

# An analysis of SARS-CoV-2 viral load by patient age

**Jones *et al.* 29.04.2020, preprint**

**Drosten's group, Charité-Universitätsmedizin Berlin**

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Silvio Ragozzino

# Background

- Growing discussion on impact of school- and kindergarten on SARS-CoV-2 transmission rate
- Children appear to be infected at similar rate as adults
- The role of children as sources of infection remains unclear
- Epidemiological investigations at present cannot answer this question
- An alternative way is to analyze the virus concentration in the respiratory tract
- **Aim**: to examine the relationship between patient age and SARS-CoV-2 viral load

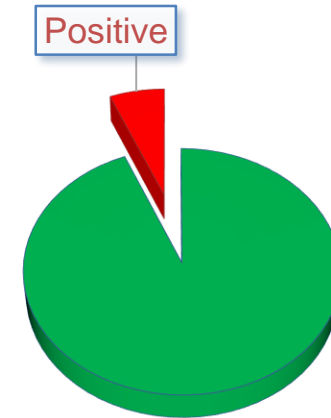
# Results

- January - April 26, 2020

Categorization C1			
Group	Count	Positive	% Positive
1-10	2,181	49	2.25
11-20	1,991	78	3.92
21-30	9,710	536	5.52
31-40	12,737	630	4.95
41-50	9,572	575	6.01
51-60	10,586	662	6.25
61-70	5,529	431	7.80
71-80	4,064	420	10.33
81-90	3,302	314	9.51
91-100	159	17	10.69

