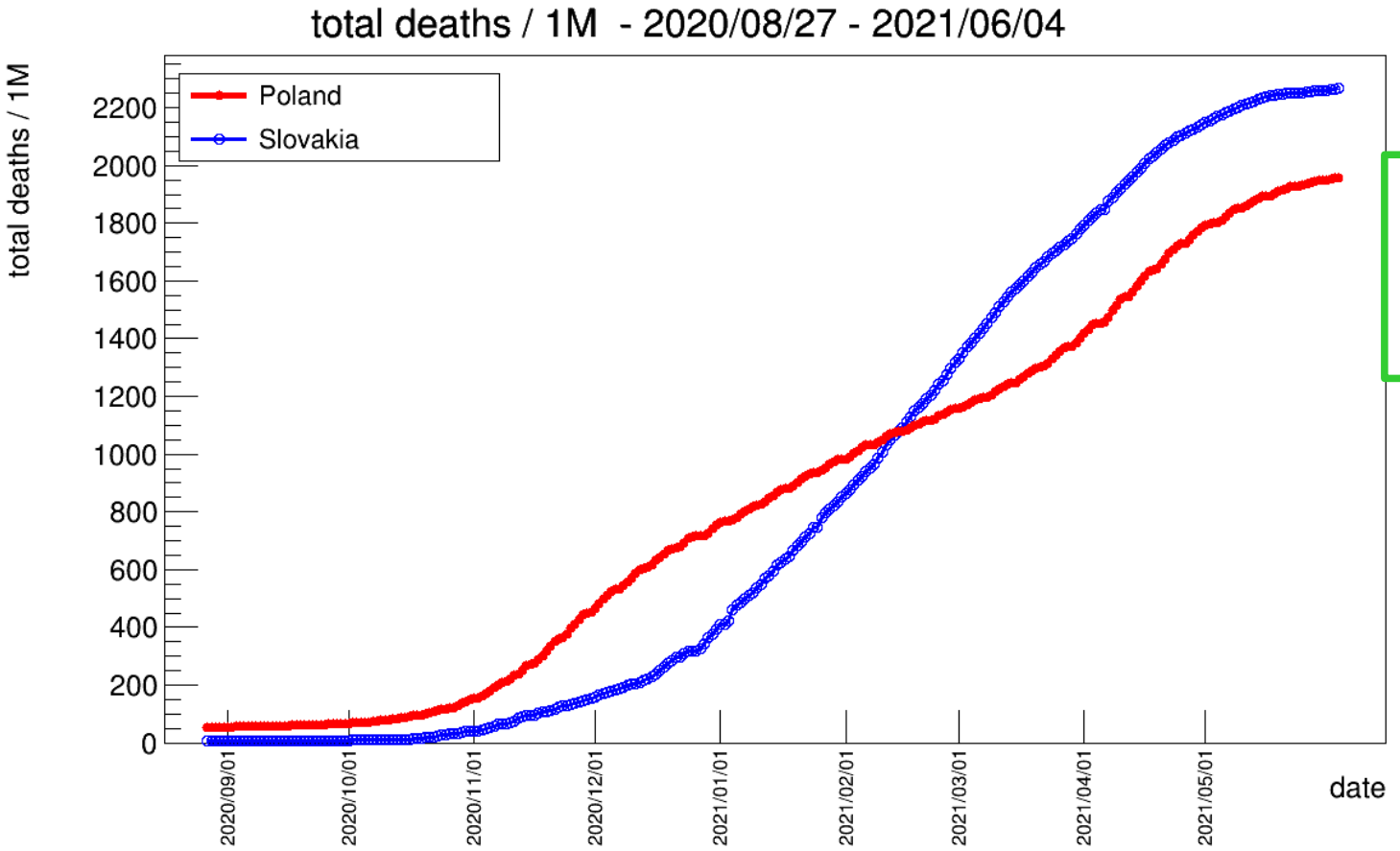
(some transferred from Slovakia to Poland)

General testing in Slovakia



similar total number of cases

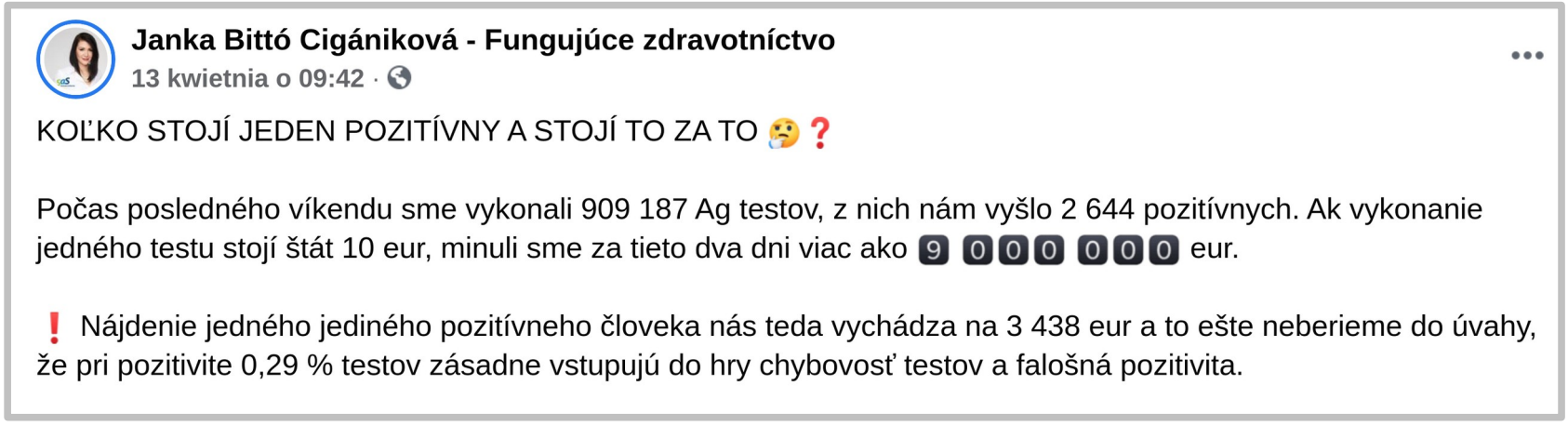
General testing in Slovakia



still larger total number of deaths in Slovakia

General testing in Slovakia

- large logistic efforts
- limited effects
- costs



Janka Bittó Cigániková - Fungujúce zdravotníctvo
13 kwietnia o 09:42 ·

KOĽKO STOJÍ JEDEN POZITÍVNY A STOJÍ TO ZA TO 🤔❓

Počas posledného víkendu sme vykonali 909 187 Ag testov, z nich nám vyšlo 2 644 pozitívnych. Ak vykonanie jedného testu stojí štát 10 eur, minuli sme za tieto dva dni viac ako 9 000 000 eur.

❗ Nájdenie jedného jediného pozitívneho človeka nás teda vychádza na 3 438 eur a to ešte neberieme do úvahy, že pri pozitivite 0,29 % testov zásadne vstupujú do hry chybovosť testov a falošná pozitivita.

- 909 187 tests in one weekend -> 2 644 positive results (0.29%)
- cost of finding one infected person: 3 438 EUR
- how many test were false positive?

Results of the COVID-19 pandemy (so far)

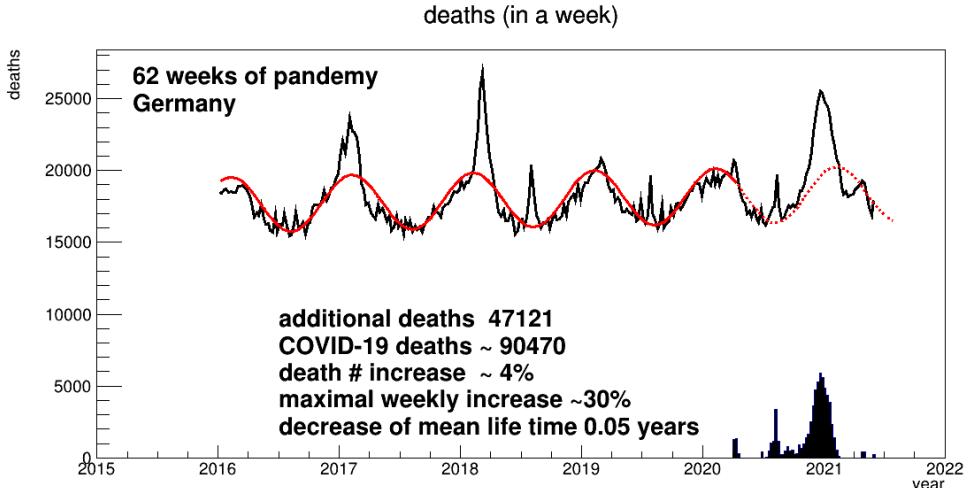
- **7800 mln people on Earth**
- **180 mln COVID-19 cases (2.3 % of population)**
- **3.9 mln deaths (2.1 % infected, ~0.05 % of population)**
- **numbers underestimated**

