

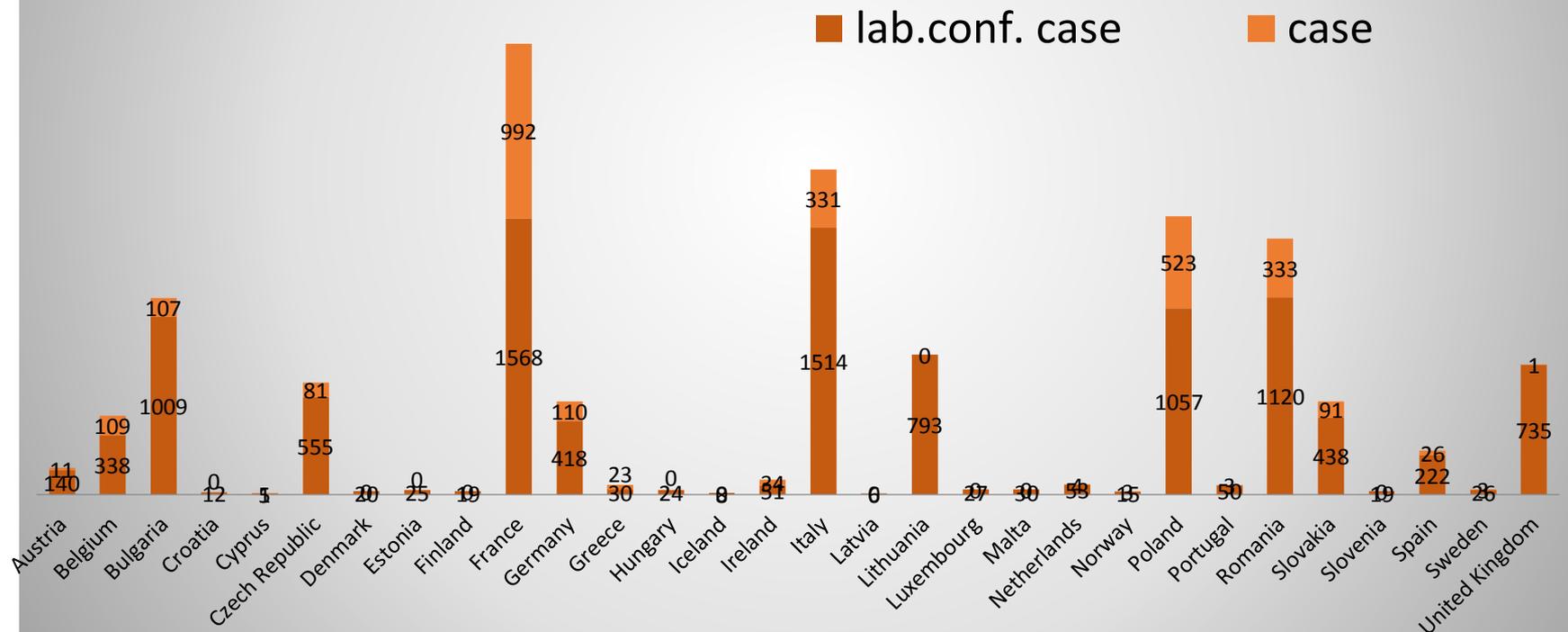
Conclusions of a measles/MMR serosurvey in the Hungarian population

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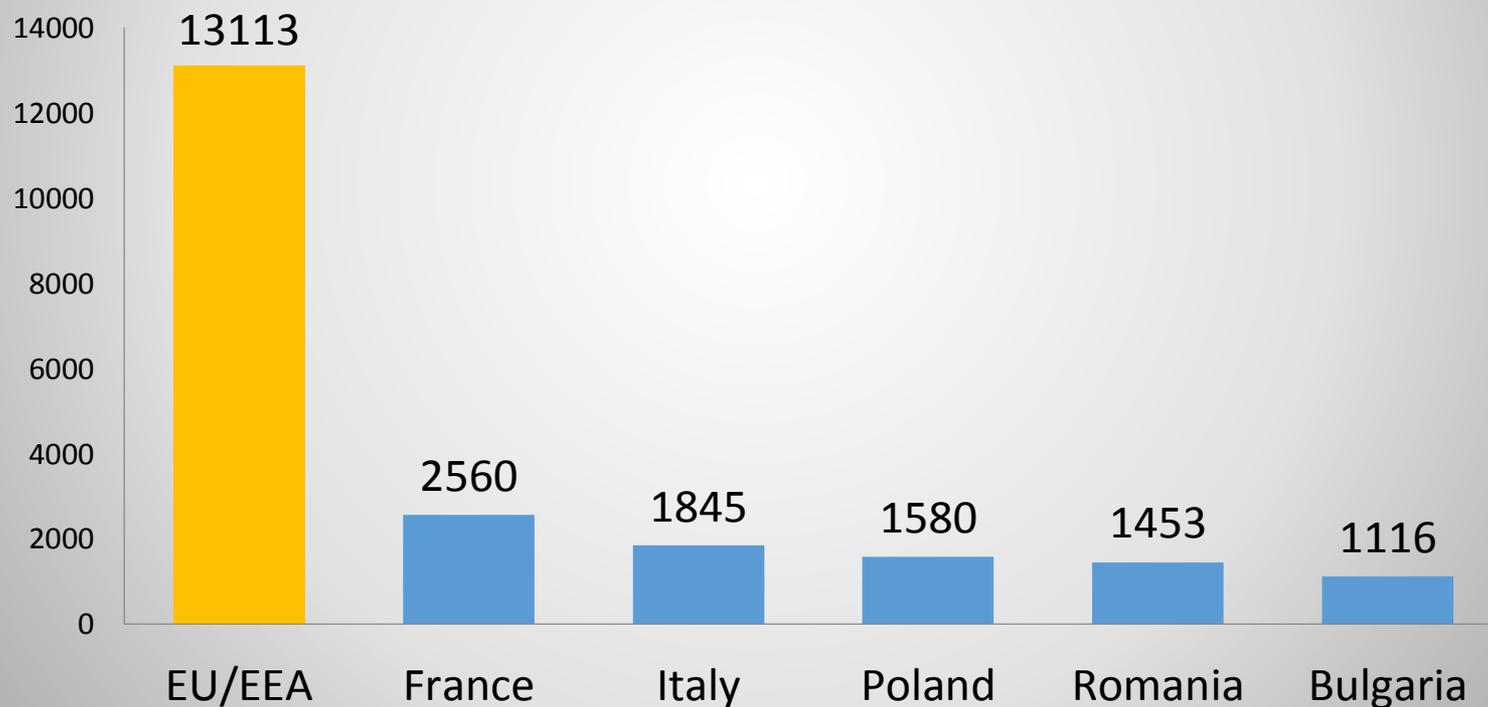
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8 October 2019

