IEO
Istituto Europeo
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IEO25

Scientific evidence on Covid-19 risks associated with schools

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Outline

- SARS-CoV-2 infections in the Italian national observational school study
- Meta-analysis on SARS-CoV-2 infections in schools
- Trends of SARS-CoV-2 incidence in Italy, Germany and Portugal with school opening during Omicron wave
- Other publications assessing the role of school closure/reopening

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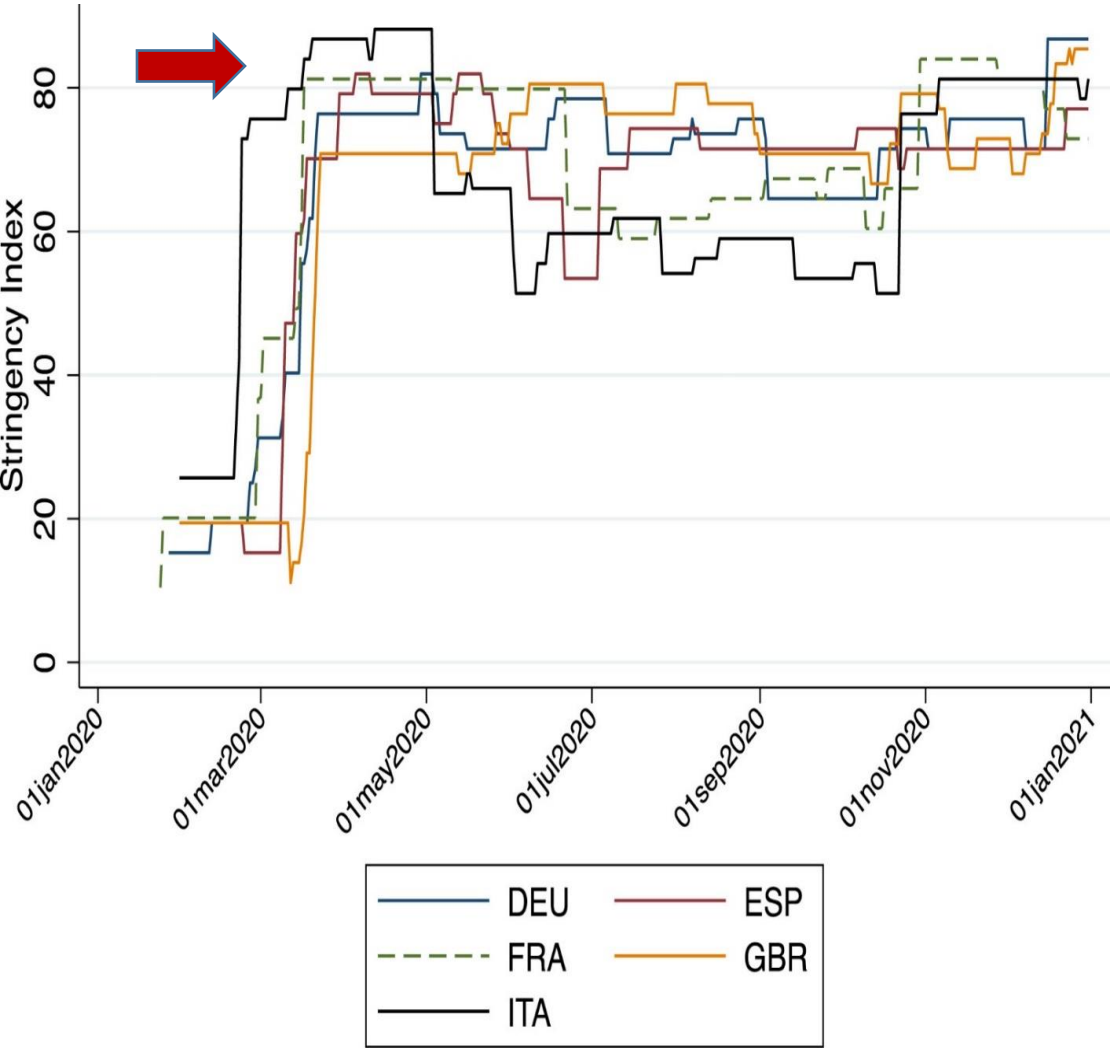
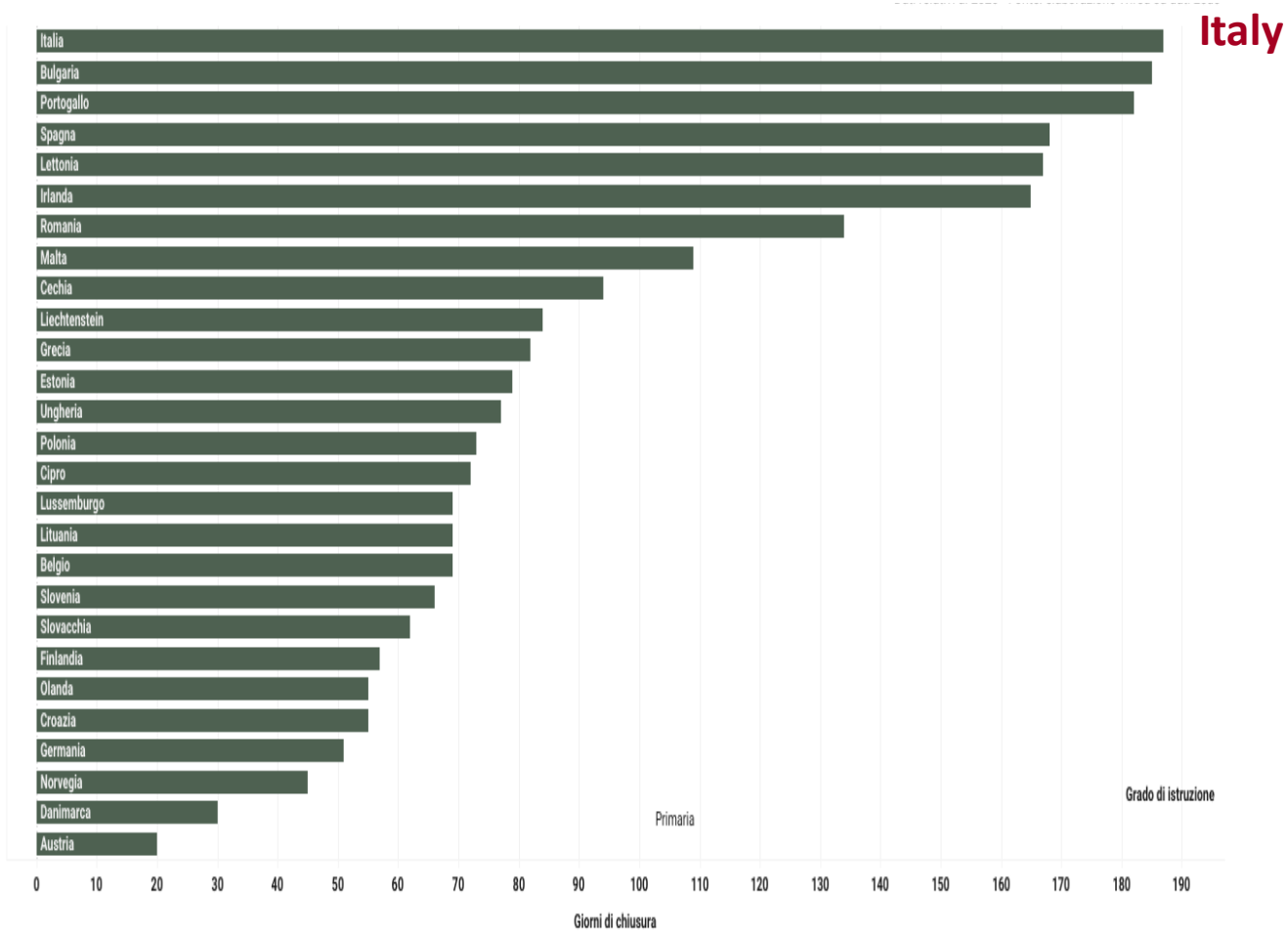
Background: Stringency index



Days of schools closure during 2020: primary schools



Daniel V. Gordon et al. Cross-country effects and policy responses to COVID-19 in 2020: The Nordic countries, Economic Analysis and Policy, 2021

ECDC

Study design and sources of data of the national Italian study

Cross-sectional and prospective cohort study:

- From 14th September to 7th November 2020 data on Sars-Cov-2 incidence in schools: 7 million students and 700,000 teachers and non-teaching staff: 97% of Italian schools
- The end of November and beginning December data on swabs tests and secondary infections: 50% Italian institutes
- In December data on secondary infections by type of index case in schools of Veneto region

Databases:
School Principals every week for each comprehensive institute.
Department of Prevention of the local unit (AULSS) of the National Health System responsible for tracing.
Italian civil protection and Office for National Statistics

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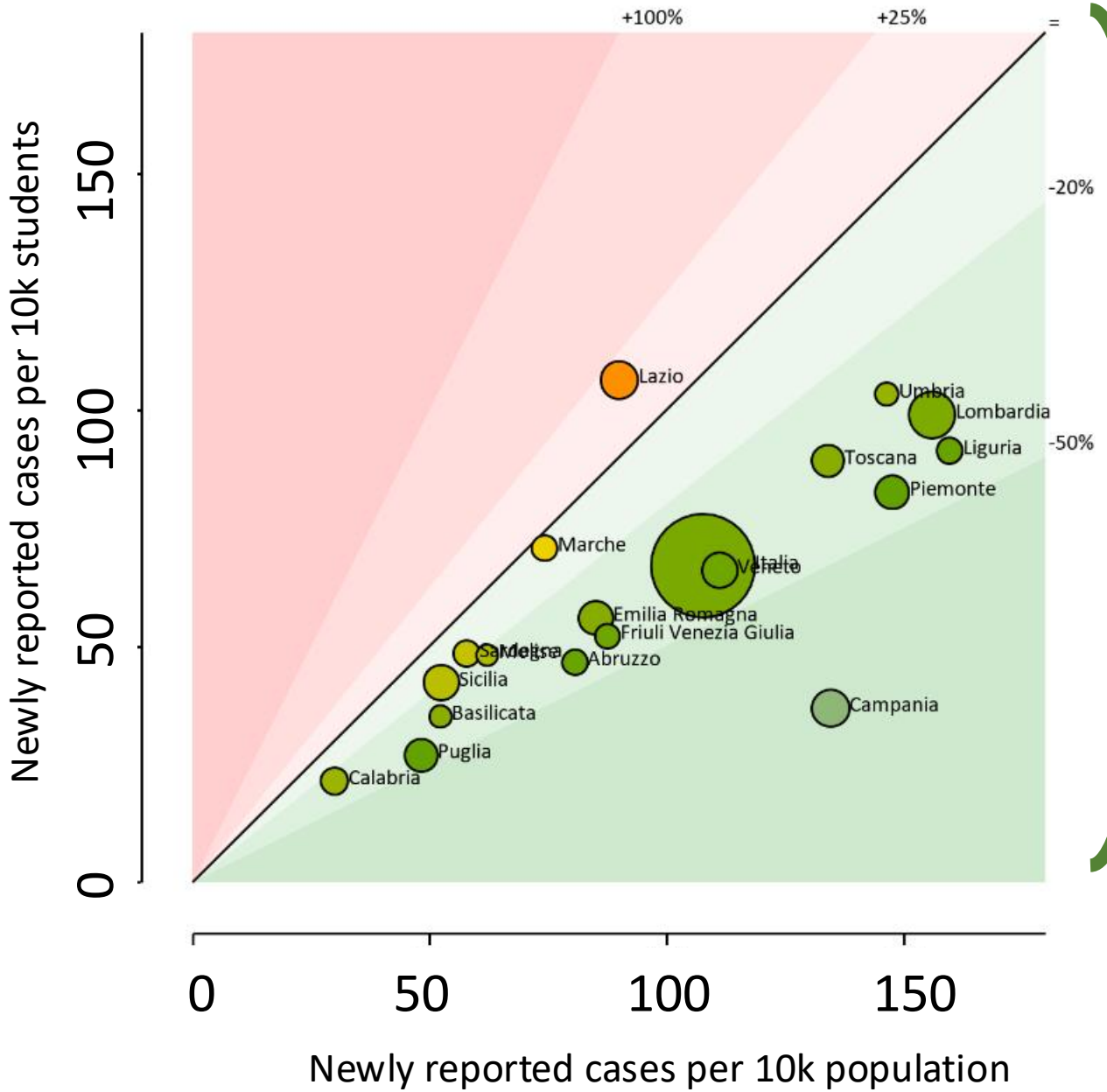
Incidence in elementary and middle school students