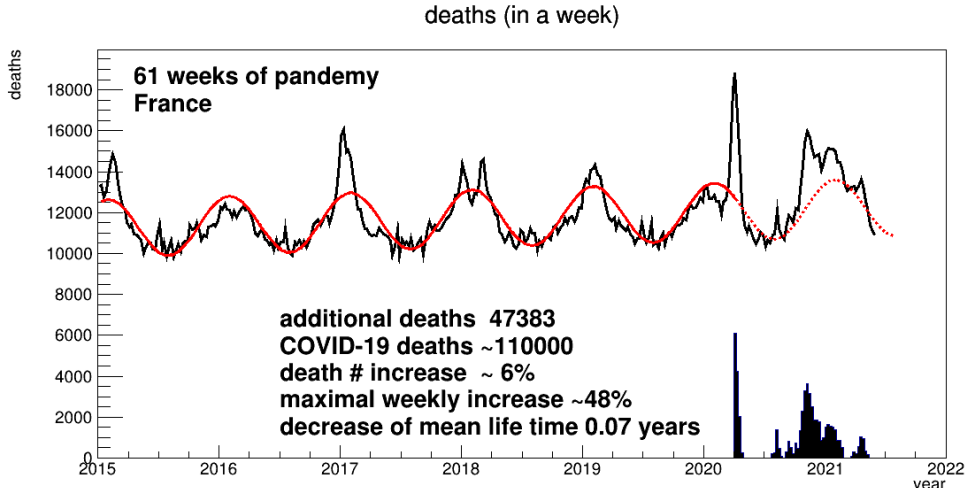
for comparison - Spanish flu

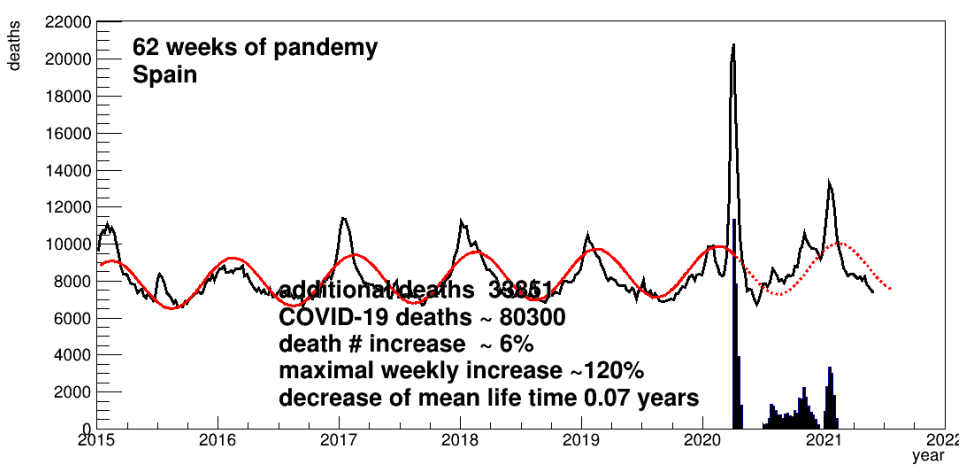
- 1700 mln people on Earth
- 500 mln cases (~29% of population)
- 17-100 mln deaths (3.5-20% of infected persons, 1-6% of population)

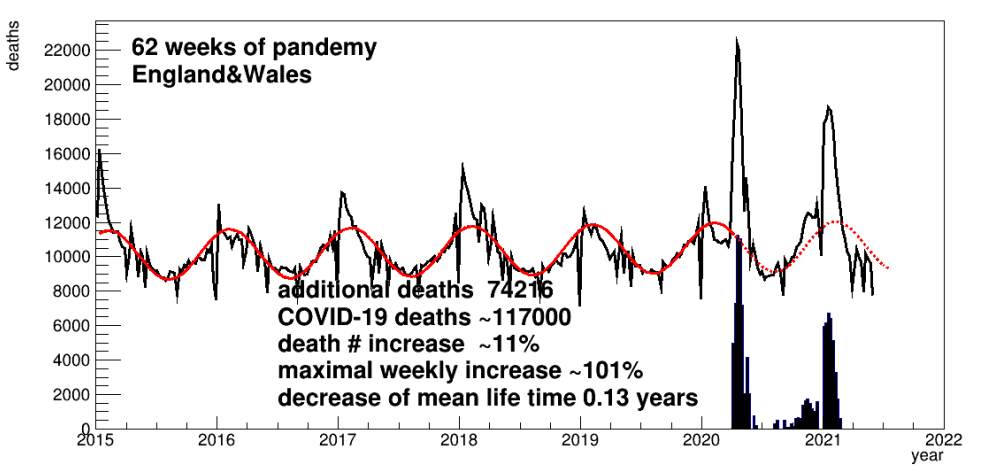
Additional deaths (from official registers)