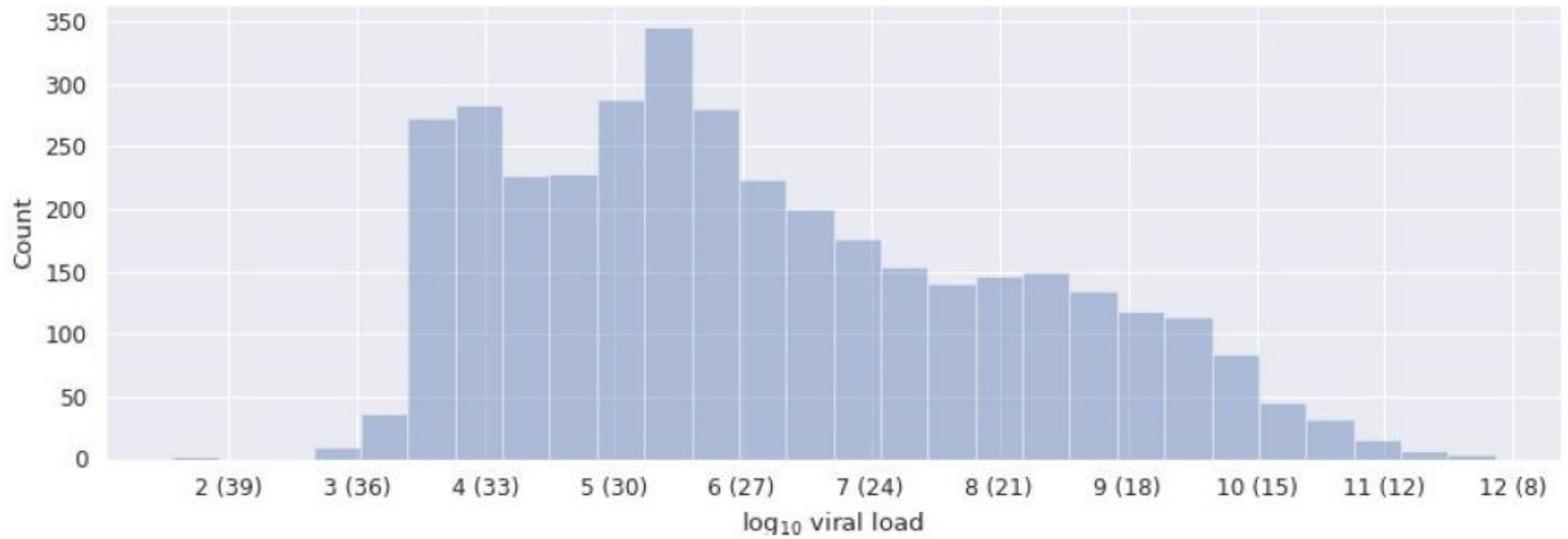
3,712 / 59,831

6.2%

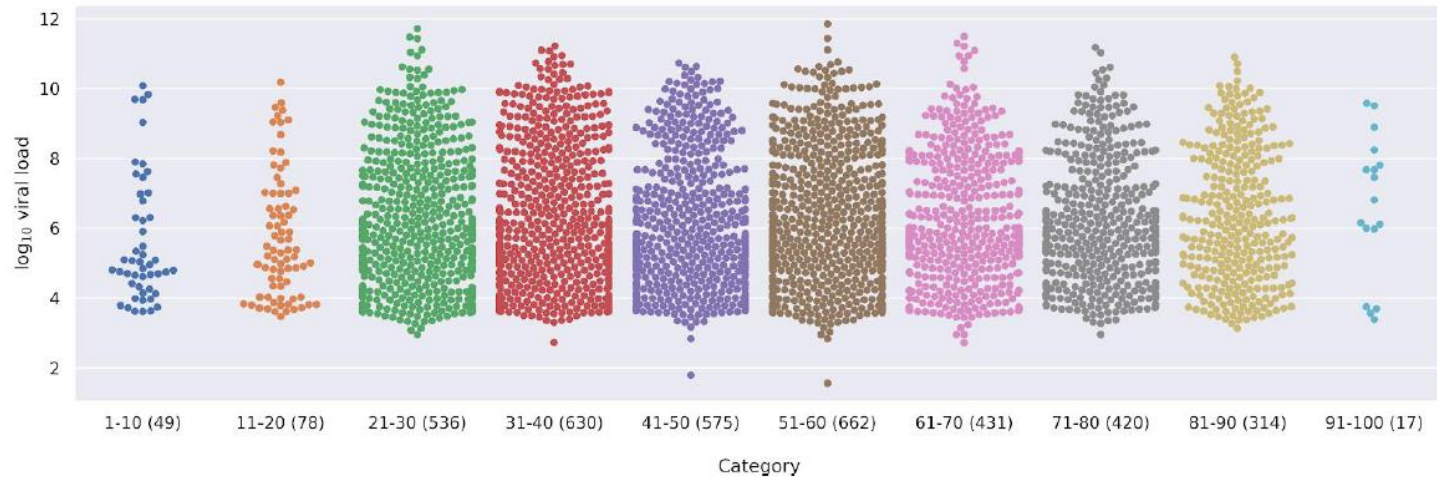


Categorization C2			
Group	Count	Positive	% Positive
KG	1,759	37	2.10
GS	623	16	2.57
HS	1,790	74	4.13
Uni	4,587	267	5.82
Adult	23,665	1,247	5.27
Mature	27,407	2,071	7.56