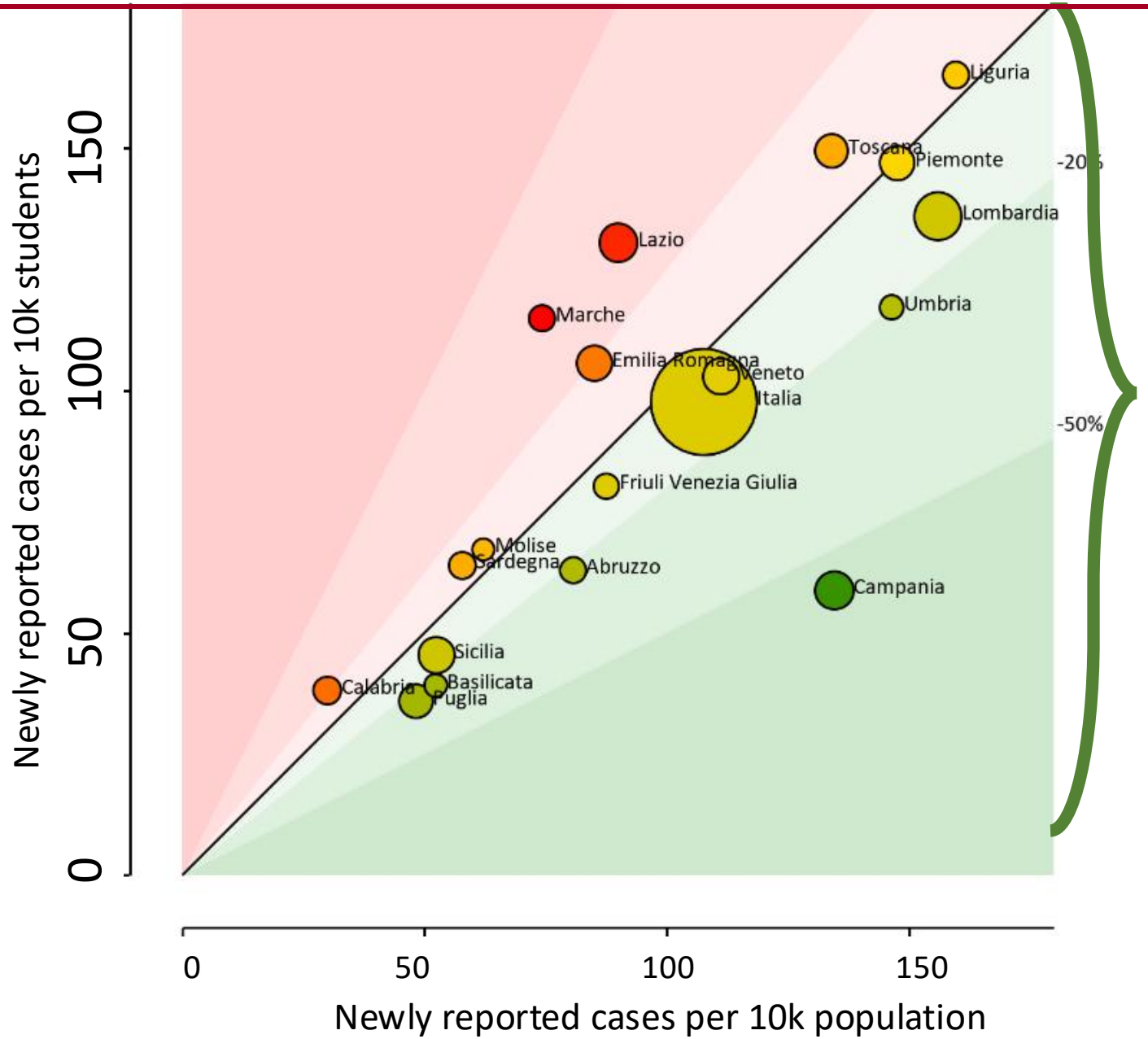


Regions with a lower incidence than the general population

Incidence in the population: 108/10,000,
elementary and middle schools: 66/10,000

On average 39% lower than
in the general population

Incidence in high schools students



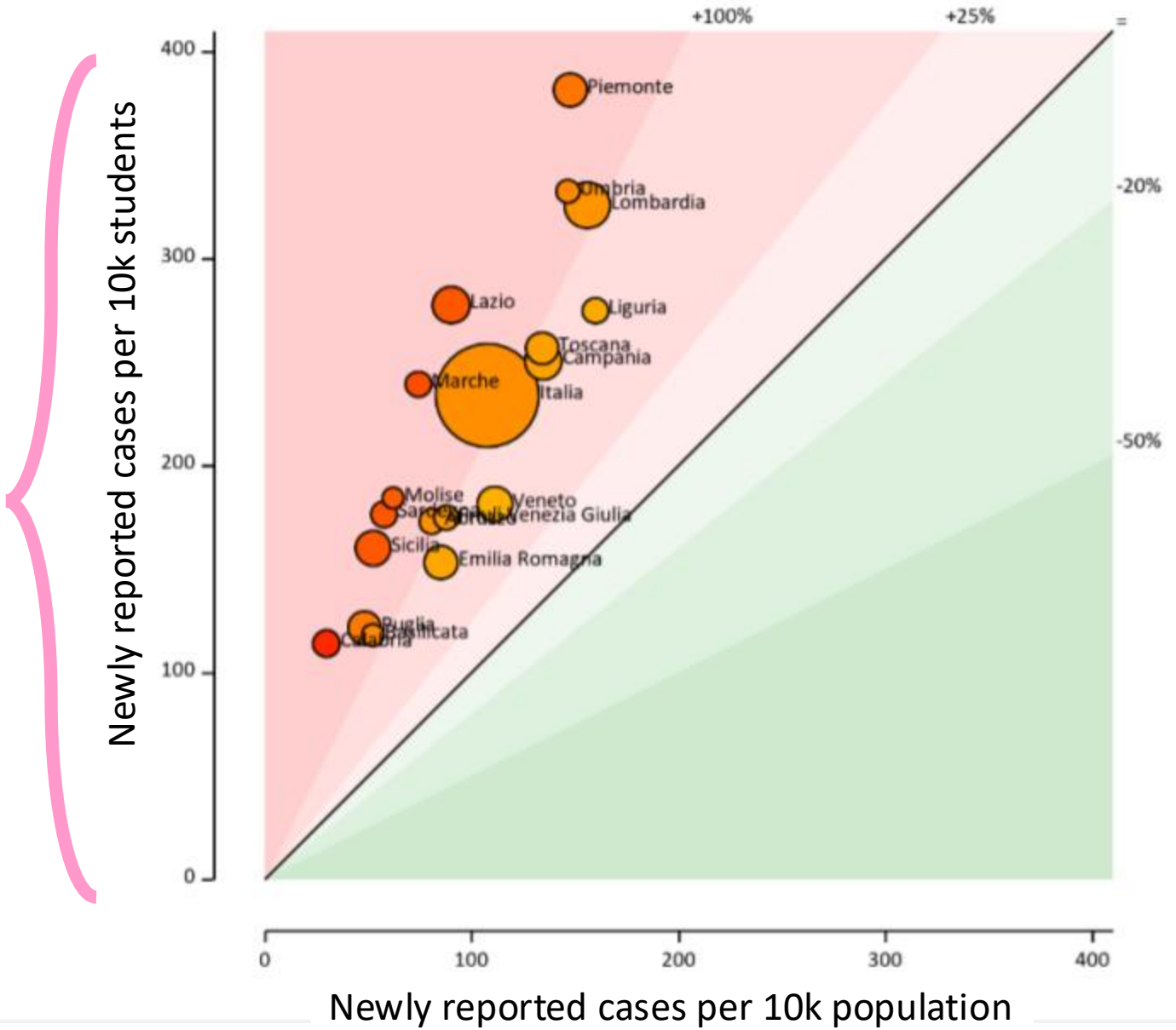
Regions with a lower incidence than the general population

In high schools students incidence was: 98/10,000. In average 9% lower to that of the general population.

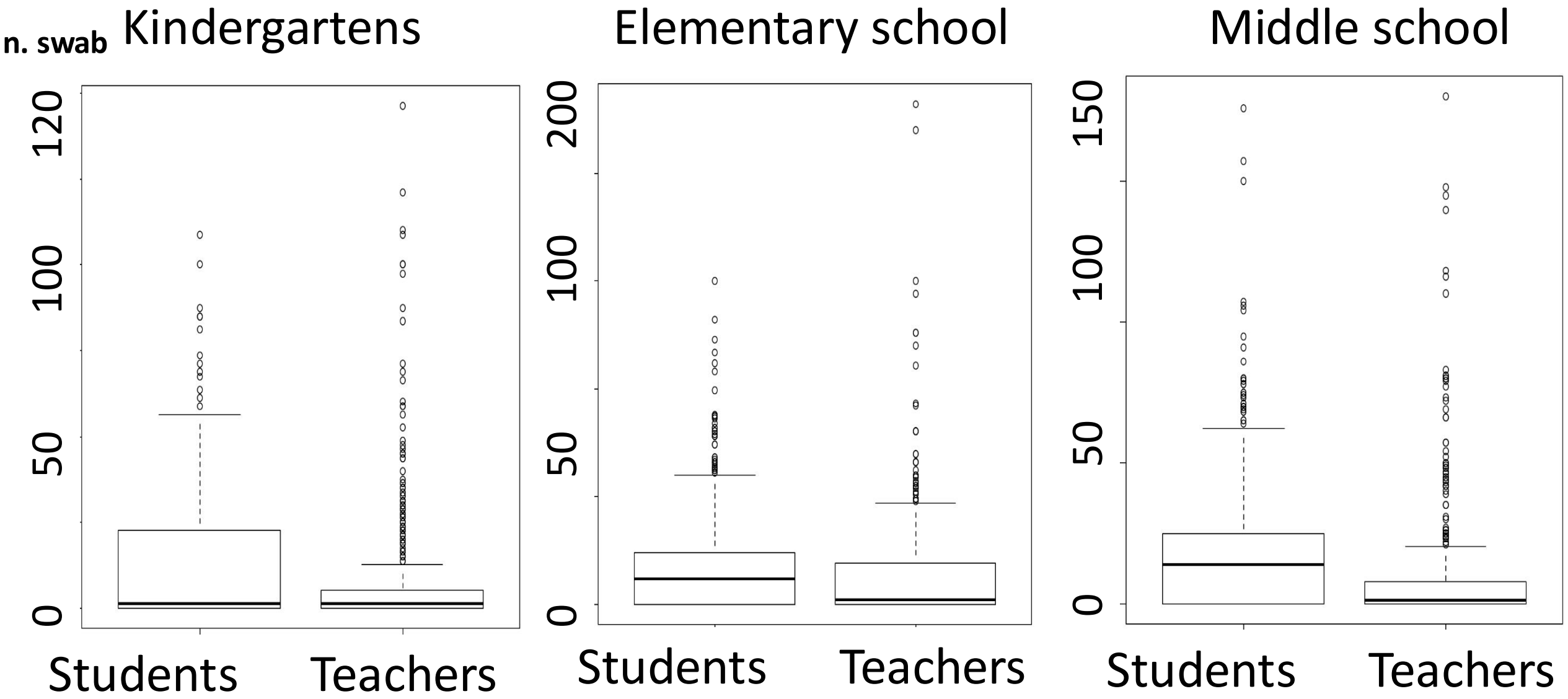
Incidence in teachers and non-teaching staff

Regions with a higher incidence than the general population

Among teachers and non-teaching staff incidence was 2-fold higher than in the general population approx. 220/10,000



Number of swabs for screening per week during contact tracing after an index case found in schools