Krzysztof Woźniak



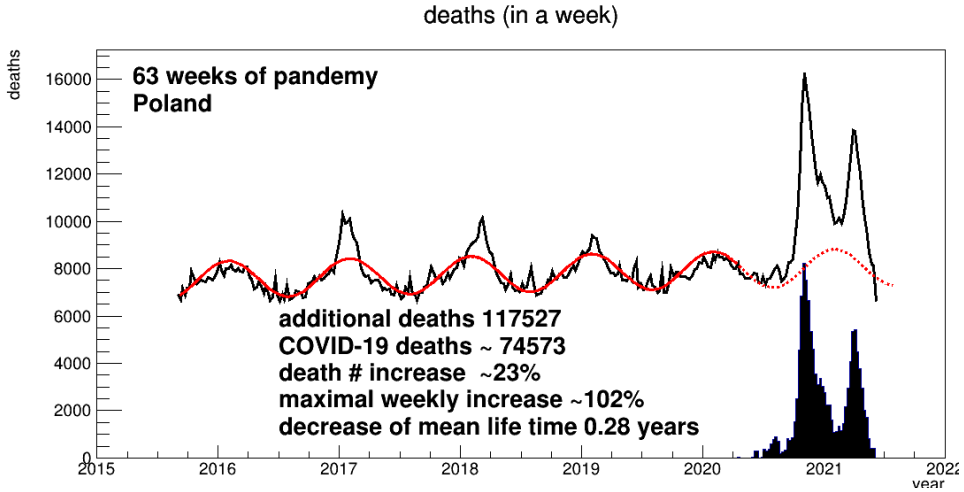


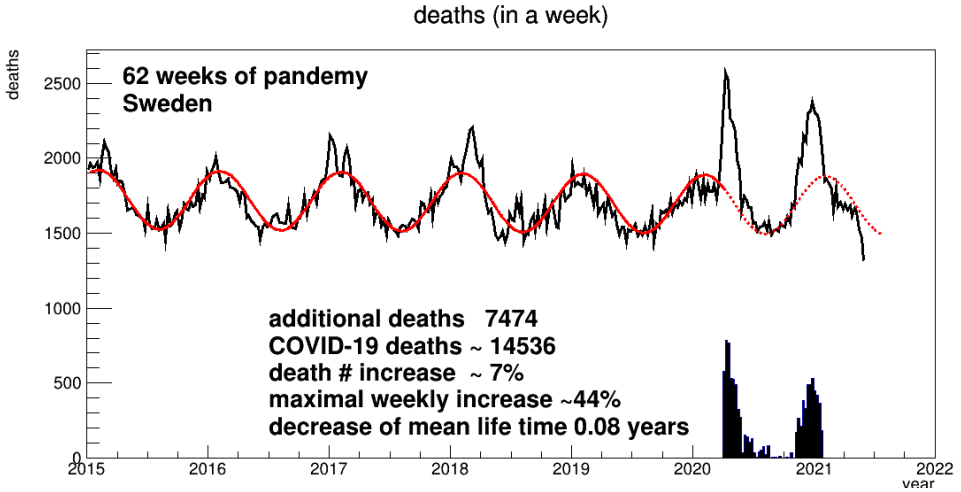


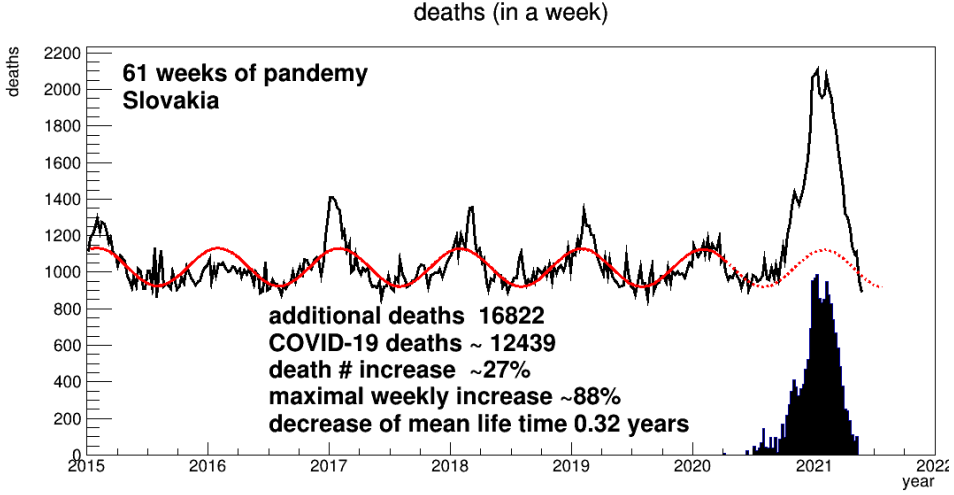


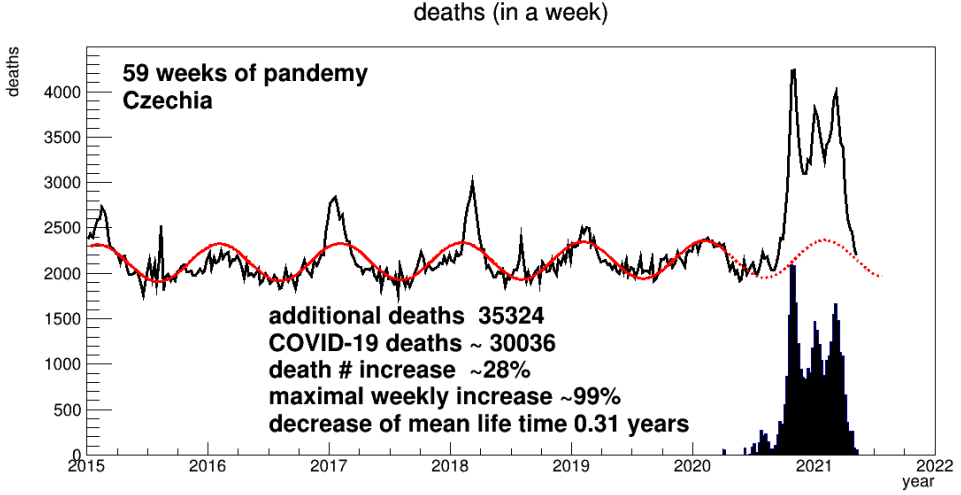
Additional deaths (from official registers)

Krzysztof Woźniak

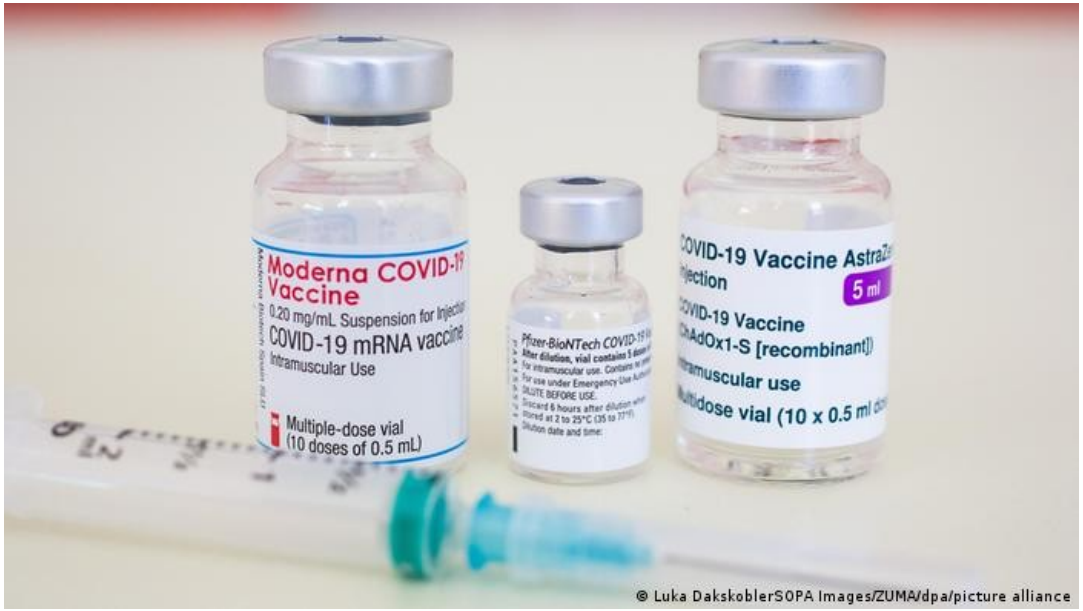








Vaccines


Moderna COVID-19 Vaccine
0.20 mg/mL Suspension for Injection
COVID-19 mRNA vaccine
Intramuscular Use
Multiple-dose vial
(10 doses of 0.5 mL)
Pfizer-BioNTech COVID-19
5 ml
COVID-19 Vaccine
AdOx1-S [recombinant])
Intramuscular use
Multidose vial (10 x 0.5 ml
© Luka DakskoblerSOPA Images/ZUMA/dpa/picture alliance

Vaccine types

- **mRNA vaccine -** fragment of RNA which after entering a cell forces it to produce S-protein
  Comirnaty (Pfizer-BionTech), Moderna Covid-19 vaccine, CureVac COVID-19 vaccine

- **viral vector vaccine -** non-replicating adenovirus shell, containing DNA fragment that encodes S protein
  Vaxzevria (Oxfort-AstraZeneca), Jassen (Johnson&Johnson), Sputnik V (Russian)

- **inactivated virus vaccine -** viruses which were killed by temperature or formaldehyd
  BBIBP-CorV (Sinopharm, China), CoronaVac (Sinovac, China)

- **protein vaccine -** lipid nanoparticle containing up to 14 S-proteins
  Novavax COVID-19 vaccine (USA), Sanofi–GSK COVID-19 vaccine (France)

red - approved in EU
black - used in other countries
gray - in clinical trials

Vaccine prices (announced)

Vaccine	doses	price (per dose)
Pfizer-BioNTech	2	14.70-19.50 USD
Moderna	2	15-18 USD
AstraZeneca	2	2.15-5.25 USD
Johnson & Johnson	1	10 USD
Sputnik V	2	10 USD
Sinovac Biotech	2	30 USD
Novavax	2	16 USD
vaccination (i.e. injection) in Poland		67 PLN

https://www.managedhealthcareexecutive.com/view/the-price-tags-on-the-covid-19-vaccines
https://www.biospace.com/article/comparing-covid-19-vaccines-pfizer-biontech-moderna-astrazeneca-oxford-j-and-j-russia-s-sputnik-v/

Effiacy calculations

	Comirnaty Pfizer/BioNTech	Vaxzevria AstraZeneca	Jassen (J&J)
vaccine group	18 242	5807	19630
placebo group	18 379	5829	19691
duration	44 days	~105 days	>28 days
cases (vaccinated)	8	64	66
cases (placebo)	162	154	193
effiacy	95% (-5%, +2.9%)	60% (-14%, +10%)	66% (-11%, +9%)

Side effects

Symptom	Flu vaccine Vaxigrip Tetra	Comirnaty Pfizer/BioNTech	Vaxzevria AstraZeneca	Jassen (J&J)
injection-site pain	52.8%	>80%	54%	58.6%
injection-site swelling	5.9%	>10%	51%	7%
injection-site purritus	0.8%	<1%	0.3%	?
malaise, fatigue	19.2%	>60%	62.3%	43.8%
headache	27.8%	>50%	52.6%	44.4%
fever	1.3%	>10%	7.9%	12.8%
shivering, chills	6.2%	>30%	31.9%	?
myalgia (i.e. muscle pain)	23%	>30%	44%	39.1%
nausea	0.1%	<10%	21.9%	15.5%

https://www.nps.org.au/medicine-finder/vaxigrip-suspension-for-injection#full-pi
https://www.ema.europa.eu/en/documents/assessment-report/comirnaty-epar-public-assessment-report_en.pdf
https://www.ema.europa.eu/documents/assessment-report/vaxzevria-previously-covid-19-vaccine-astrazeneca-epar-public-assessment-report_en.pdf

Side effects - official report

Undesired vaccination effects report (NOP - niepożądane odczyny poszczepienne)
11 645 cases / 27 078 372 vaccinations (0.04%)

1731	12.02.2021	mazowieckie	pow. sierpecki	K	zaczerwienienie i krótkotrwała bolesność w miejscu wkłucia
1732	12.02.2021	mazowieckie	pow. wyszkowski	K	zgon 12.02.2021

~90% -"redness and pain in injection site

~100 cases - sometimes vague as here or obviously not related to vaccination

Can be reported by medical staff only, it includes:

- deaths after no more than 28 days

or

- allergic reactions

non allergic side effects are usually not included.