Number of measles cases by month and notification rate per million population by country, August 2018 - July 2019



TOTAL number of measles cases by month and notification rate per million population by country, August 2018 - July 2019



Our neighbouring countries...

- In 2018, Ukraine reported >54 000 measles cases; more than the entire EU.

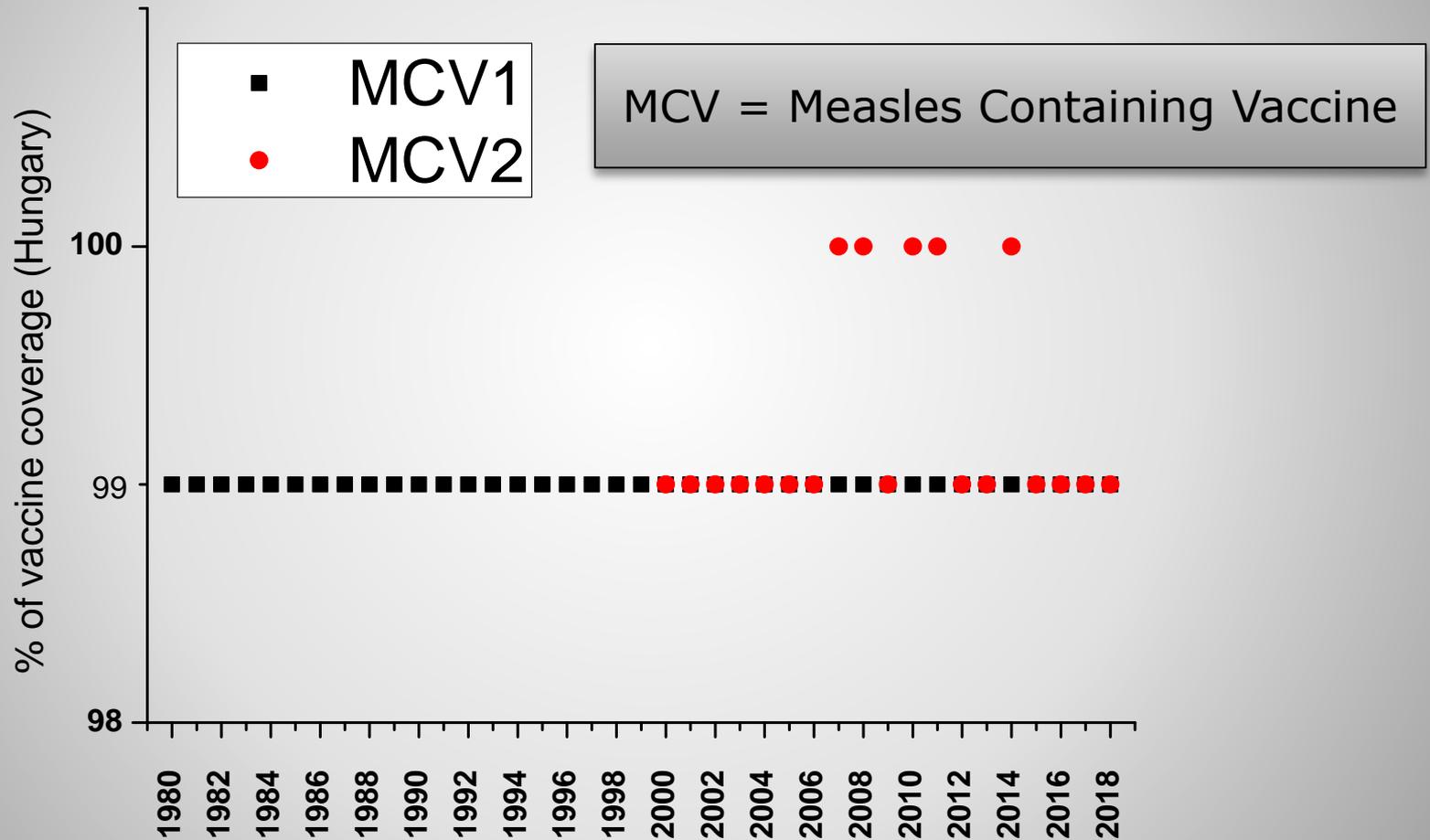
The total estimated number of measles cases for the first five months of 2019 was 52 034, including 17 deaths*.