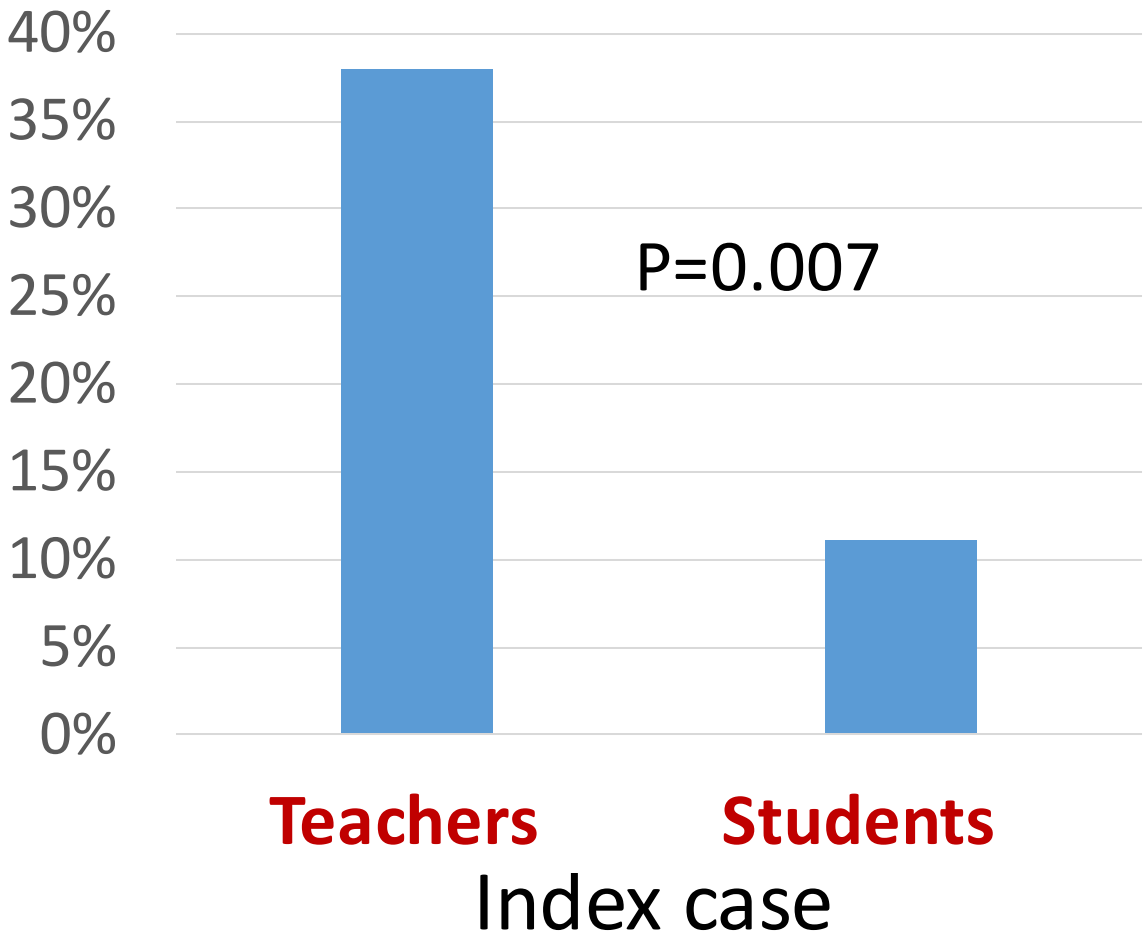


The frequency of secondary cases in teachers at school by type of index case

Index cases		Secondary cases			
		Total	Students	Teachers	Staff
Students	355	60 (100%)	54 (90%)	6 (10%)	0 (0%)
Students age <13		38 (100%)	33 (87%)	5 (13%)	0 (0%)
Students age 13-18		22 (100%)	21 (95%)	1 (5%)	0 (0%)
Teachers	112	16 (100%)	10 (63%)	6 (37%)	0 (0%)
Staff	25	5 (100%)	0 (0%	0 (0%)	5 (100%)
Total	492	81	64	12	5

Index and secondary cases in 339 schools of the Province of Verona

25th of November to 21st of December 2020



Similar results were found in a study conducted in Georgia

Clusters of SARS-CoV-2 Infection Among Elementary School Educators and Students in One School District — Georgia, December 2020–January 2021. Jeremy A. W. Gold, M. MMWR Morb Mortal Wkly Rep. 2021

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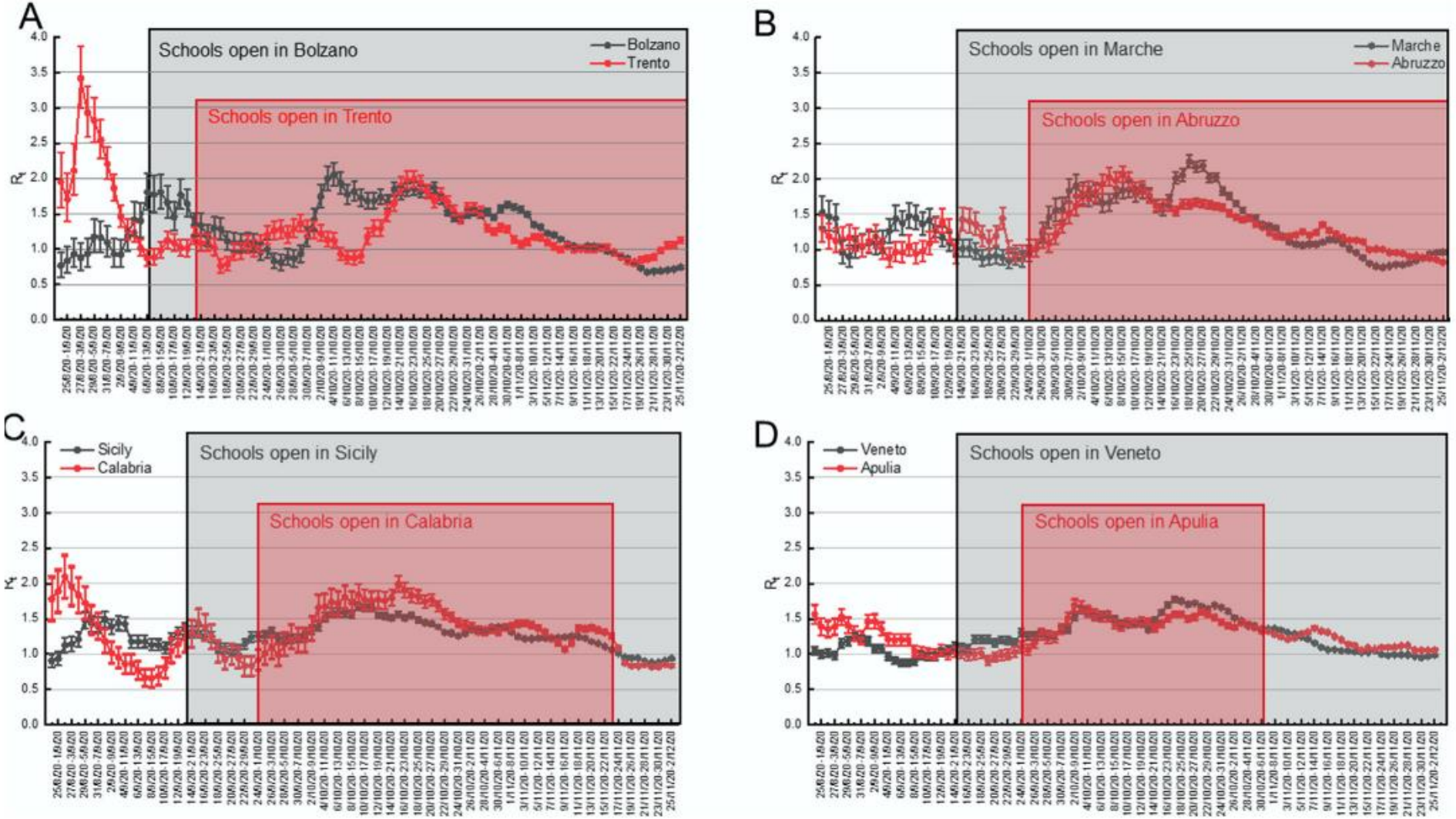
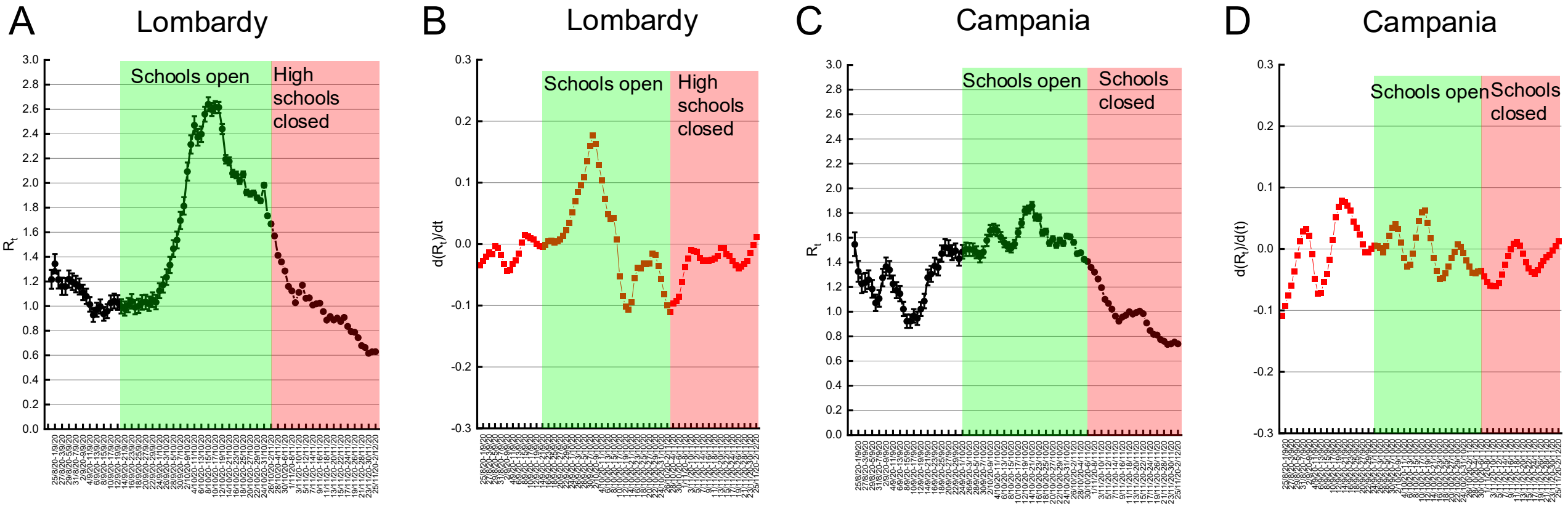
Changes in R_t were not univocally correlated with school opening times



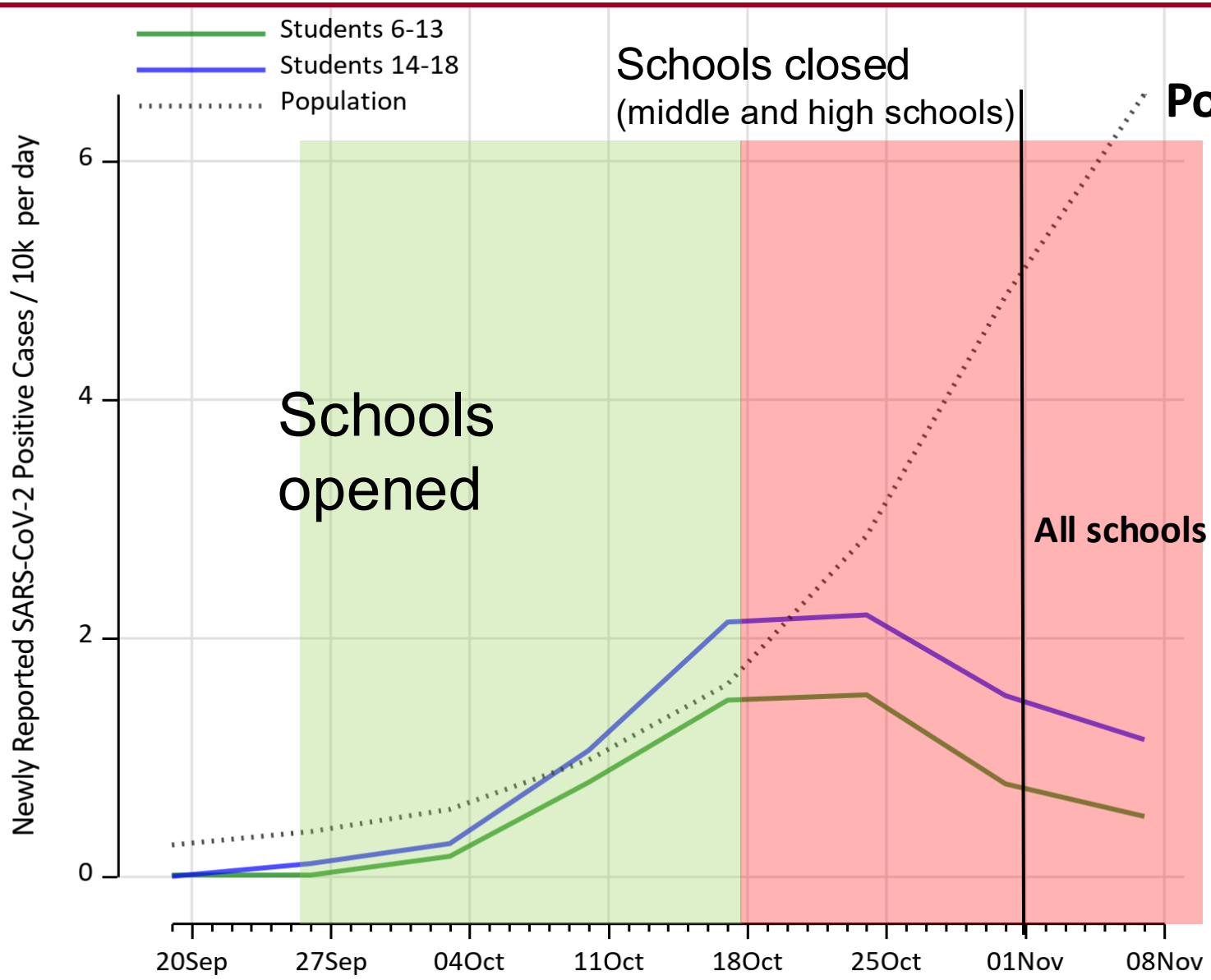
Pairwise comparison of median R_t in the indicated 7 days periods (95% Confidence intervals) by similar geographical areas