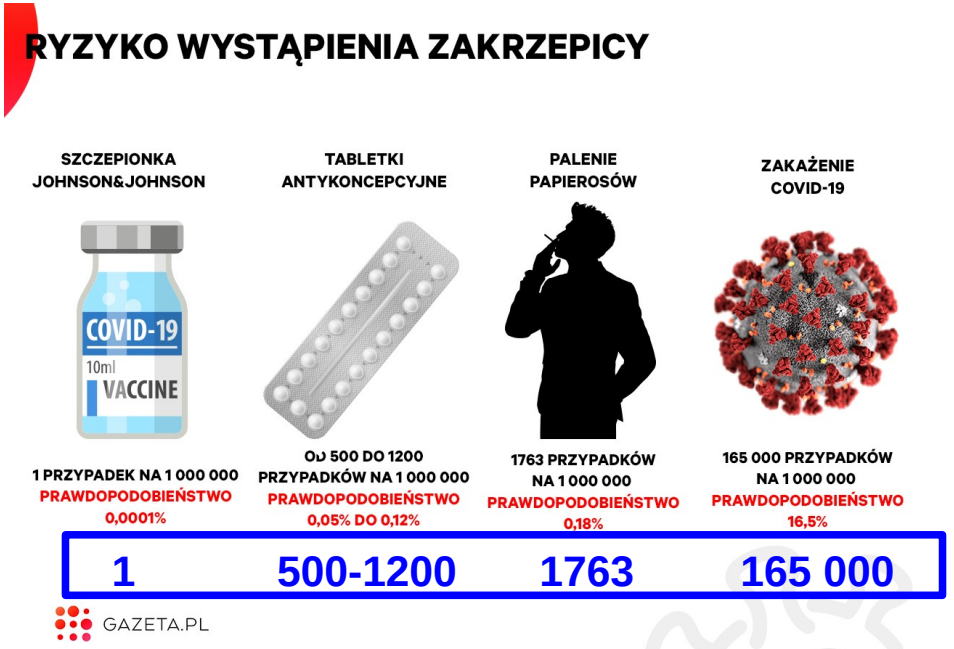
https://www.gov.pl/web/szczepimysie/niepozadane-odczyny-poszczepienne

Side effects - risk of blood cloths

Estimated risk

- **0.0001%** - **vaccination**
- **0.05-0.12%** - **birth control pills**
- **0.18%** - **smoking**
- **16.5%** - **COVID-19 infection (exagerated?)**

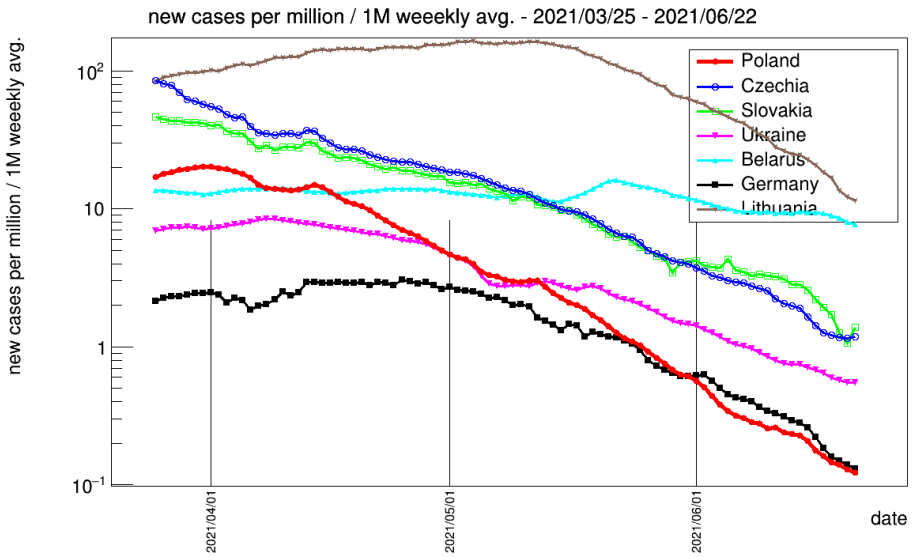
if you smoke or take pills - don't blame vaccinations