- Also Romania bears high burden of the disease; between the first outbreak (late 2016) and May 2019 Romania has reported 16 627 cases and 63 deaths. **94% of the reported cases were unvaccinated individuals, and 4% received only one of the two-shot vaccination series.**

** WHO EpiBrief A report on the epidemiology of selected vaccine-preventable diseases in the European Region. 2018.*

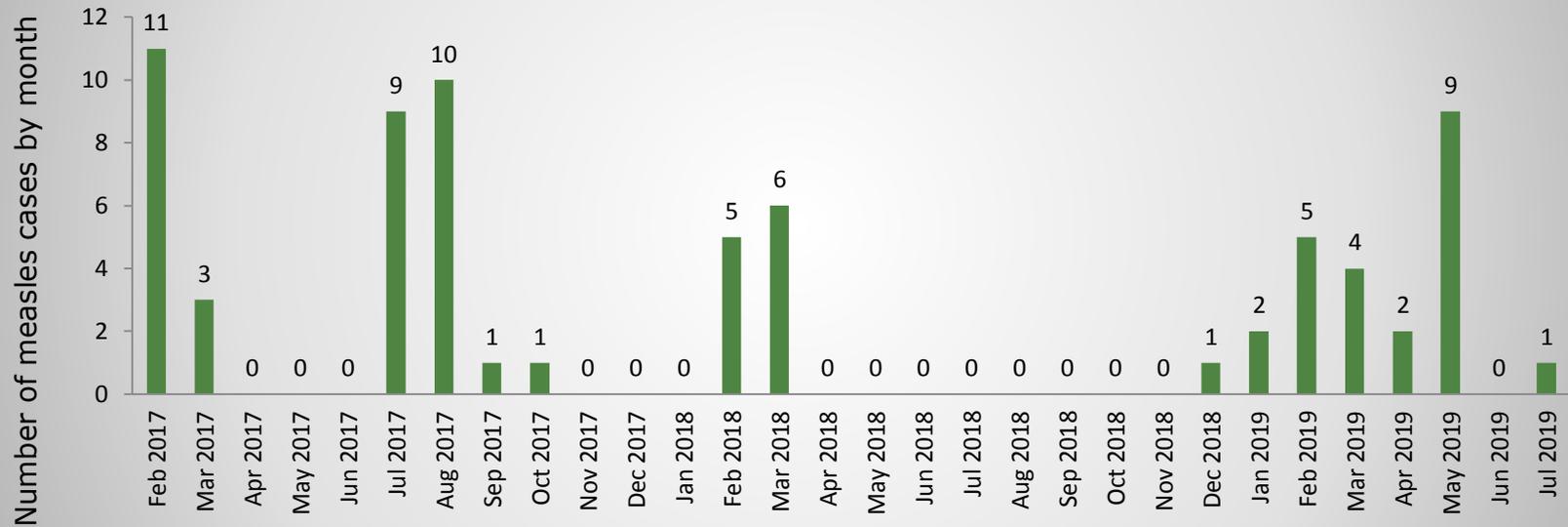
Ukraine: Measles Outbreak - Jan 2019 | ReliefWeb. (<https://reliefweb.int/disaster/ep-2019-000017-ukr>). Accessed 22 August 2019