No evidence that opening and closure of schools modified Rt



Rt was computed from the positives after referral to swab by a physician (diagnostic suspicion).
In all graphs, R_t values are reported as median values with 95% confidence interval over a 7-day period.
First order derivative of R_t in Lombardy (B) and Campania (D). Days of school opening and closure are indicated.

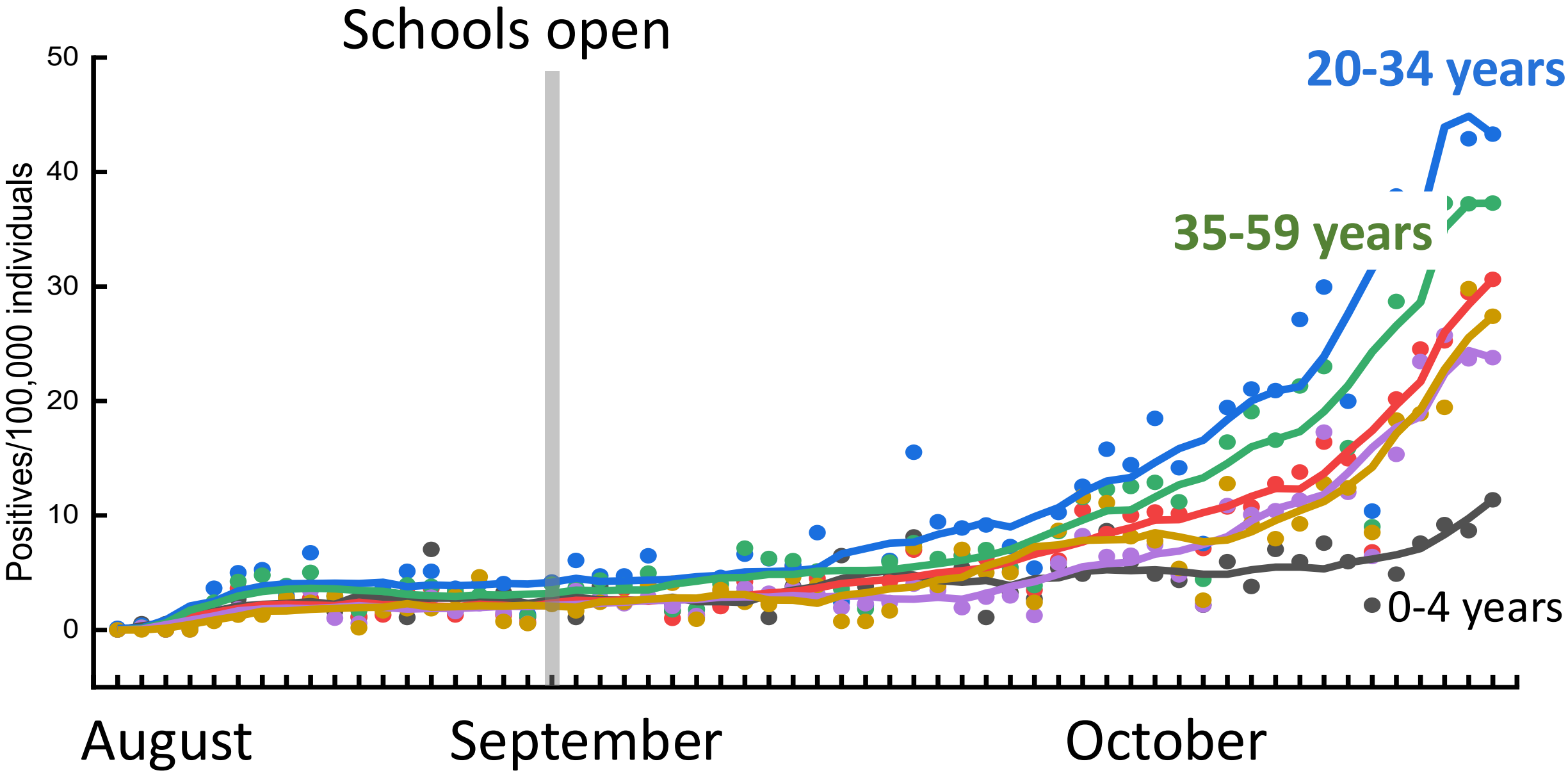
In Campania even when schools are closed the curve of sars-cov-2 cases continues to increase as before



High schools

Elementary and middle schools

Cases increased primarily for the 20-59 age groups



National observational Italian school study

The Lancet Regional Health - Europe 5 (2021) 100092

Contents lists available at ScienceDirect

The Lancet Regional Health - Europe

journal homepage: www.elsevier.com/lanepe

Research paper

A cross-sectional and prospective cohort study of the role of schools in the SARS-CoV-2 second wave in Italy

Sara Gandini[a,*], Maurizio Rainisio[b], Maria Luisa Iannuzzo[c], Federica Bellerba[a], Francesco Cecconi[d], Luca Scorrano[e,f,**]

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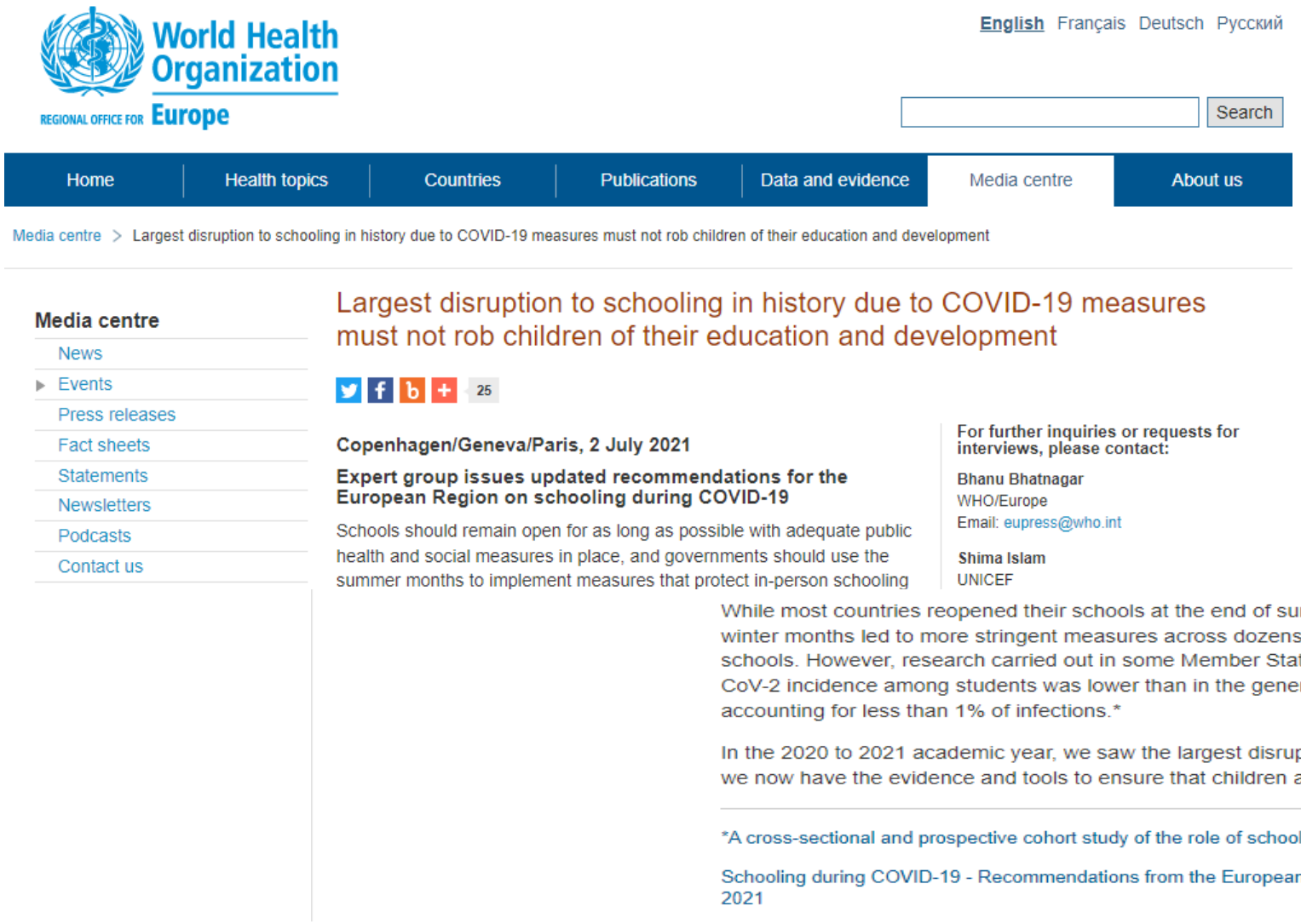
WHO and schools closure



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Largest disruption to schooling in history due to COVID-19 measures must not rob children of their education and development

25

Copenhagen/Geneva/Paris, 2 July 2021

Expert group issues updated recommendations for the European Region on schooling during COVID-19

Schools should remain open for as long as possible with adequate public health and social measures in place, and governments should use the summer months to implement measures that protect in-person schooling

For further inquiries or requests for interviews, please contact:

Bhanu Bhatnagar
WHO/Europe
Email: eupress@who.int

Shima Islam
UNICEF

While most countries reopened their schools at the end of summer 2020, rising infection rates in the autumn and winter months led to more stringent measures across dozens of countries, including, in some areas, the closure of schools. However, research carried out in some Member States during the winter months of 2020 shows that SARC-CoV-2 incidence among students was lower than in the general population, with secondary infections in schools accounting for less than 1% of infections.*

In the 2020 to 2021 academic year, we saw the largest disruption to education in history. With these recommendations, we now have the evidence and tools to ensure that children and young people can return to in-person schooling safely.