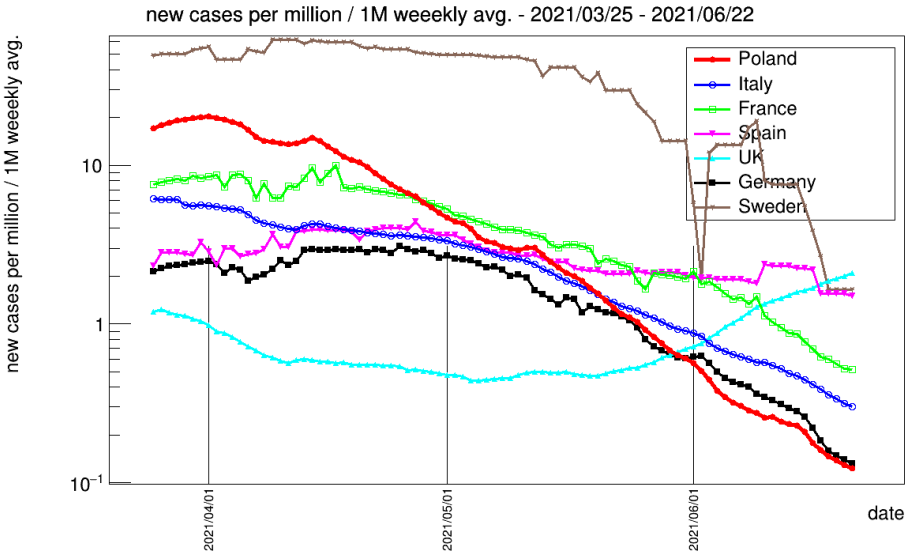
Current status

Last 3 months

Poland and neighbours



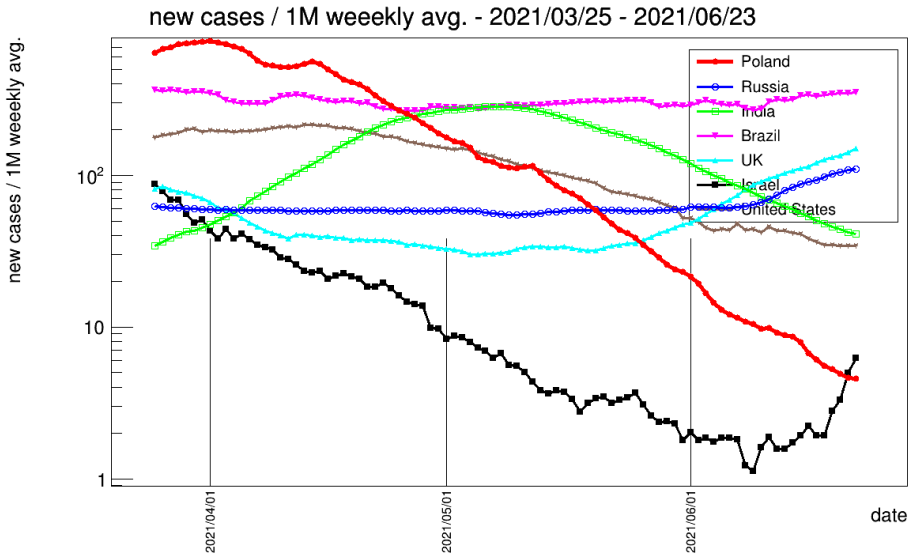
Europe: big countries



Poland: fastest decrease of new cases since mid-April 2021

Last 3 months

Selected countries

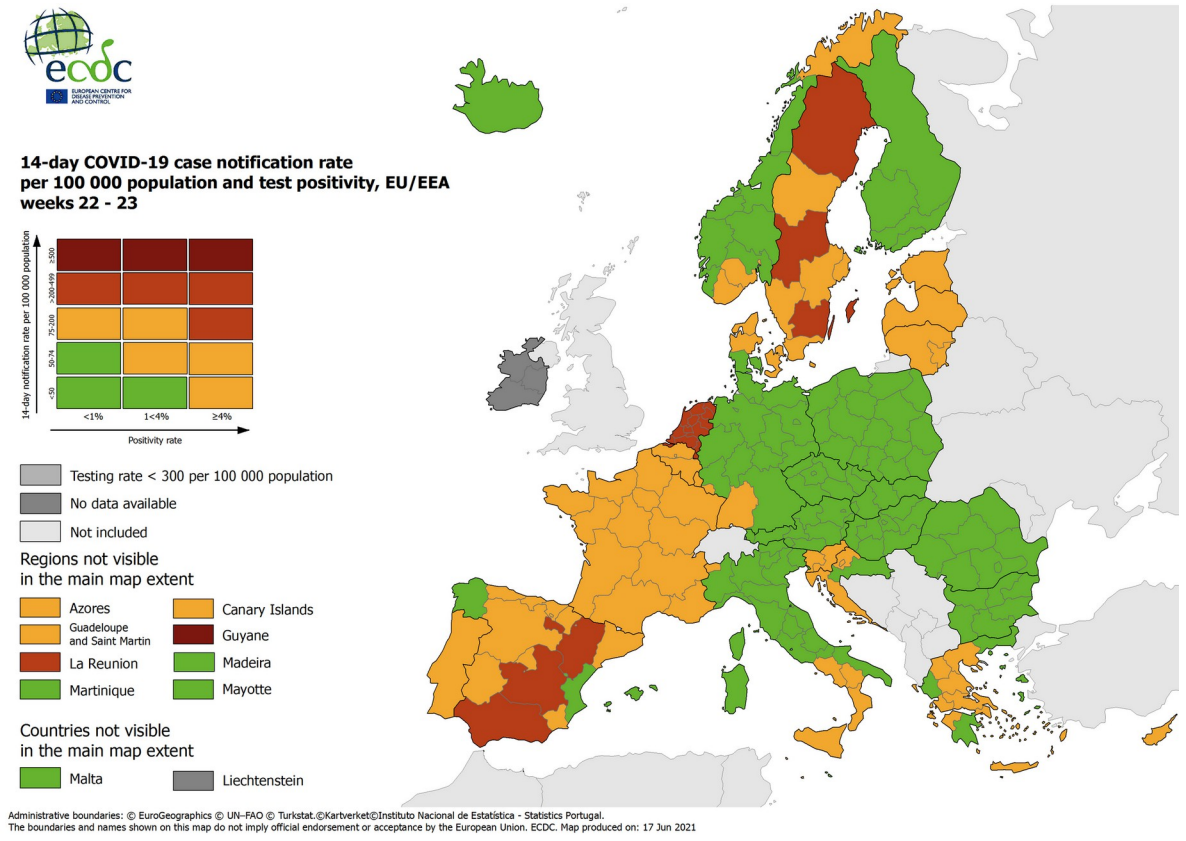


In some countries:

- the fourth wave was observed recently (India, Japan),
- significant increase is seen (UK, Russia, Israel)
- infections are at the maximum (Brazil)

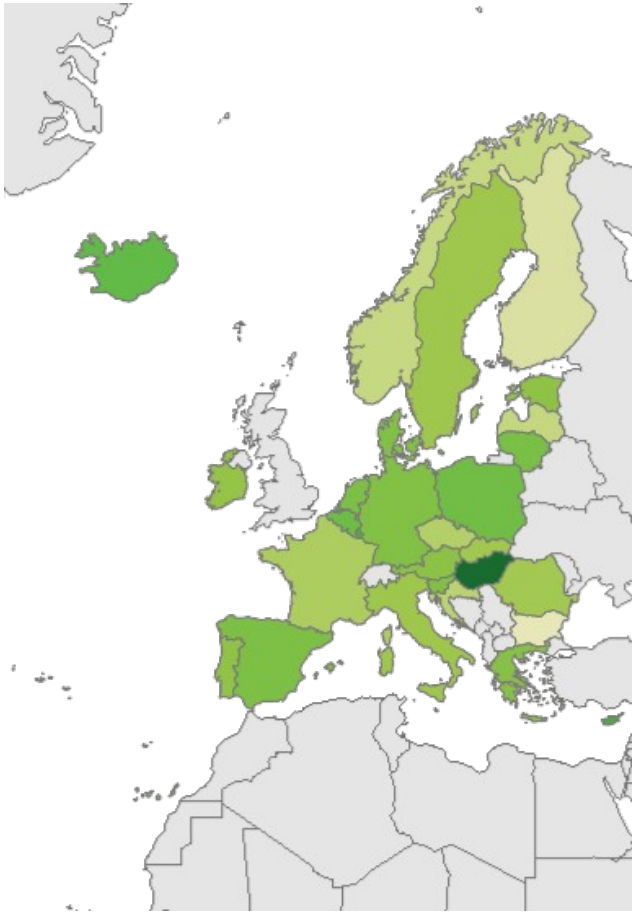
Current situation

Combined indicator: 14-day notification rate, testing rate and test positivity, updated 17 June 2021



https://www.ecdc.europa.eu/en

Current situation

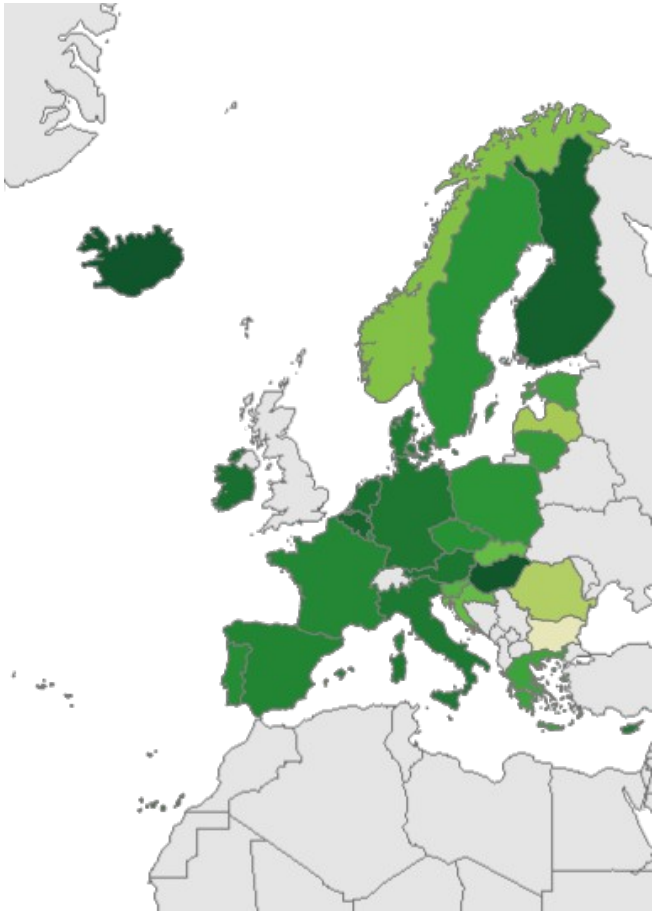


Full vaccination
updated 17 June 2021

Hungary
vaccination using Sputnik V started early

https://www.ecdc.europa.eu/en

Current situation



At least first dose vaccination
updated 17 June 2021

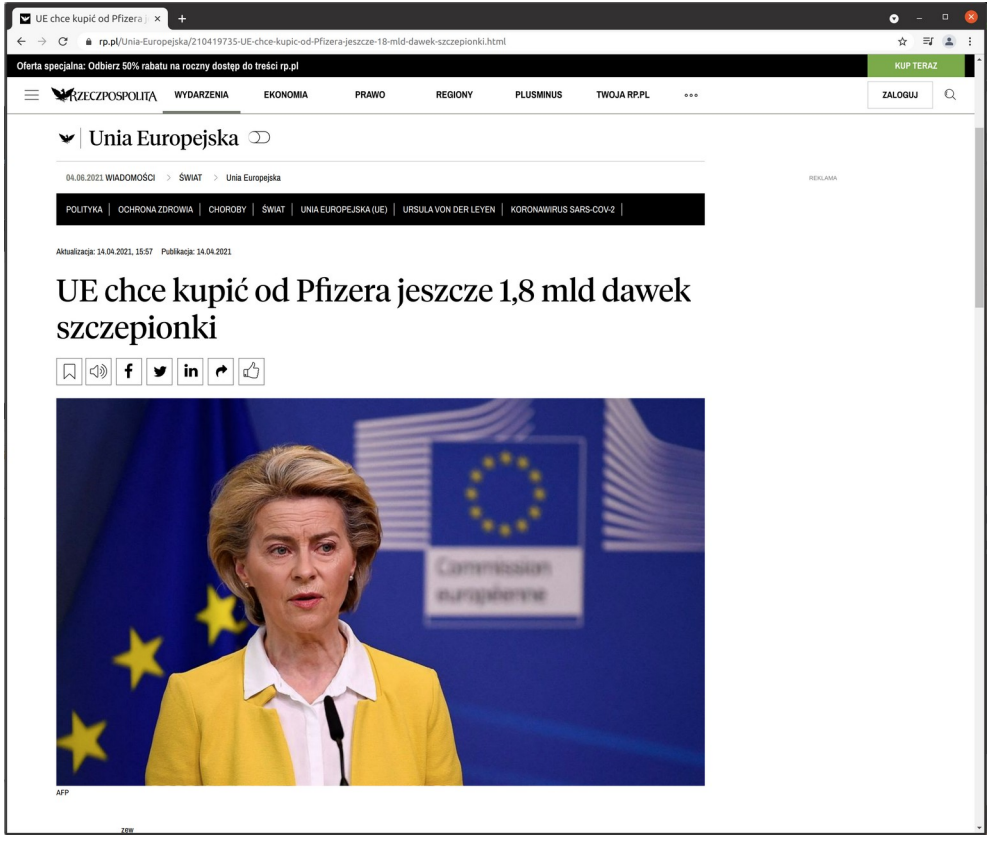
Poland
vaccination is slowing down
Finland
fast speed up

https://www.ecdc.europa.eu/en

EU wants to buy from Pfizer 1.8 billion vaccine doses

delivery time 2022-2023

(16.04.2021)



https://www.rp.pl/Unia-Europejska/210419735-UE-chce-kupic-od-Pfizera-jeszcze-18-mld-dawek-szczepionki.html