In Hungary the vaccination coverage is $\approx 99\%$



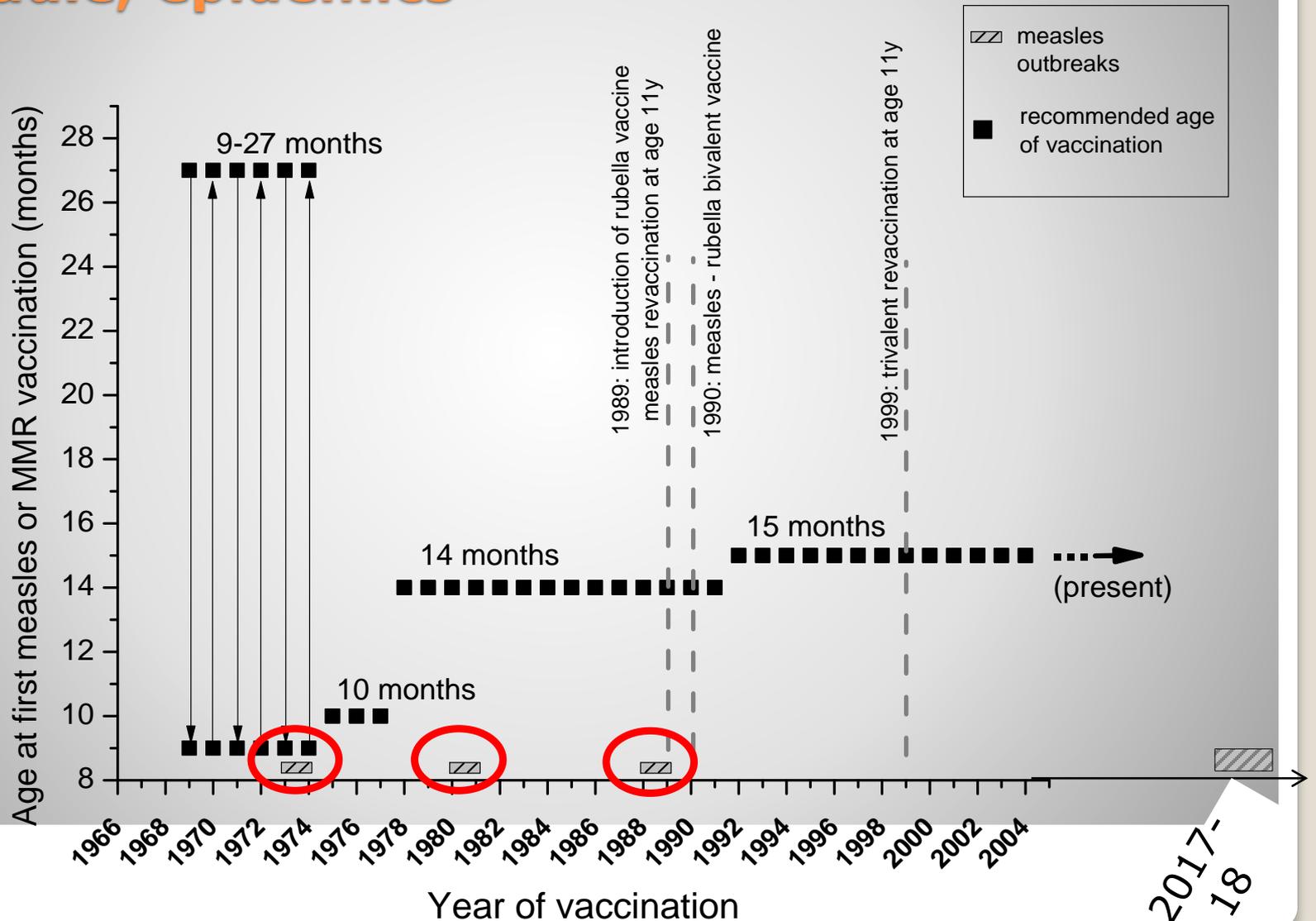
Hungary: WHO and UNICEF estimates of immunization coverage: 2018 revision

Measles cases in Hungary February 2017- July 2019



$$\Sigma = 70$$

Main changes of the Hungarian vaccination schedule, epidemics



2017-18

Hungarian measles history

In 1969, Hungary began measles vaccination efforts using the live, attenuated Leningrad-16 strain produced in the Soviet Union

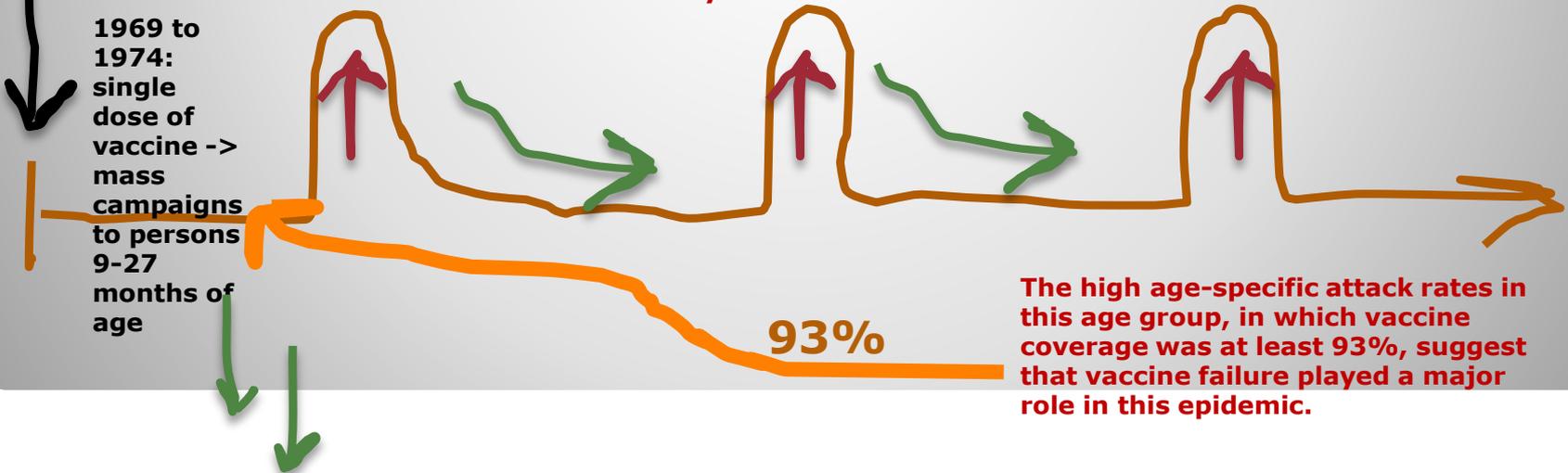
1969 to 1974: single dose of vaccine -> mass campaigns to persons 9-27 months of age

After the epidemic, persons born between 1973 and 1977, who would have received vaccine when the recommended age was 10 months, were revaccinated.