*A cross-sectional and prospective cohort study of the role of schools in the SARS-CoV-2 second wave in Italy

Schooling during COVID-19 - Recommendations from the European Technical Advisory Group for schooling during COVID-19, June 2021

https://www.euro.who.int/en/media-centre/sections/press-releases/2021/largest-disruption-to-schooling-in-history-due-to-covid-19-measures-must-not-rob-children-of-their-education-and-development

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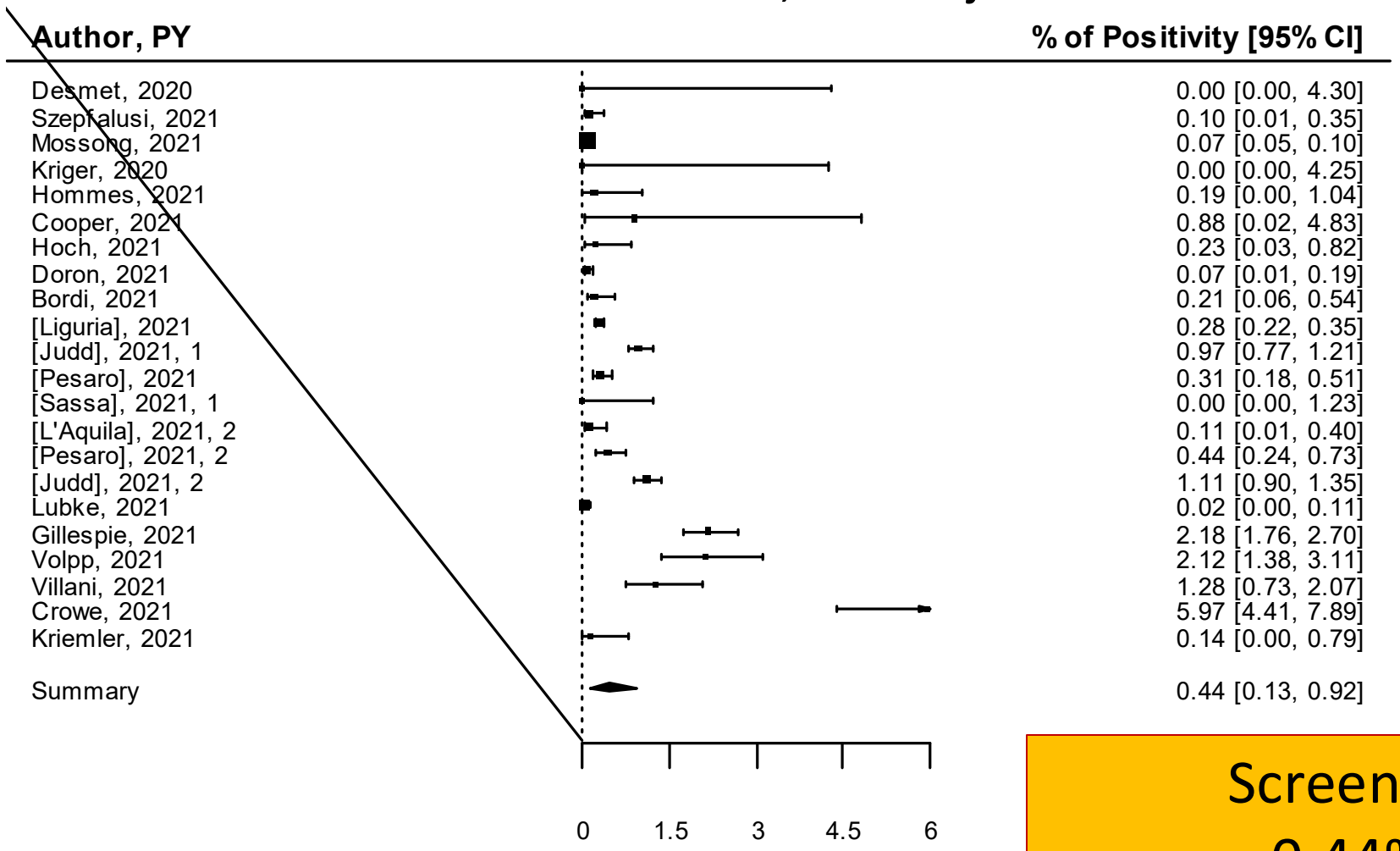
Meta-analysis of tests from screening in schools

Total of 120,000 subjects

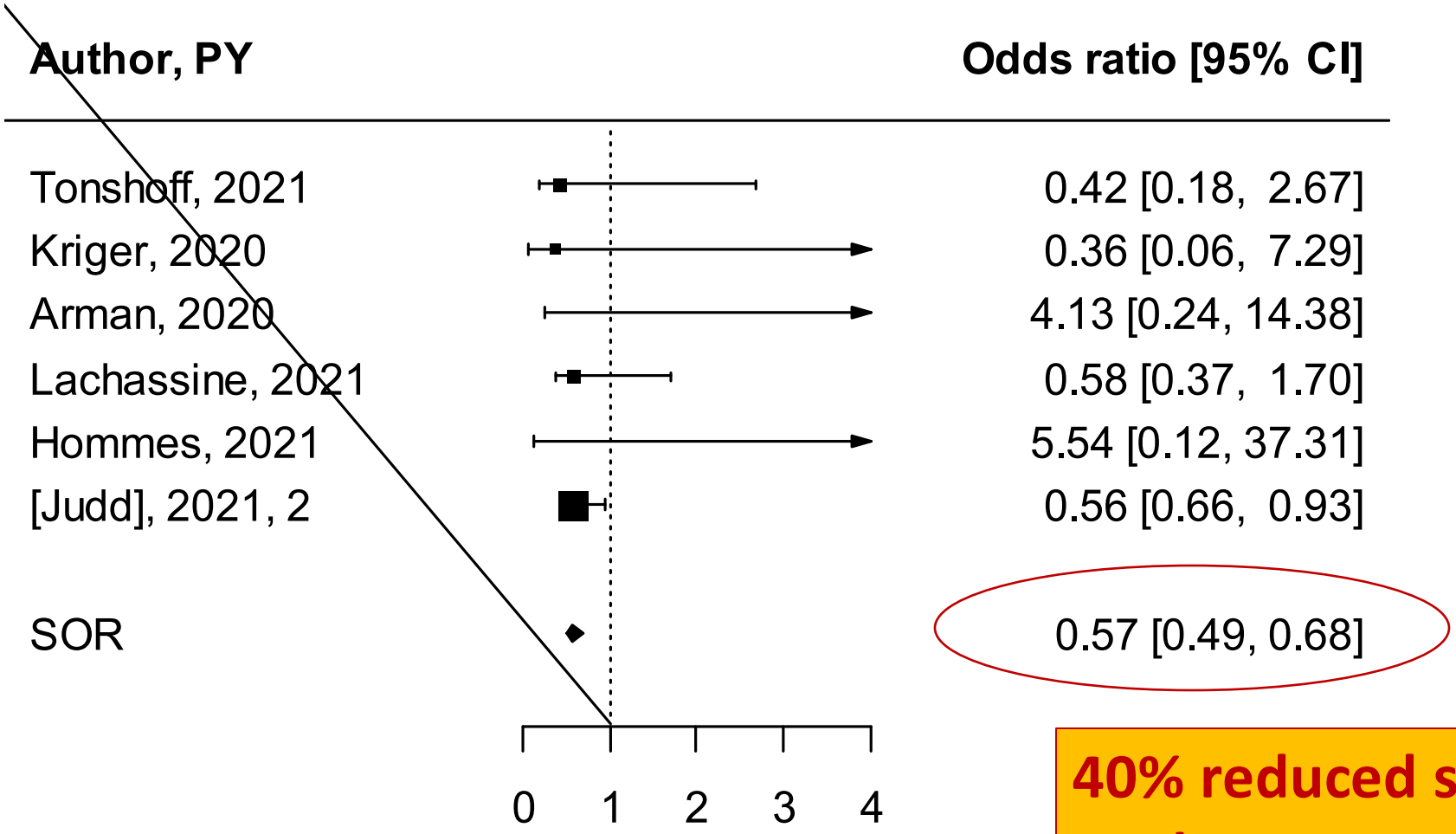


Screening in average
0.44% of positive

Caini et al. SARS-CoV-2 Circulation in the School Setting: A Systematic Review and Meta-Analysis. Int J Environ Res Public Health. 2022