Additional slides

Additional deaths - data

- Poland: https://dane.gov.pl/pl/dataset/1953,liczba-zgonow-zarejestrowanych-w-rejestrze-stanu-cywilnego
- Germany: https://www.destatis.de/DE/Themen/Gesellschaft-Umwelt/Gesundheit/Todesursachen/_inhalt.html
- France: https://blog.insee.fr/statistiques-sur-les-deces-le-mode-demploi-des-donnees-de-linsee-en-7-questions-reponses/
- France: https://www.data.gouv.fr/en/datasets/fichier-des-personnes-decedees/
- Czechia: https://www.czso.cz/csu/czso/obypz_cr
- UK: https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/datasets/weeklyprovisionalfiguresondeathsregisteredinenglandandwales
- Spain: https://www.ine.es/jaxiT3/Datos.htm?t=35176
- Switzerland: https://www.bfs.admin.ch/bfs/de/home/statistiken/bevoelkerung/geburten-todesfaelle/todesfaelle.assetdetail.17644566.html
- Sweden: https://www.scb.se/hitta-statistik/statistik-efter-amne/befolkning/befolkningens-sammansattning/befolkningsstatistik/pong/tabell-och-diagram/preliminar-statistik-over-doda/
- Slovakia: http://datacube.statistics.sk/#!/view/sk/VBD_URBANAUDIT/om3003tr/v_om3003tr_00_00_00_sk

Side effects - serious

Comirnaty (Pfizer/BioNtech)

- Norway: 33 deaths / 20 000 vaccinated (in nursing homes)
- France: 9 deaths / 800 000 vaccinated

rather unconnected with vaccination

https://www.rp.pl/Koronawirus-SARS-CoV-2/210129631-Koronawirus-Zgony-zaszczepionych-na-COVID-Nieliczne-bez-zwiazku-ze-szczepieniem.html

Vazevria (AstraZeneca)

- 41 severe allergic reaction / 5 million vaccinations (UK)
- 31 cereblar venous thromboses (9 deaths) / 2.7 million vaccinations (Germany)
  rate lower than in the general population overall
  note: use of combined oral contraceptives increases the risk 3-5 fold or more

Jassen (Johnson and Johnson)

- 4 serious cases of unusual blood clots (1 death)

Side effects reported in Poland (official report, 2021/04/10)

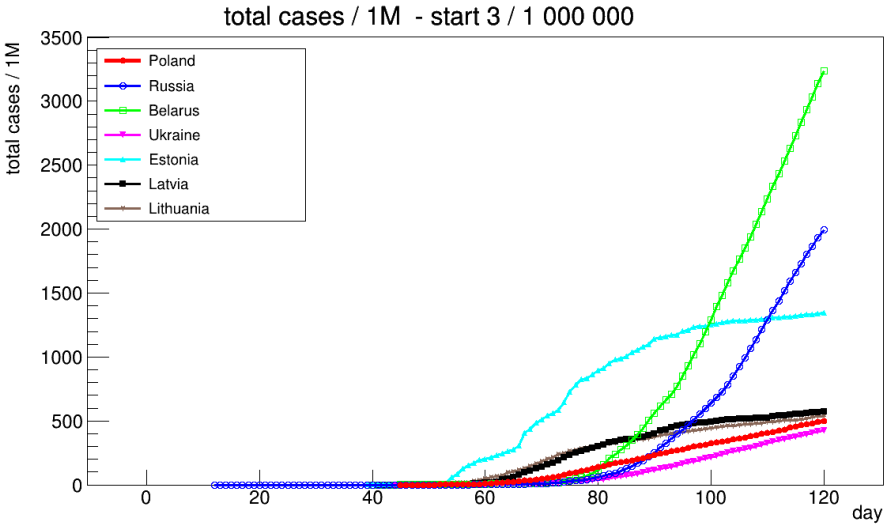
- 5 928 cases / 7 485 164 vaccinations
- 5 057 mild (obviously strongly underreported)
- 54 deaths (in some cases obviously not connected with vaccination)

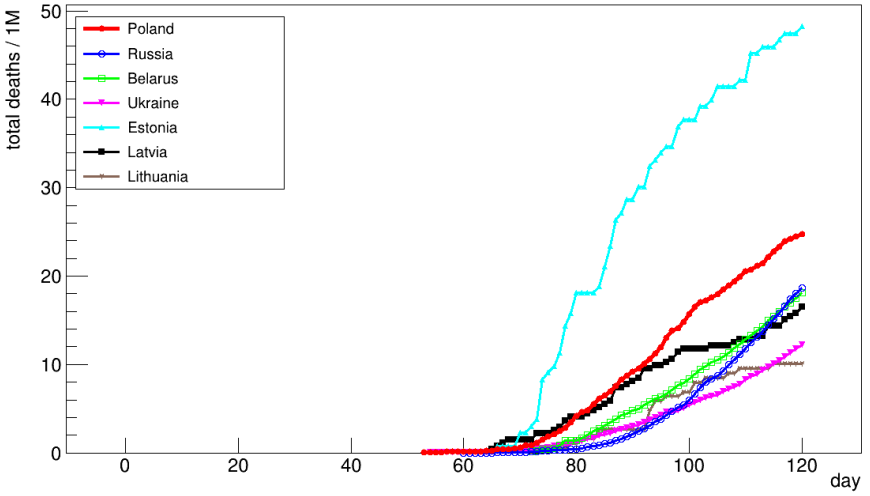
https://www.gov.pl/web/szczepimysie/niepozadane-odczyny-poszczepienne

Krzysztof Woźniak

Eastern Europe

numbers scaled to 1 million of citizens
day0: when 3 cases per 1 M were found

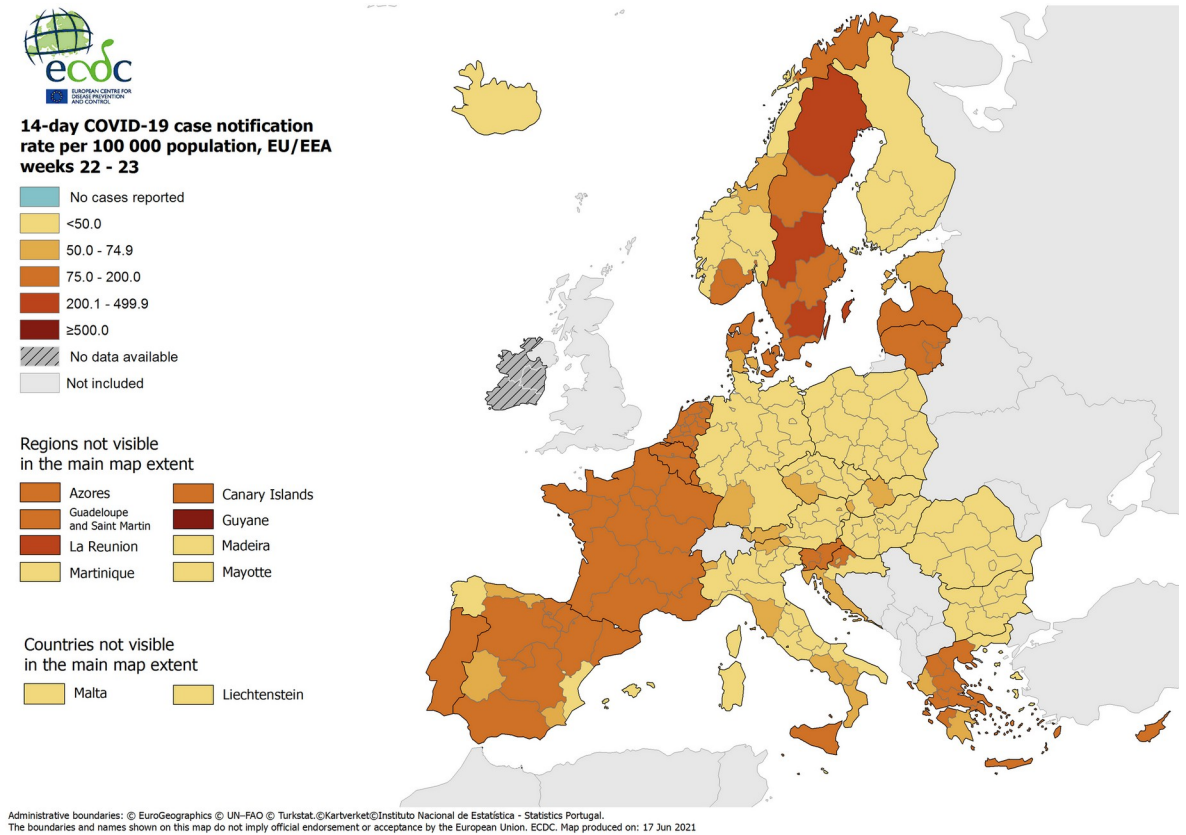




- in Eastern Europe Belarus and Russia "leads" in the number of cases
- Estonia registered largest mortality rate 50 / 1 000 000