# Histogram of viral loads

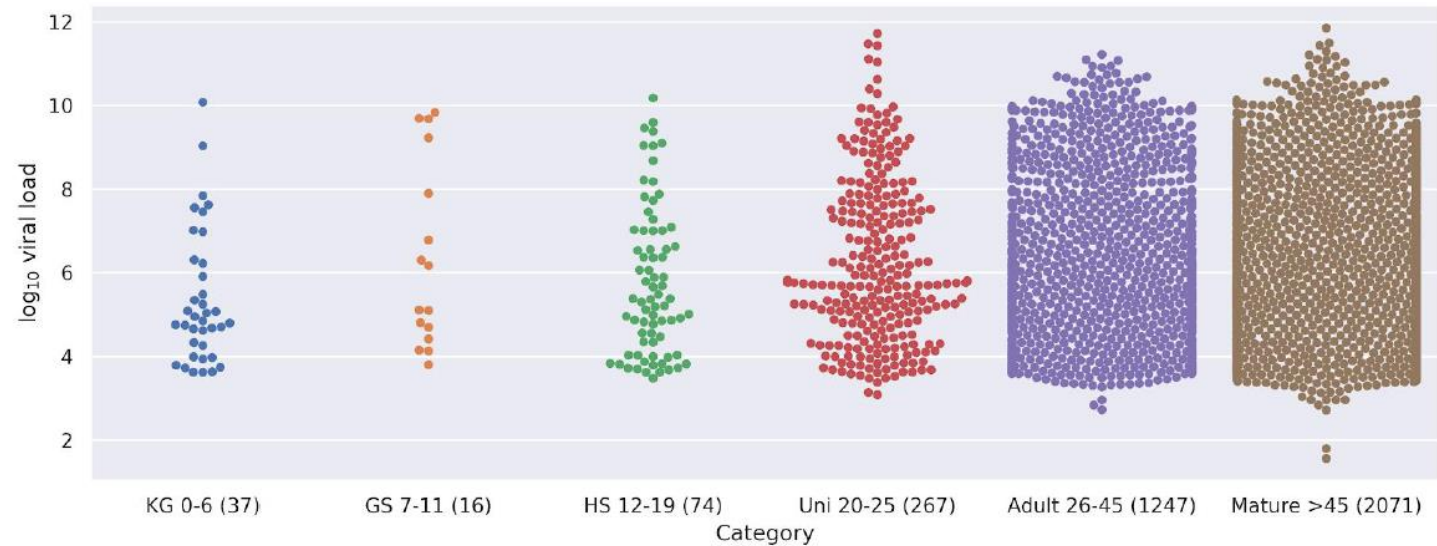


# Viral load by patient category



**10-year  
age strata**

**B**



**Schooling/  
Social**

# Pairwise post-hoc analyses

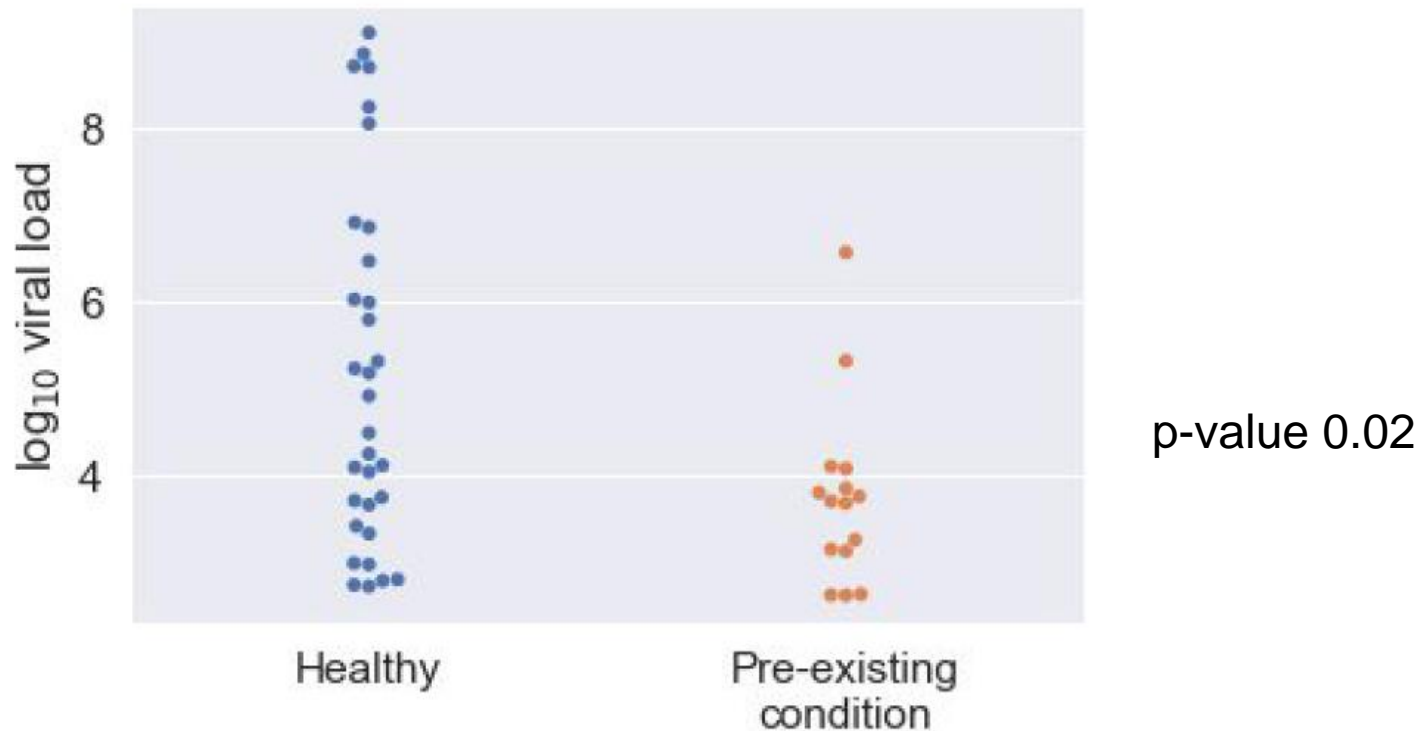
- Pairwise post hoc analyses on both categorizations using three methods

	Adult	GS	HS	KG	Mature	Uni
Adult	-1	1	0.996	0.128	0.847	1
GS		-1	1	0.847	1	1
HS			-1	1	0.455	0.549
KG				-1	0.045	0.056
Mature					-1	1
Uni						-1

Dunn's test for the schooling/social categorization

- No significant differences in viral load exists between any subgroups in either categorization.