Meta-analysis of serological tests in schools

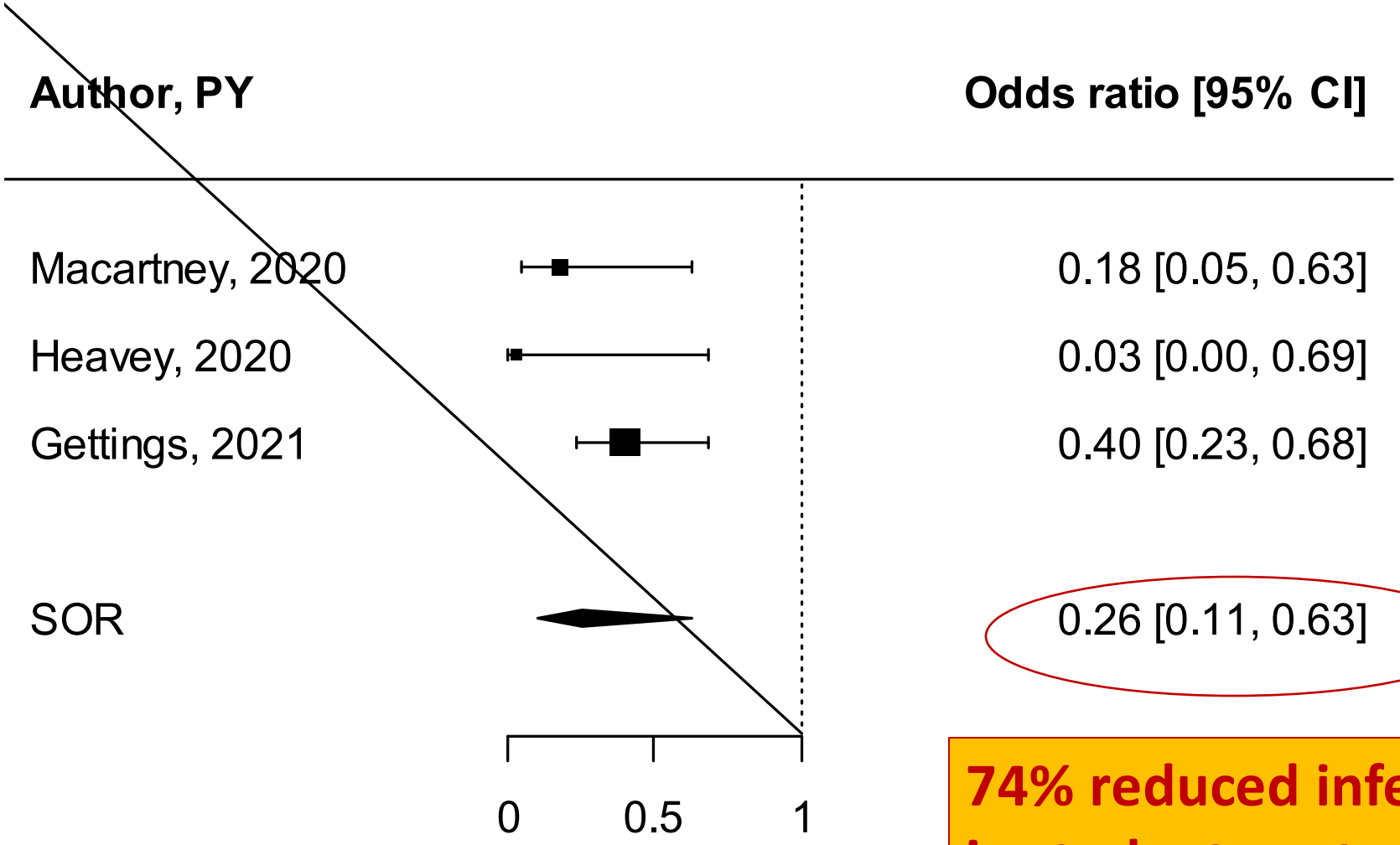
Total of 17,879 subjects



40% reduced susceptibility of students vs teachers

Young index cases were found to be less susceptible to infection

Meta-analysis on infectivity looking at index cases in schools



74% reduced infectivity in students vs teachers

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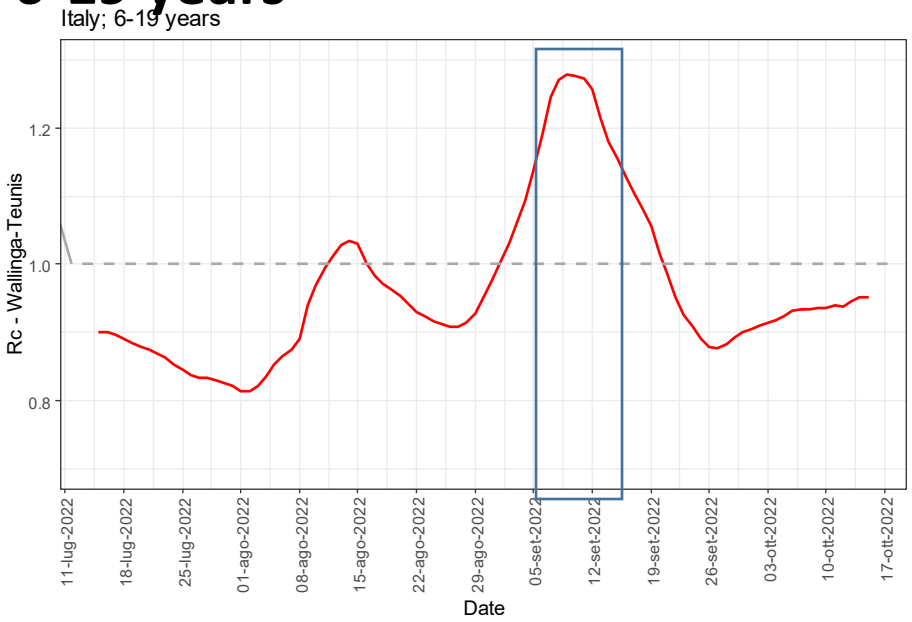
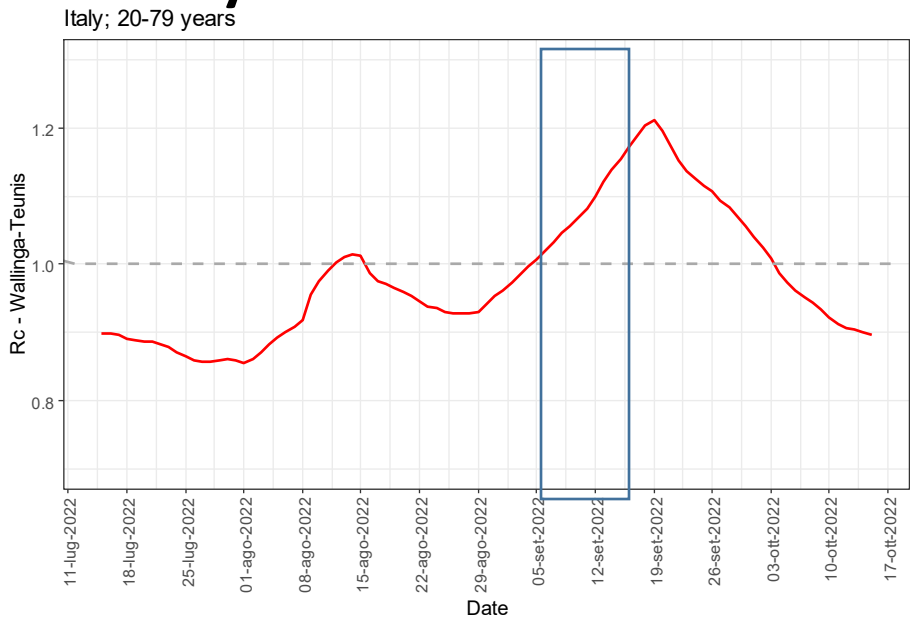
Case reproduction number R_c, Italy and Germany by age, with schools opening

6-19 years

20-79 years

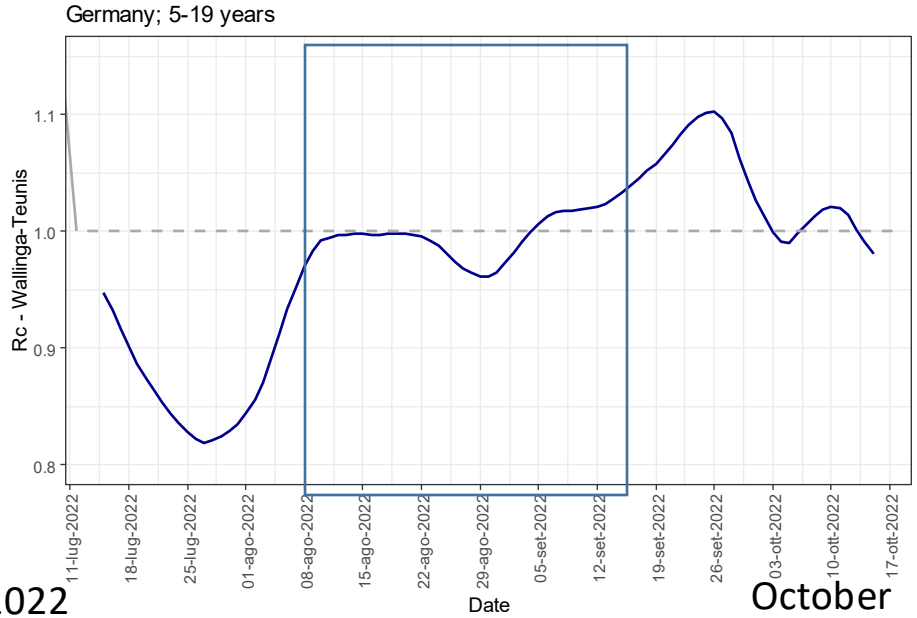
Italy

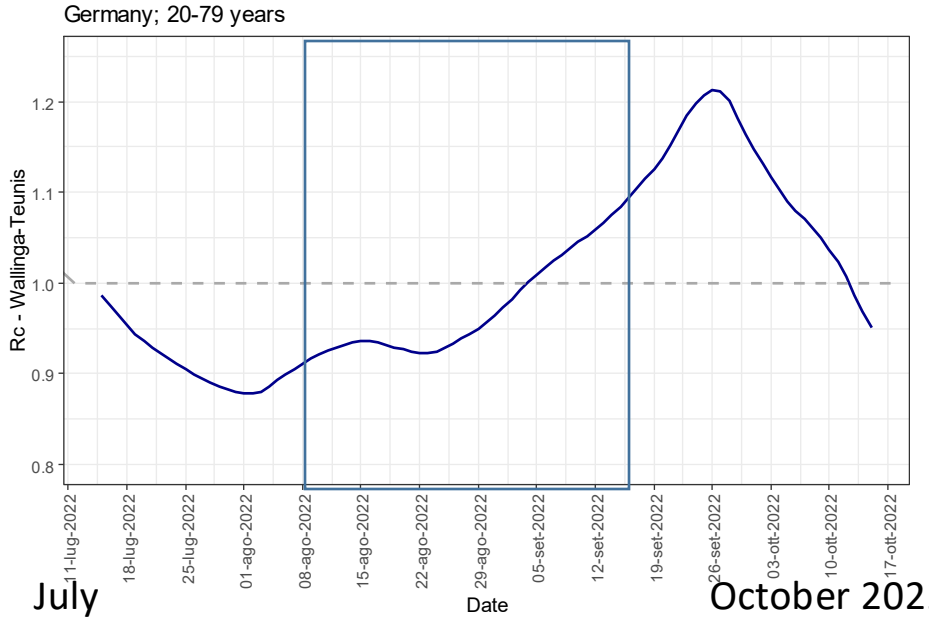




Periods of school openings indicated with the squares

Germany





July 2022 – October

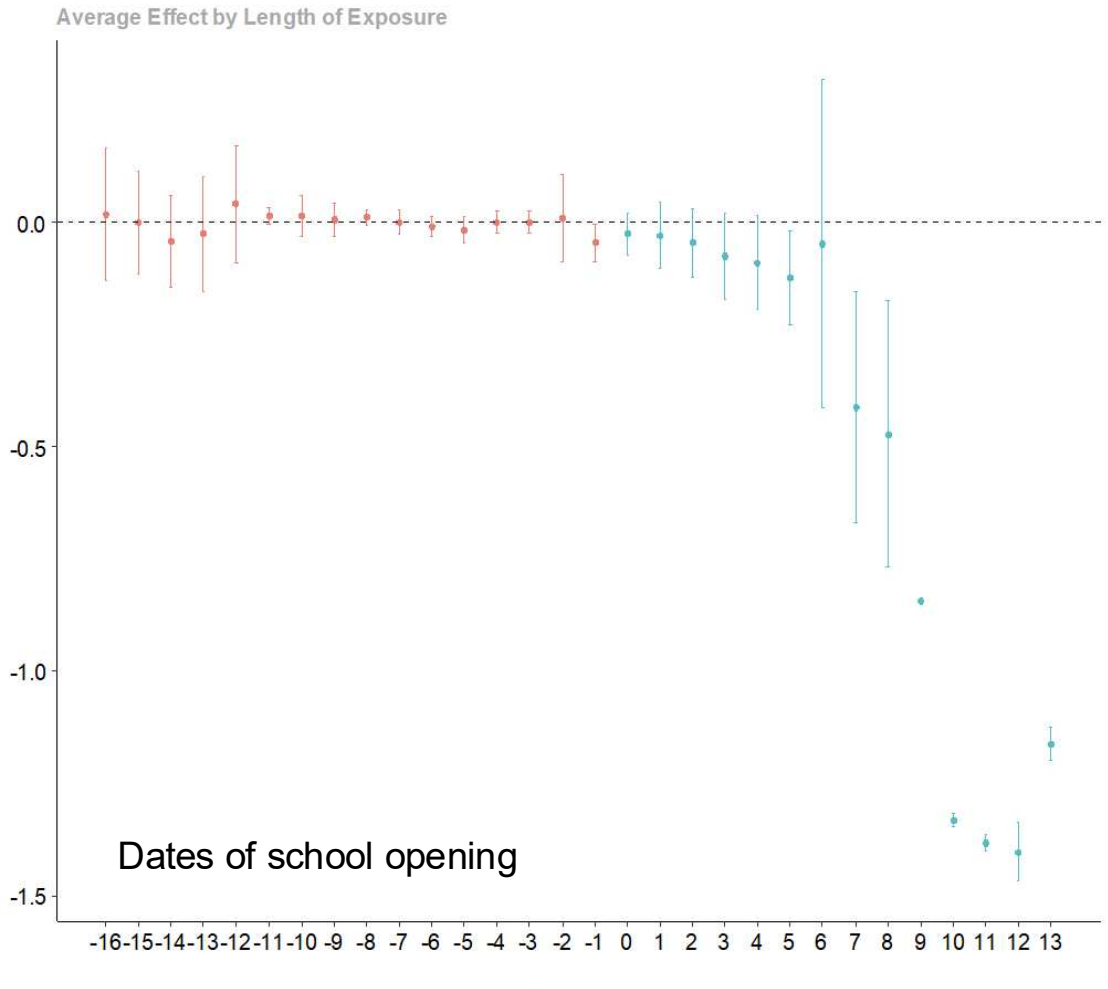
July – October 2022

Wallinga and Teunis (2004)

Causal association: Staggered Difference in differences analysis Italy - Rc

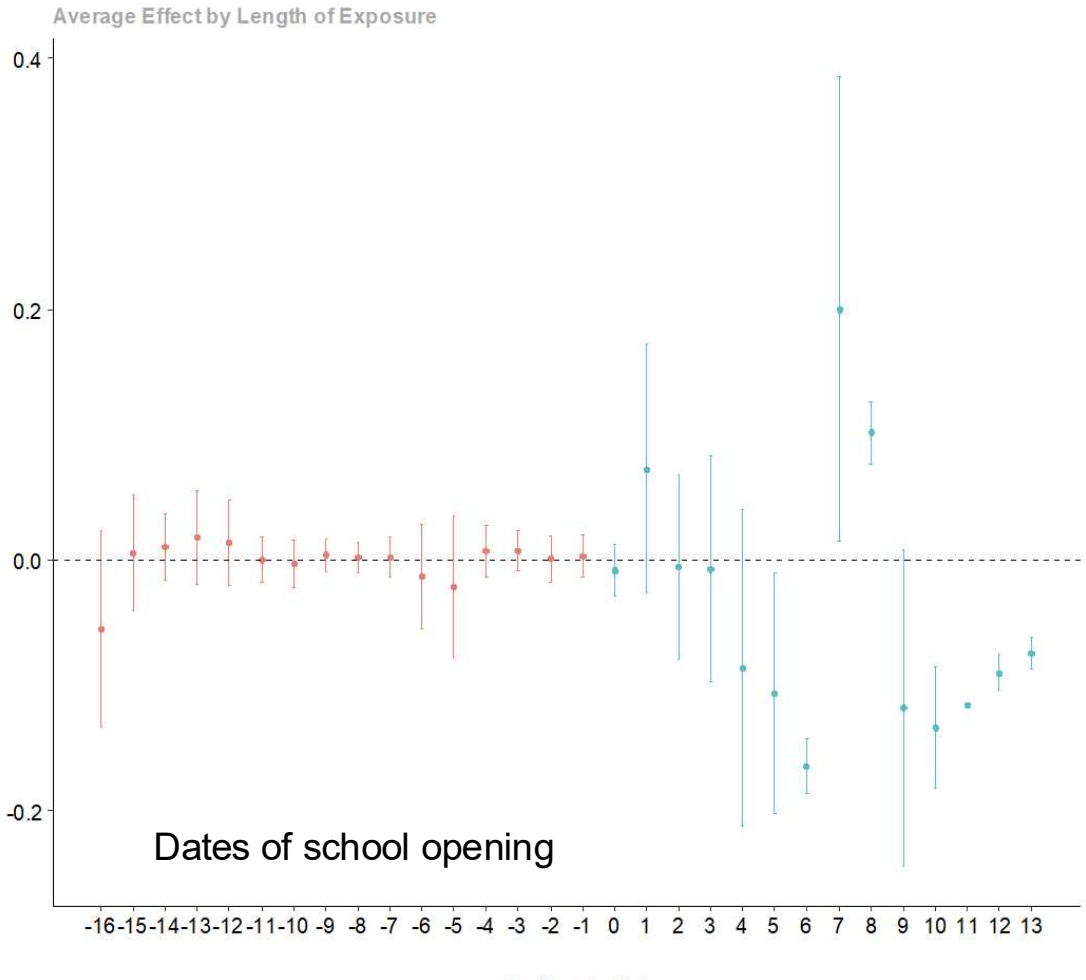
Average effect of school opening by lenght of exposure