Current situation

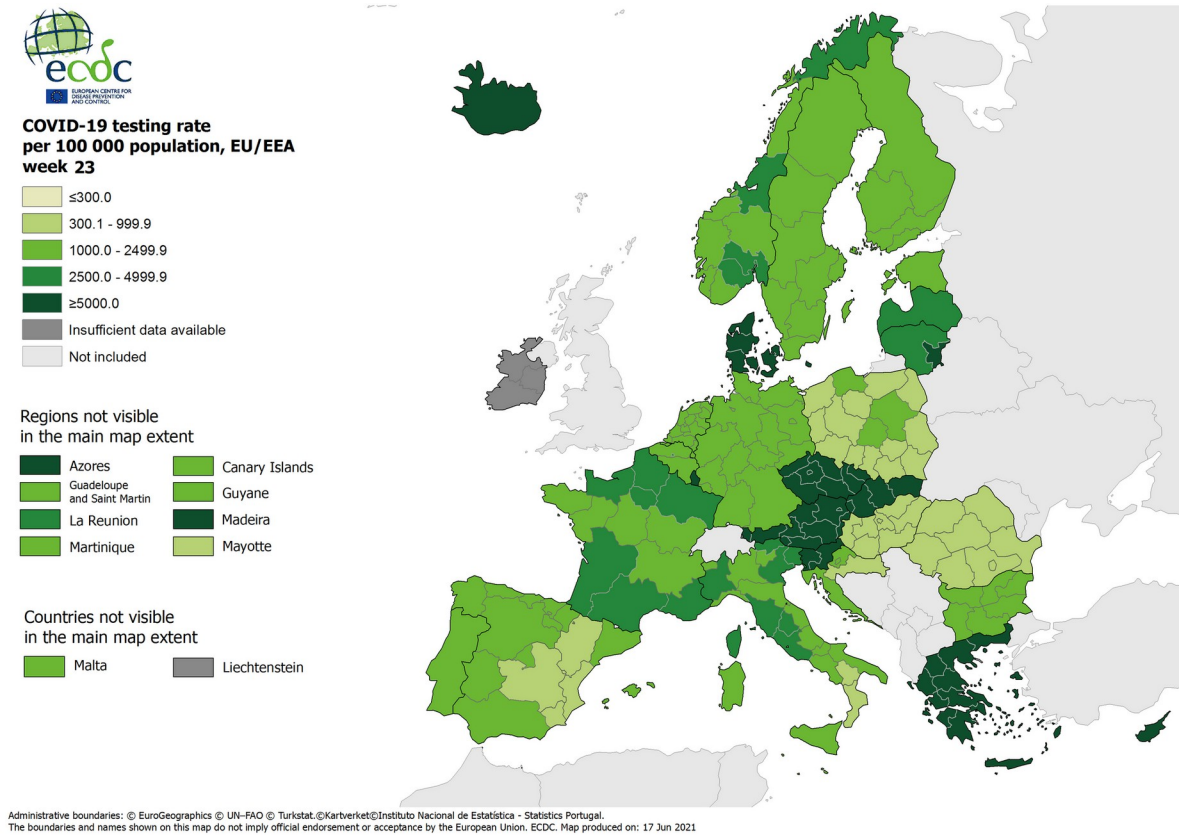
14-day case notification rate per 100 000 inhabitants,
updated 17 June 2021



https://www.ecdc.europa.eu/en

Current situation

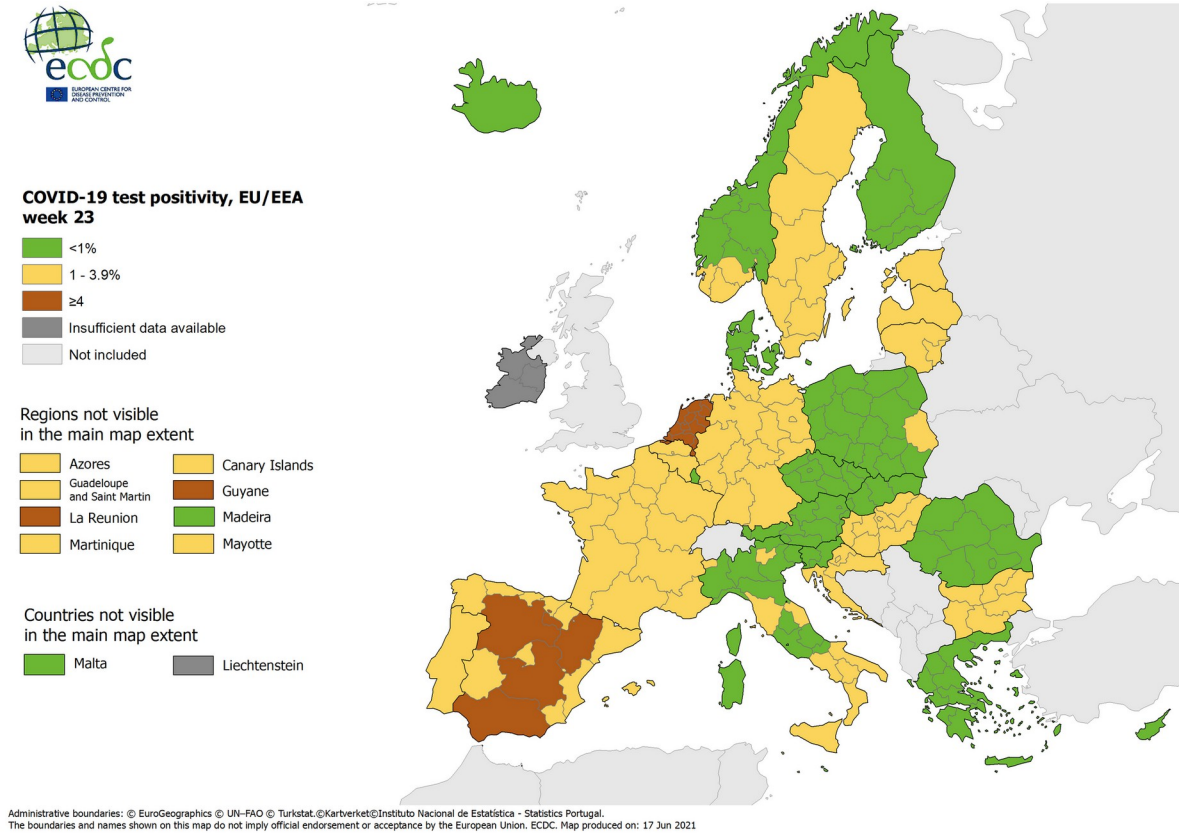
Testing rates per 100 000 inhabitants,
updated 17 June 2021