# Viral load in pediatric patients with and without a pre-existing condition



# Conclusions

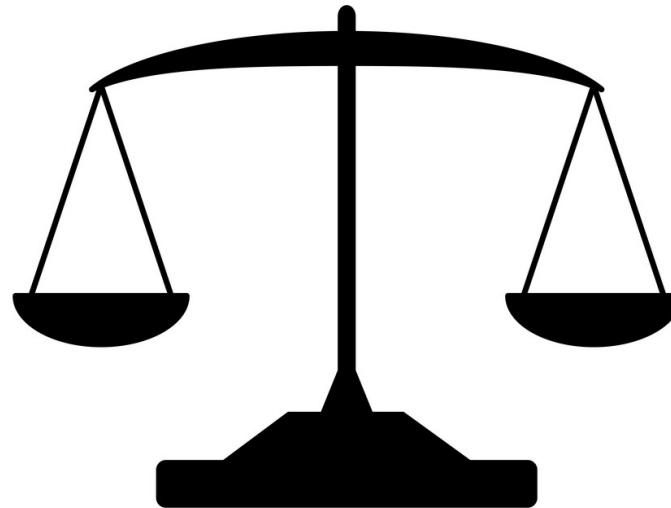
- Children may be as infectious as adults

## Adult-like infectivity in children

No cough or  
sneeze

Smaller  
exhaled air  
volume

Against



Greater  
physical  
activity

Closer social  
engagement

In favour

- Caution against an unlimited re-opening of schools and kindergartens in the present situation



## Shedding of infectious SARS-CoV-2 in symptomatic neonates, children and adolescents

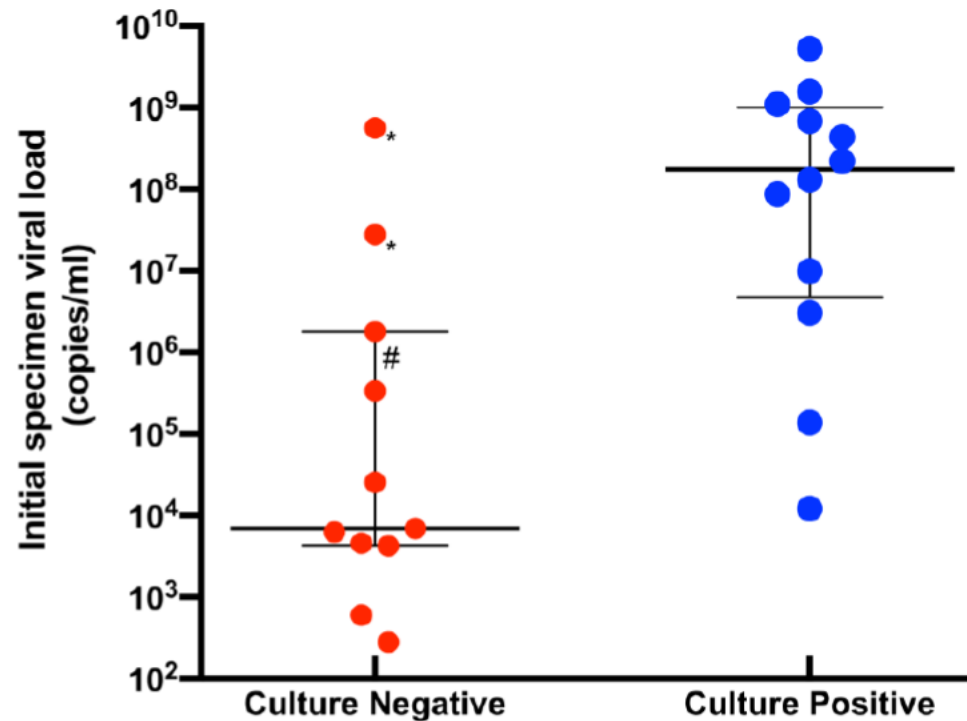
 Arnaud G L'Huillier, Giulia Torriani, Fiona Pigny, Laurent Kaiser, Isabelle Eckerle

doi: <https://doi.org/10.1101/2020.04.27.20076778>

Posted May 01, 2020

- Case series including the first 23 children diagnosed with SARS-CoV-2 infection
- SARS-CoV-2 virus isolation in 12/23 (52%)
- No correlation with disease presentation
- SARS-CoV-2 shedding patterns of culture competent virus in symptomatic children resemble those observed in adults.