1973-74: large epidemics occurred primarily in unvaccinated 6-9-year-olds

1980-81: another epidemic occurred, primarily in 7-10-year-olds

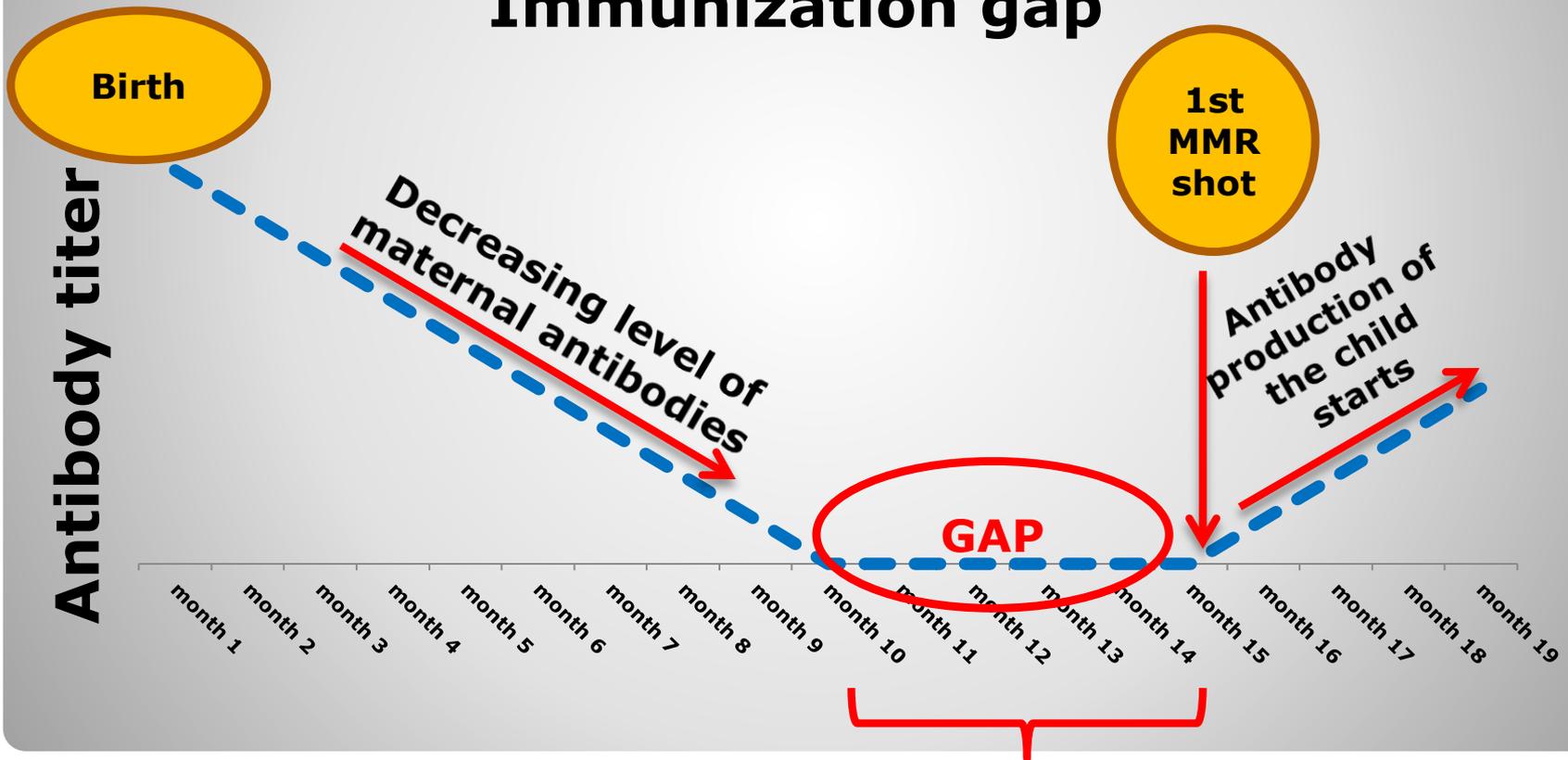
The 1988-89 epidemic mainly affected persons 17-21 years of age, who had been targeted to receive vaccine during mass campaigns in the first years of the vaccination program in Hungary.



The high age-specific attack rates in this age group, in which vaccine coverage was at least 93%, suggest that vaccine failure played a major role in this epidemic.

Antibody dynamics

Immunization gap



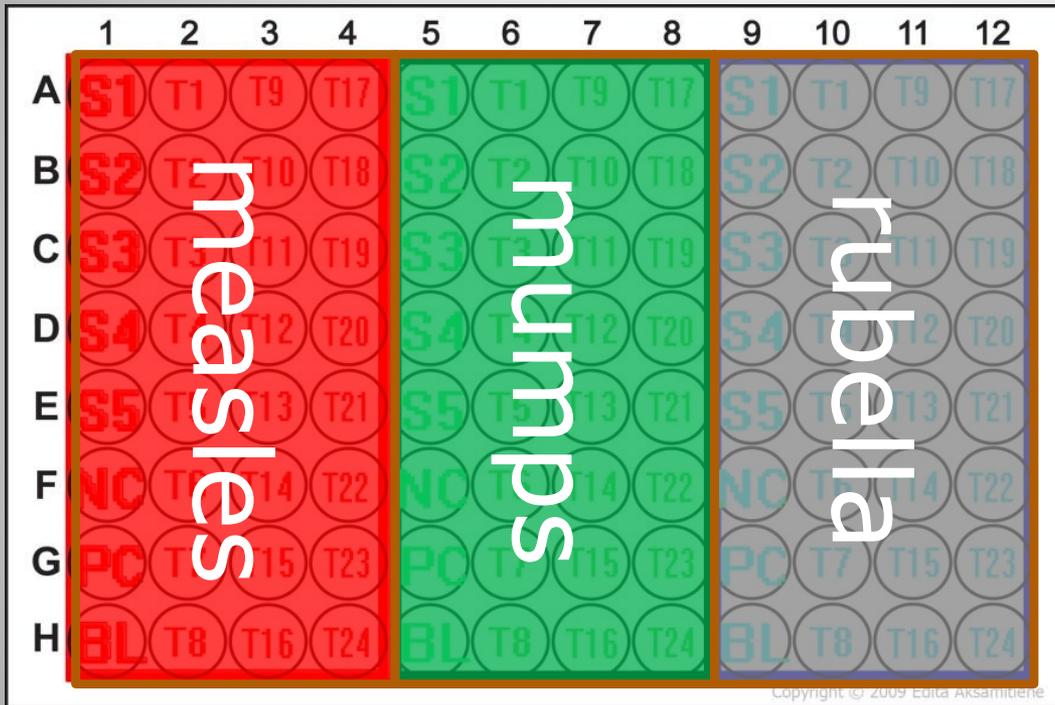
Infants are susceptible!