https://www.ecdc.europa.eu/en

Current situation

Positivity rates,
updated 17 June 2021

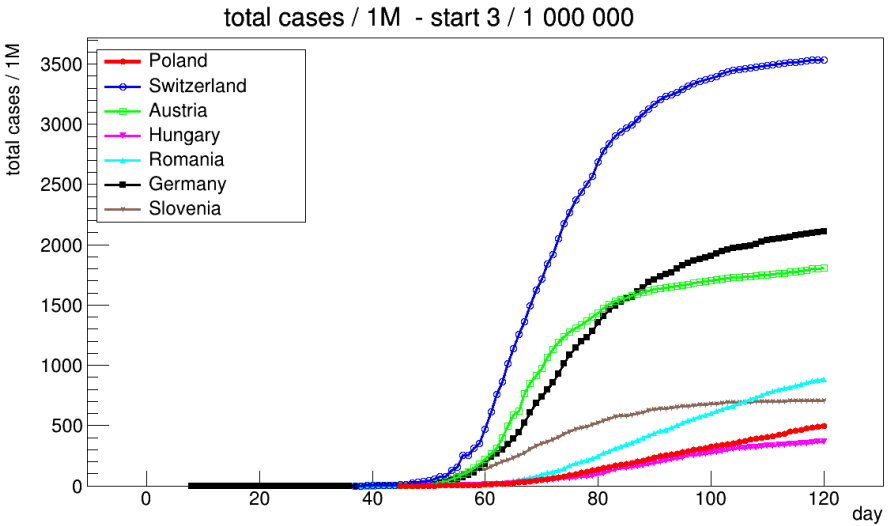


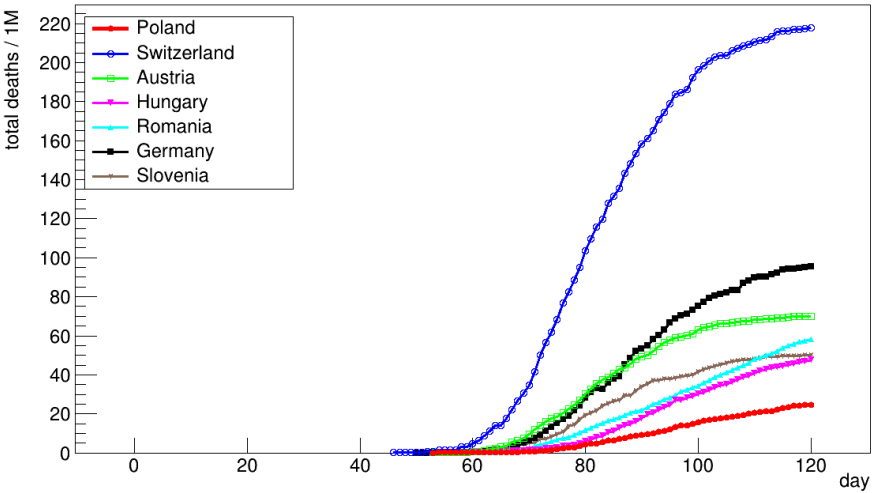
Poland:
more than 100 tests needed
to find 1 infected person

https://www.ecdc.europa.eu/en

Central Europe

numbers scaled to 1 million of citizens
day0: when 3 cases per 1 M were found





- also other countries in Central Europe followed trends similar to Poland,
- Austria very similar to Germany
- Switzerland ~2 times more affected

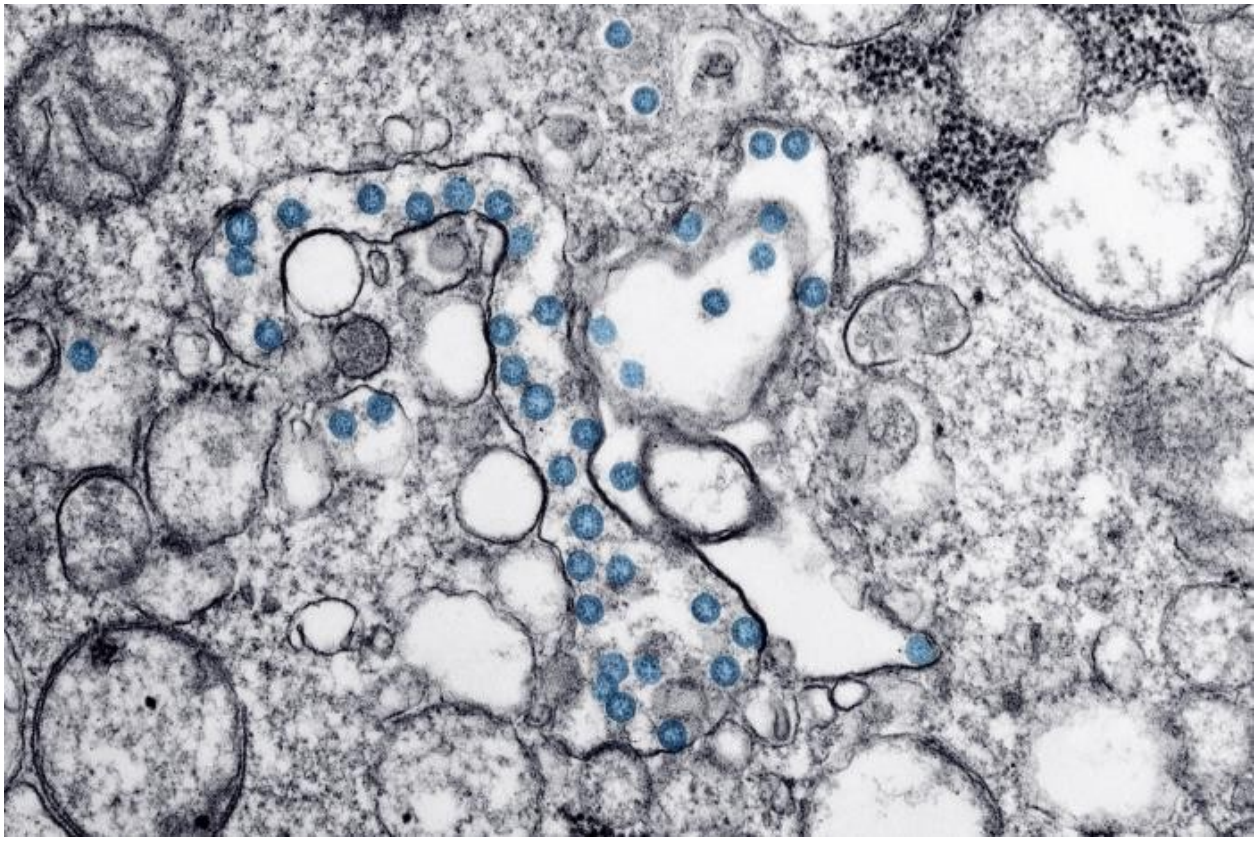
Virus variants

"British variant": more deadly or not

- hospital patients: severe disease or death 64/170 (37.7%) compare to 46/119 (38.7%)
  https://www.thelancet.com/journals/laninf/article/PIIS1473-3099(21)00170-5/fulltext

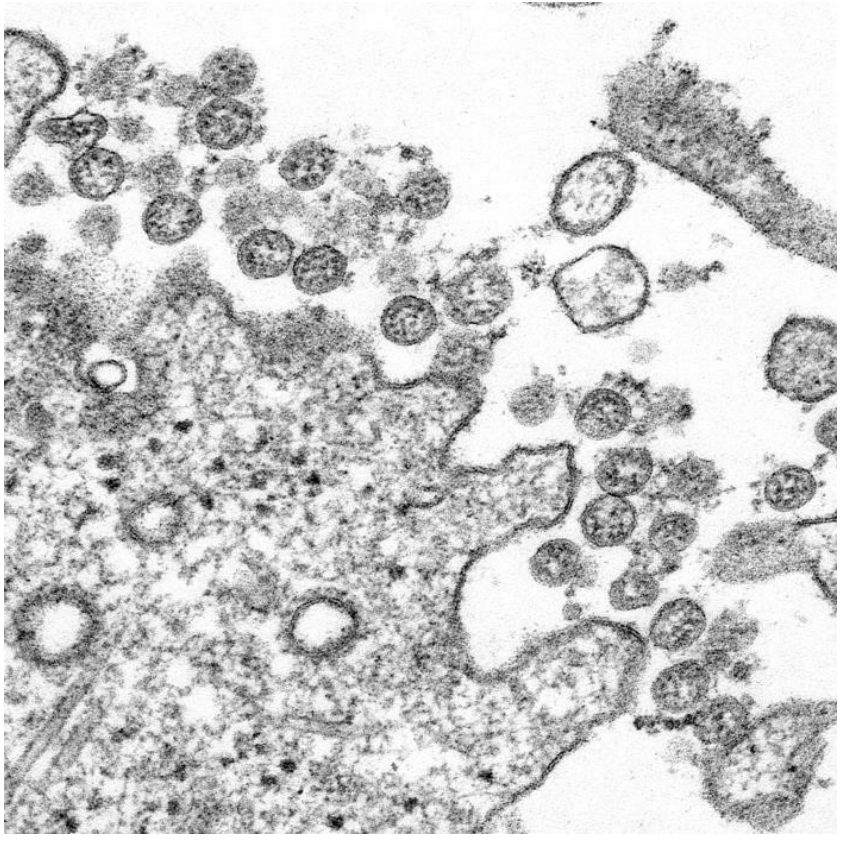
- comunity study: 227 deaths / 54 906 cases (compare to 141) (death rate 0.41% vs. 0.26%)
  https://www.bmj.com/content/372/bmj.n579

SARS CoV-2 virus



Public Health Image Library (PHIL)
https://www.cdc.gov/media/subtopic/images.htm

SARS CoV-2 virus



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