# Viral load of nasopharyngeal swabs among culture-negative and culture-positive specimens





Christian Drosten ✓

@c\_drosten

Superb new study: Risk of infection upon exposure in children may be about 1/3 that of adults (sorry for the simplification). Important counterpart to yesterday's viral load data ([bit.ly/SARS-2-load](https://bit.ly/SARS-2-load))

## Changes in contact patterns shape the dynamics of the COVID-19 outbreak in China

Juanjuan Zhang<sup>1</sup>, Maria Litvinova<sup>2</sup>, Yuxia Liang<sup>1</sup>, Yan Wang<sup>1</sup>, Wei Wang<sup>1</sup>, Shanlu Zhao<sup>3</sup>, Qianhui Wu<sup>1</sup>, Stefano Merler<sup>4</sup>, Cécile Viboud<sup>5</sup>, Alessandro Vespignani<sup>6,2</sup>, Marco Ajelli<sup>\*\*†</sup>, Hongjie Yu<sup>1\*†</sup>

*Science*, published online 29 April 2020

- Age profile of susceptibility to SARS-CoV-2 infection
- Based on the analysis of contact tracing data for Hunan province

**Table S14.** Characteristics of the contacts based on 114 clusters in Hunan.

<b>Characteristics</b>	<b>Not infected</b>	<b>Infected</b>	<b>% Infected</b>
<b>Age</b>			
0-14 y	709	47	6.2
15-64 y	5242	491	8.6
65+ y	589	115	16.3
Unknown	175	7	3.8
<b>Type of contact</b>			
Household contacts	617	339	35.5
Healthcare contacts	565	7	1.2
Contacts on means of transportation	304	22	6.7
Other contacts	5229	292	5.3
<b>Exposed relative to the introduction of strict measures (January 23, 2020)</b>			
After	3107	168	5.1
Before	3196	323	9.2
Unclear	412	169	29.1
<b>Sex</b>			
Male	3531	305	8.0
Female	3184	355	10.0
<b>Traveled to/from Wuhan/Hubei</b>			
Yes	4612	540	10.5
No	2053	117	5.4
Unknown	50	3	5.7

**Table S15. Results of regression models.**

Characteristics	Stratified Cox		GLMM <sup>a</sup>		GEE <sup>b</sup>	
	OR (95% CI)	p value	OR (95% CI)	p value	OR (95% CI)	p value
<b>Intercept</b>	-	-	0.79 (0.60, 1.05)	0.0972	0.72 (0.50, 1.04)	0.0762
<b>Age</b>						
<u>0, 14 y</u>	0.33 (0.23, 0.48)	<0.0001	<u>0.34 (0.24, 0.49)</u>	<u>&lt;0.0001</u>	0.38 (0.22, 0.65)	<0.0001
15, 64 y	Reference	-	Reference	-	Reference	-
<u>65+ y</u>	1.44 (1.10, 1.90)	0.0085	<u>1.47 (1.12, 1.92)</u>	<u>0.0045</u>	1.45 (1.02, 2.07)	0.0373
Unknown	0.40 (0.17, 0.94)	0.0360	0.42 (0.17, 0.90)	0.0413	0.47 (0.20, 1.13)	0.0924

- Susceptibility to SARS-CoV2 infection increased with age:
  - Young individuals (0-14 years) had a lower risk of infection than individual aged 15-64 years
  - Older individuals ( $\geq 65$  years) had a higher risk of infection than individual aged 15-64 years

## In conclusion...

- Children have viral loads similar to adults
- Shedding of infectious virus resemble that observed in adults
- Risk of infection upon exposure may be about 1/3 that of adults

# Manuscript v.2, Revision 30.04.2020, 6 pm

Categorization C1				
Group	Count	+ve	% +ve	% +ve load >1M
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41-50	9,572	575	6.01	1.59
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71-80	4,064	420	10.33	3.03
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