Herd-immunity?



Sant' Antioco, Sardegna, 2017

Three-in-one ELISA

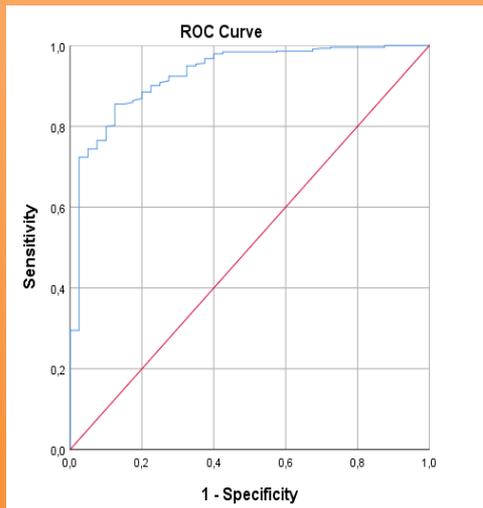


To our knowledge, this triple format of MMR ELISA is currently not available on the market.

- 3x 15 min
- Standardized
- Automated
- Optimal (very low) signal-to-noise ratio
- Reliable results also in the lower measurement range
- Concordant results with commercial kits
- 24 samples – 3 parameters – 1 run

Excellent correlation with the commercially available "gold standard" kit's results