6-19 years old



Overall summary of ATT's based on event-study/dynamic aggregation: -0.53 (-0.57; -0.49) *

20-79 years old

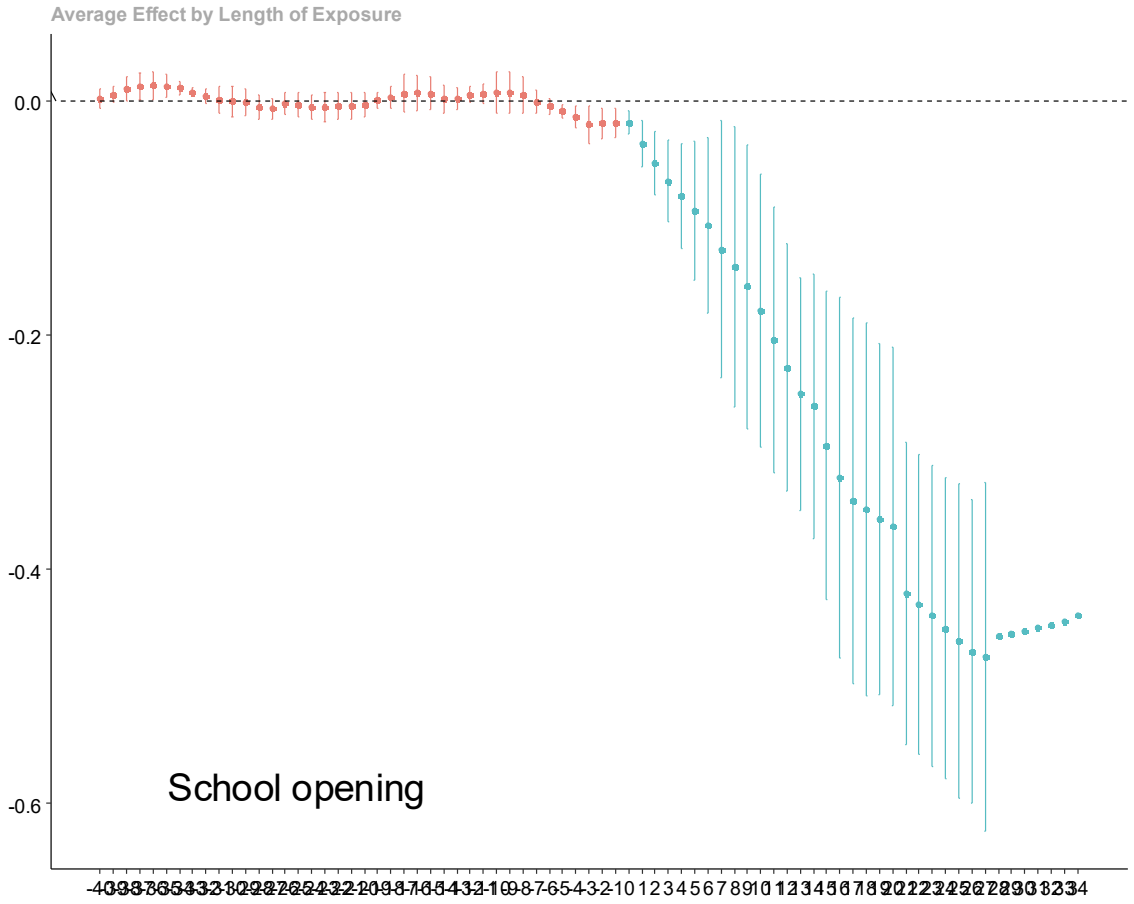


Overall summary of ATT's based on event-study/dynamic aggregation: -0.04 (95%CI: -0.068, -0.009)*

Causal association: Staggered Difference in differences analysis Germany -

Average effect of school opening by lenght of exposure

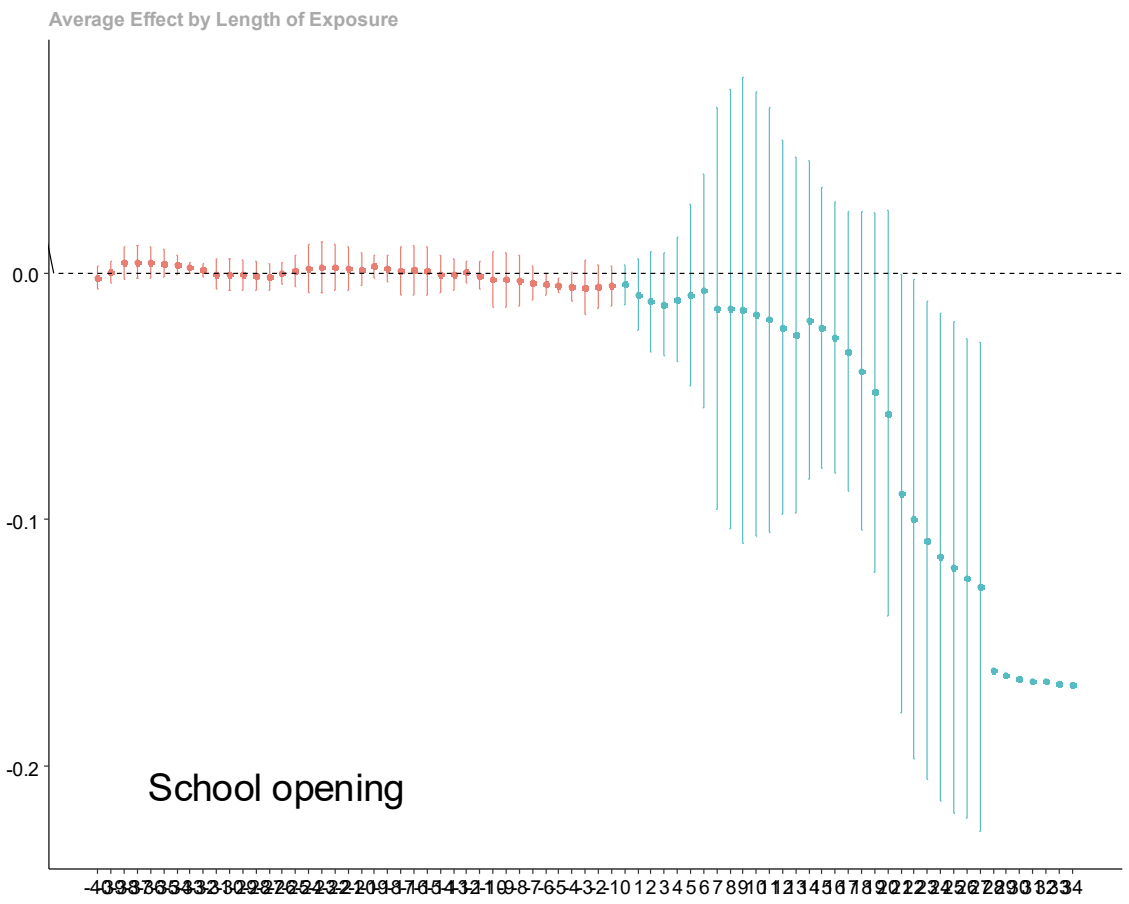
5-19 years old



Overall summary of ATT's based on event-study/dynamic aggregation:

-0.29 (95%CI: -0.36, -0.23) *

20-79 years old



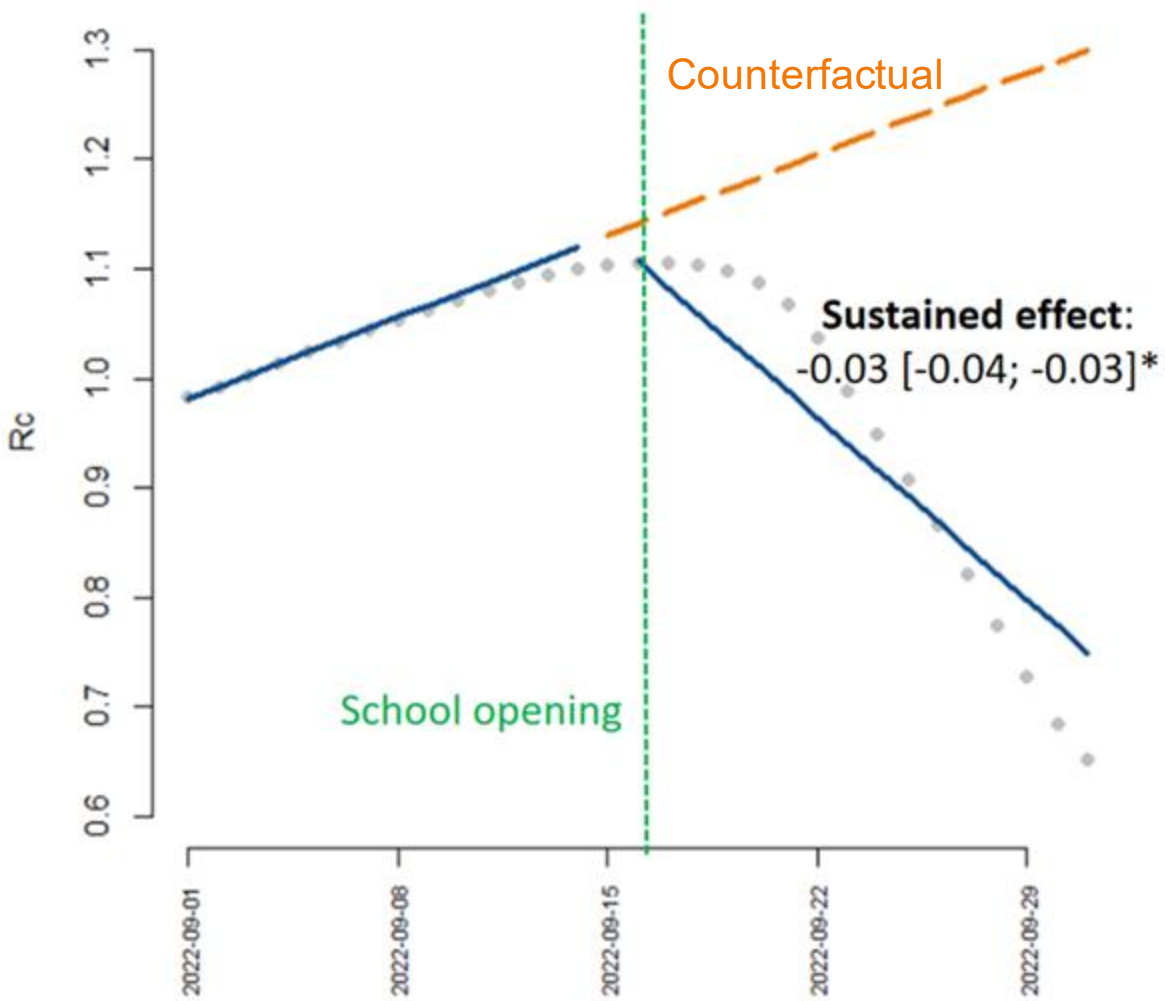
Overall summary of ATT's based on event-study/dynamic aggregation:

-0.07 (95%CI: -0.111, -0.024) *

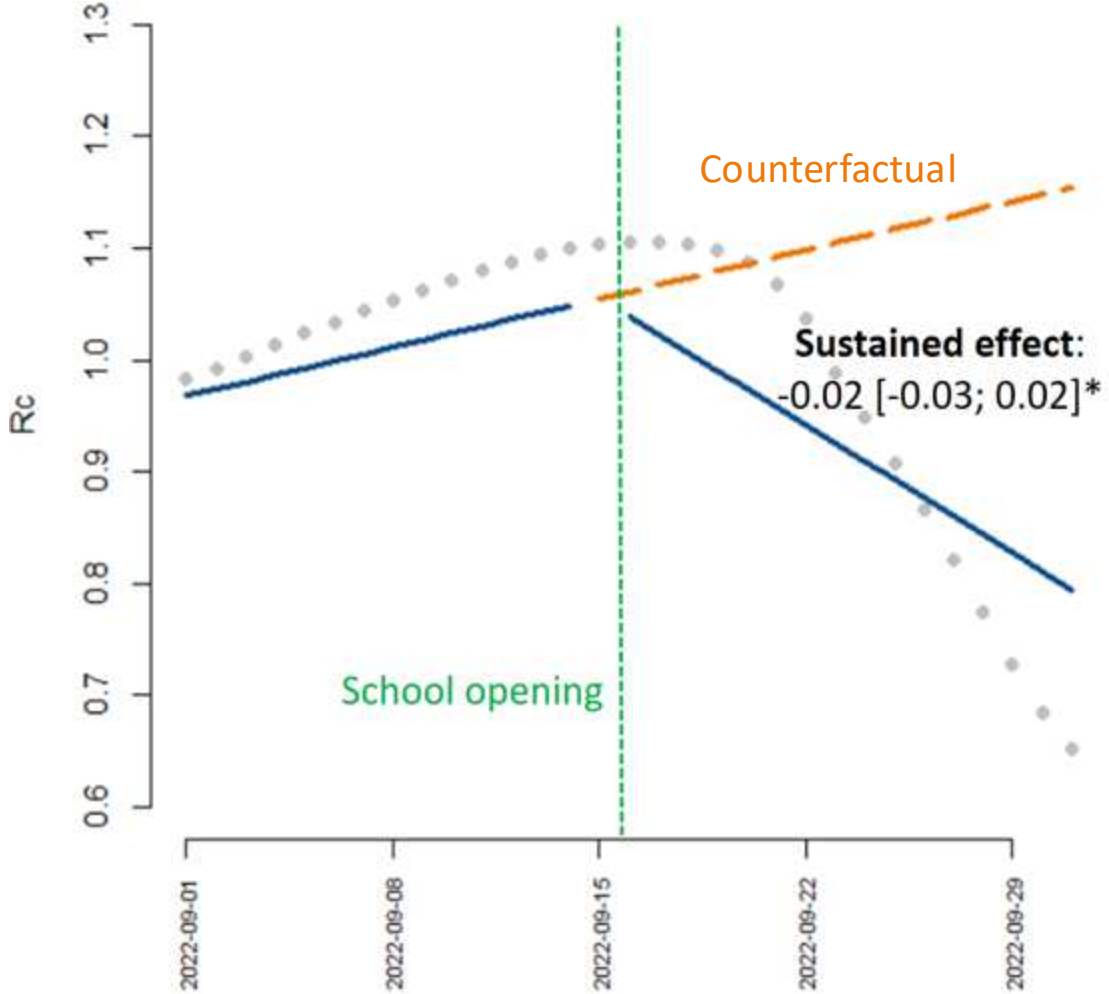
Causal association: Sustained effect of schools opening in Portugal

EUCARE

0-19 years old



20-79 years old



Bellerba F et al. SARS-CoV-2 trends in Italy, Germany and Portugal and school opening during the period of Omicron variant dominance: A quasi experimental study in the EuCARE project. *Int J Infect Dis. 2024 Jan*

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Analysis adjusting for confounders and at a high granular level

nature medicine

ARTICLES

https://doi.org/10.1038/s41591-021-01571-8

Check for updates

OPEN

No causal effect of school closures in Japan on the spread of COVID-19 in spring 2020

Kentaro Fukumoto[1]✉, Charles T. McClean[2,3] and Kuninori Nakagawa[4]

Among tool kits to combat the coronavirus disease 2019 (COVID-19), caused by severe acute respiratory syndrome coronavirus 2, school closures are one of the most frequent non-pharmaceutical interventions. However, school closures bring about substantial costs, such as learning loss. To date, studies have not reached a consensus about the effectiveness of these policies at mitigating community transmission, partly because they lack rigorous causal inference. Here we assess the causal effect of school closures in Japan on reducing the spread of COVID-19 in spring 2020. By matching each municipality with open schools to a municipality with closed schools that is the most similar in terms of potential confounders, we can estimate how many cases the municipality with open schools would have had if it had closed its schools. We do not find any evidence that school closures in Japan reduced the spread of COVID-19. Our null results suggest that policies on school closures should be reexamined given the potential negative consequences for children and parents.

Fukumoto, K. et al. No causal effect of school closures in Japan on the spread of COVID-19 in spring 2020. Nat Med 2021

Studies that provided a quantitative estimate of the impact school closures on community transmission of SARS-CoV-2.

Author, Year	Finding	Overall Judgement	Likely Direction
Courtemanche, 2020	**No effect**	**Low**	-
Hsiang, 2020	**No effect**	**Low**	-
Auger, 2020	Preventative effect	Moderate	Favours Experimental
Matzinger, 2020	Preventative effect	Moderate	Unpredictable
Iwata, 2020	No effect	Serious	Unpredictable
Juni, 2020	Preventative effect	Serious	Favours Experimental
Neidhofer, 2020	Preventative effect	Serious	Favours Experimental
Wong, 2020	Preventative effect	Serious	Unpredictable
Yehya, 2020	Preventative effect	Serious	Favours Experimental
Stein-Zamir, 2020	Preventative effect	Critical	Unpredictable

Figure 2: Study results, stratified by risk of bias

Studies with lower risk of bias did not report any association, while those with a higher risk of bias generally reported significant preventive effects of school closure.

Walsh S et al Do school closures and school reopenings affect community transmission of COVID-19? A systematic review of observational studies. BMJ Open 2021

Meta-analysis of serological tests

Parameter	Summary estimate (95%CI); I^2		
	IgM	IgG	Total Ab
Sensitivity	0.82 (0.75–0.88); $I^2 = 72\%$	0.85 (0.73–0.93); $I^2 = 88\%$	0.85 (0.74–0.94); $I^2 = 79\%$
Specificity	0.98 (0.92–1.00); $I^2 = 92\%$	0.99 (0.98–1.00); $I^2 = 13\%$	0.99 (0.98–1.00); $I^2 = 74\%$

The specificity of the tests was generally very high, but this is not sufficient for screening the general population in areas with low prevalence such as schools.
A positive predictive value between 76% and 88% with a prevalence of 5% means that about 1 in 5 results would be a false positive case.

Caini S et al. Euro Surveill. 2020

Teachers vs other occupations

The NEW ENGLAND JOURNAL of MEDICINE

CORRESPONDENCE

Open Schools, Covid-19, and Child and Teacher Morbidity in Sweden

The risk of intensive care for Covid-19 in teachers was found lower compared with other occupations (excluding health care workers).

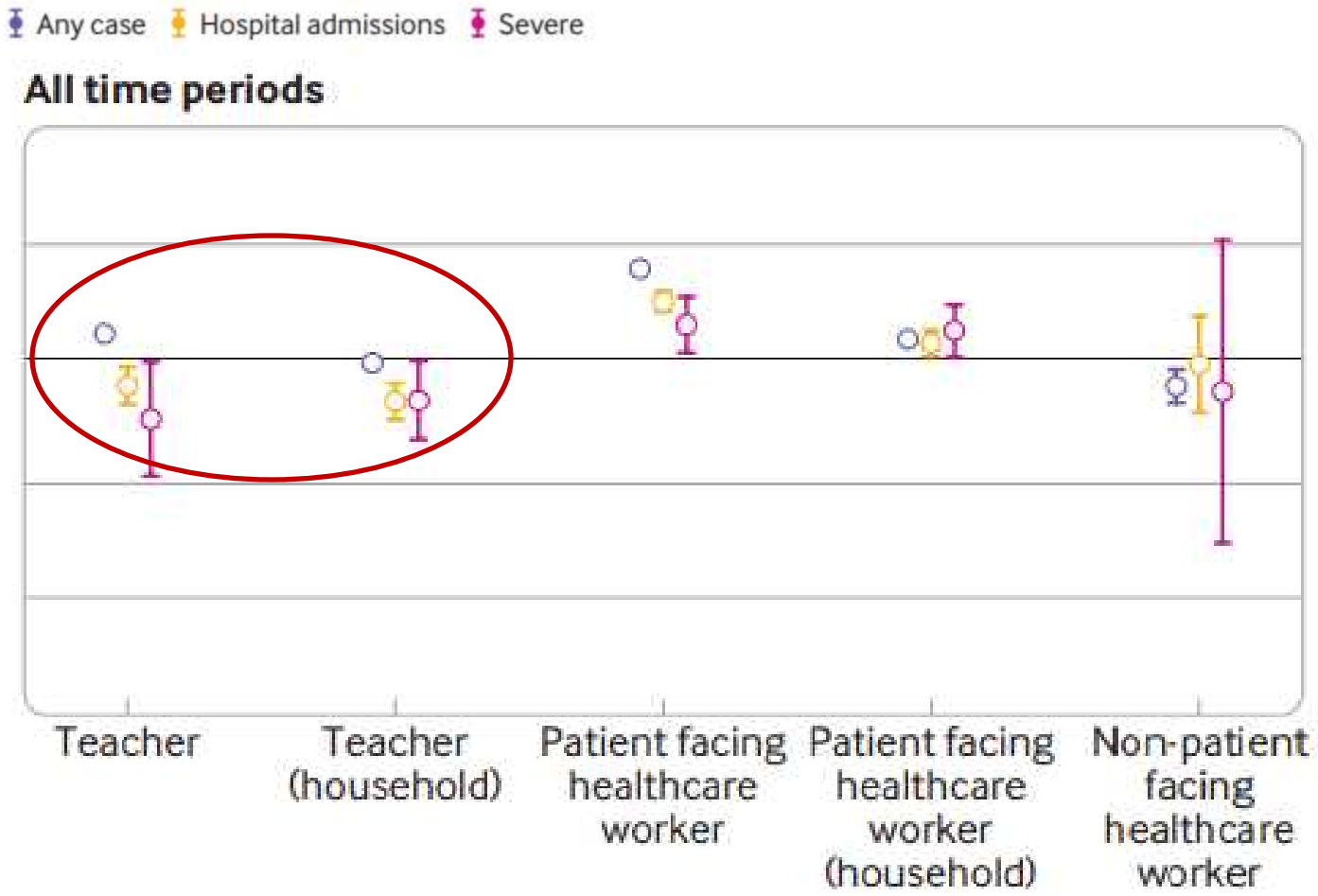
The sex- and age-adjusted relative risk was:

among preschool teachers RR= 1.10 (95%CI: 0.49 to 2.49)

among school teachers RR=0.43 (95%CI: 0.28 to 0.68)

Ludvigsson et al. N Engl J Med February 2021.

Teachers vs healthcare workers: a national Scottish study



Teachers and their households were at lower risk of severe COVID-19 compared to other occupational groups.

Fenton et al BMJ September 2021

Conclusions

- No clear evidence that school openings are causally associated with increased transmission of SARS-CoV-2, both in the young population and the in general population, in Italy during the second wave.

- Consistent results across three different countries (Italy, Germany and Portugal) during the Omicron wave indicate no association with school opening.
  Multivariable models with adjusting for confounders did not change the results.
  The trends of SARS-CoV-2 curves appear to be driven more by the geographical location and overall population behavior than by school openings.

- The highest rates of infection and infectivity were found among teachers, although no more severe cases of COVID-19 were observed compared to other occupations.

- Given the uncertain evidence on transmission and the well-known psychological harm of closures, the Precautionary Principle should have supported reopening schools during the second wave.

Thanks

In particular for statistical analyses:

Federica Bellerba and Giulia Doi, IEO team, and all Eucare consortium