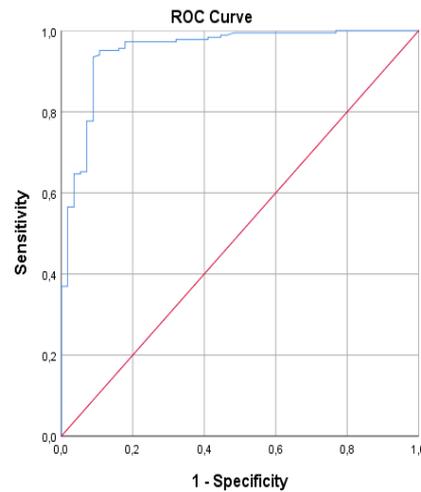
(A) Measles



AUROC
Area

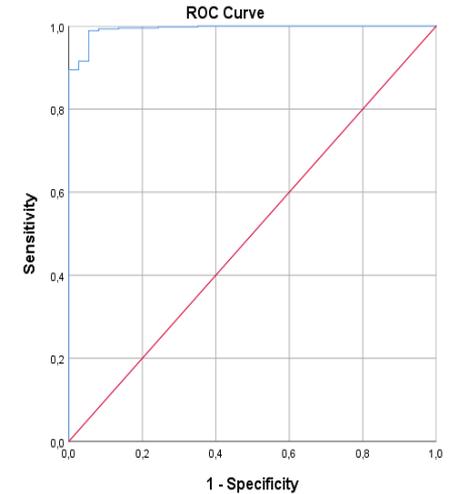
0.92

(B) Mumps



0.95

(C) Rubella

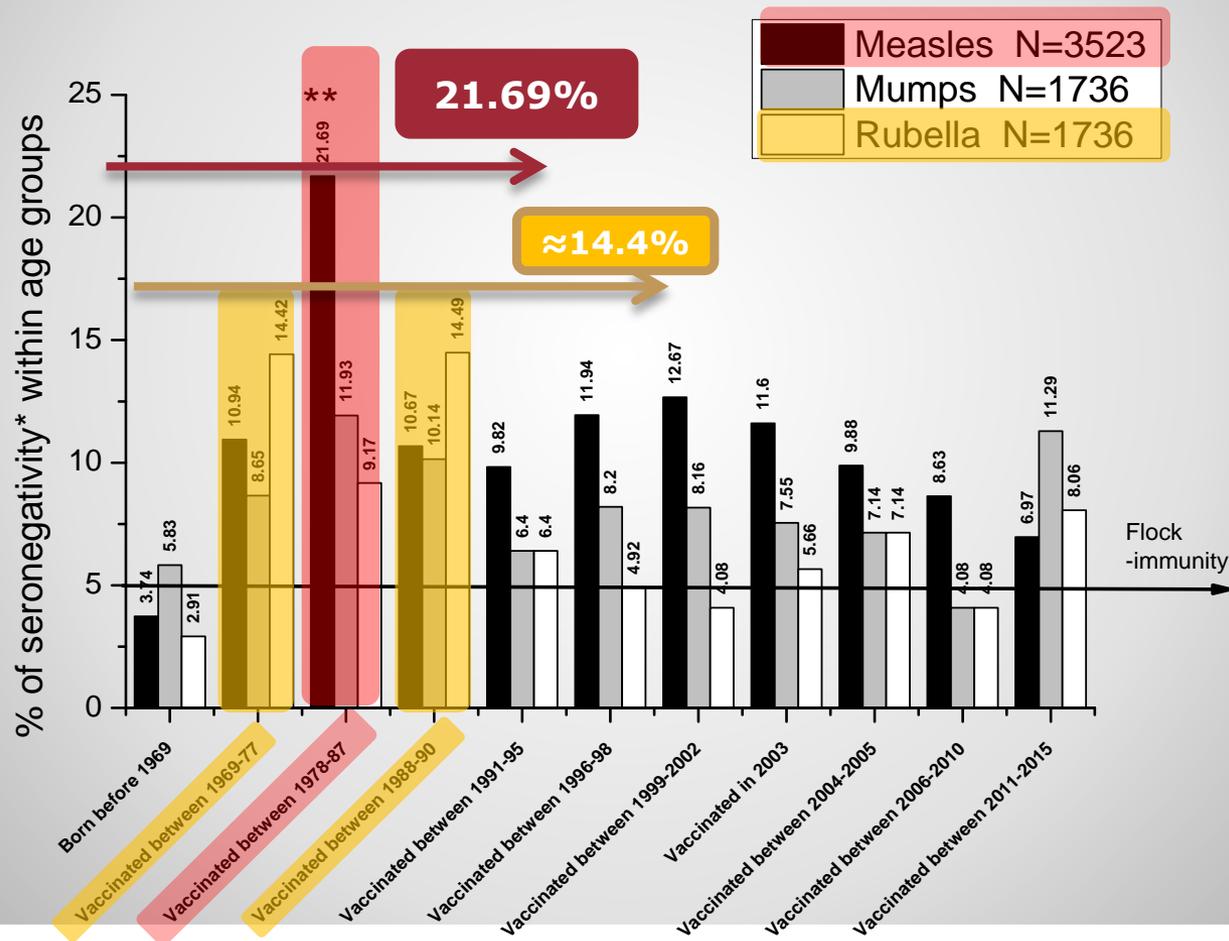


0.99

- Flexible
- **Cheap!**

RESULTS I

Seronegativity ratios



* Inadequate = negative or equivocal qualitative result

** Vaccine inefficiency and/or under-vaccination

RESULTS II

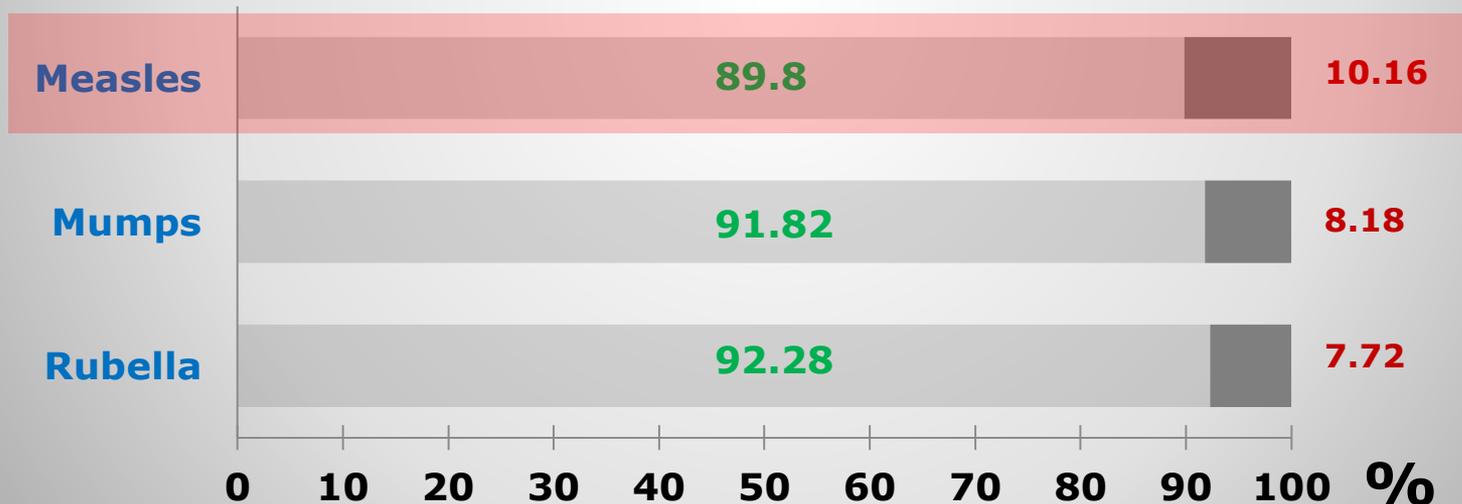
R_0 Measles = 12-18 / HIT Measles = 92-95%,
 R_0 Mumps = 4-12 / HIT Mumps = 75-86%,
 R_0 Rubella = 5-7 / HIT Rubella = 83-86%

$N_{\text{measles}} = 3523$

$N_{\text{mumps, rubella}} = 1736$

■ adequate %

■ inadequate %



Who can be at risk?

- **Healthcare workers**
- **Police/military officers**
- **People living in large communities**
- **Immune compromised individuals**
- **Children under age of vaccination**
- **Individuals with a single dose of vaccine**

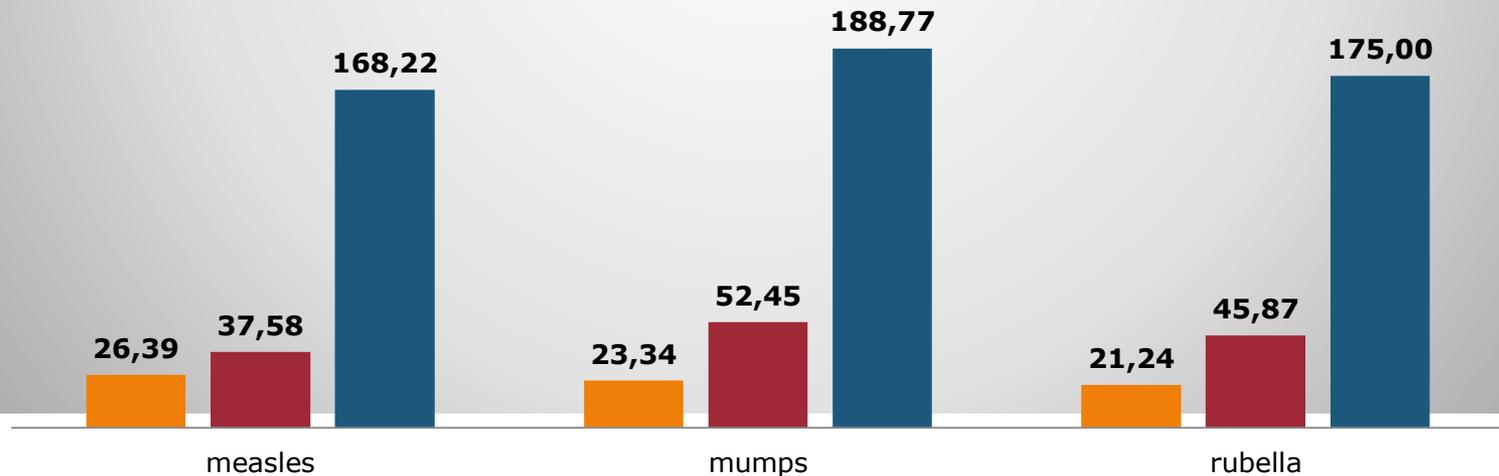
Conclusion

Screening is important!

...and with our newly developed OP is not even expensive...

Prices/costs per assay (EUR)

- Our entire virus antigen-repertoire based assay per assay Eur
- Our purified, recombinant antigen -repertoire based assay per assay Eur
- Mean price 'average quality' commercially available kits per assay Eur

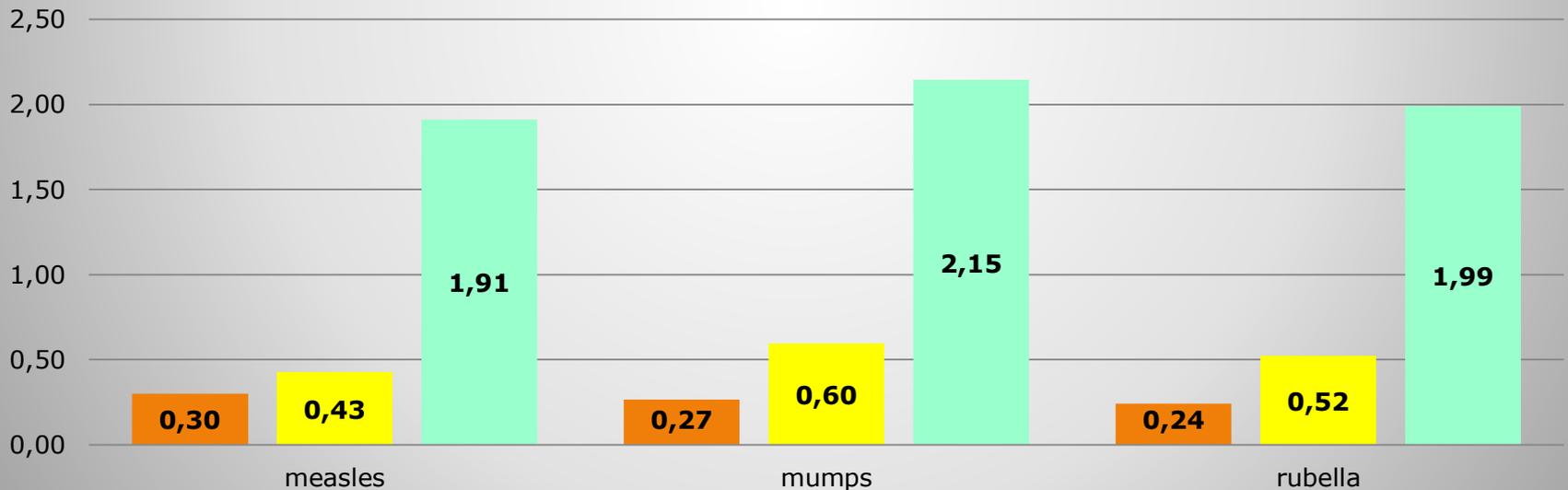


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Thank you for the attention!

