

ORIGIN AND TRANSMISSION PATTERNS OF SARS-COV-2 IN LOMBARDY

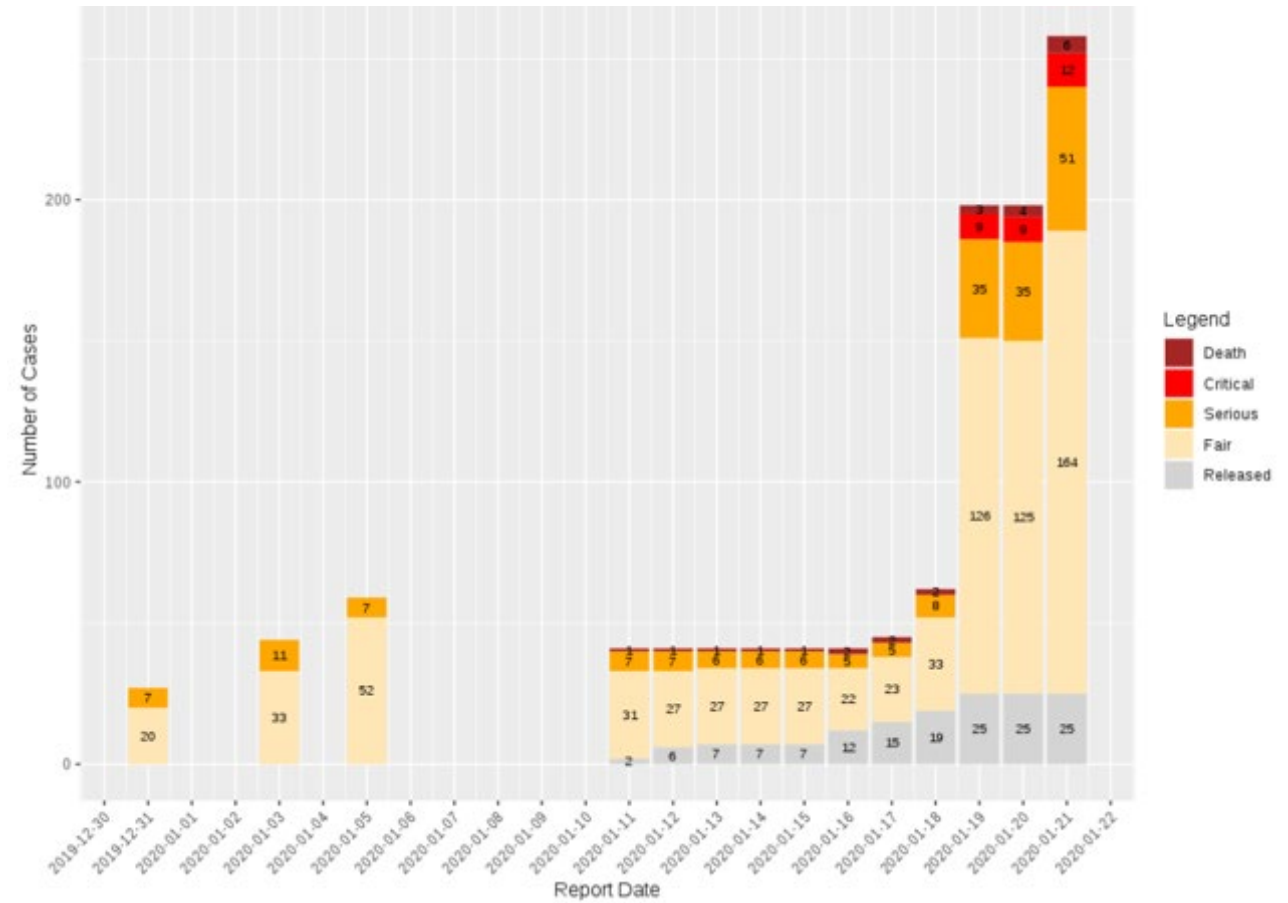
Background findings

Prof. Fausto BALDANTI – Policlinico San Matteo



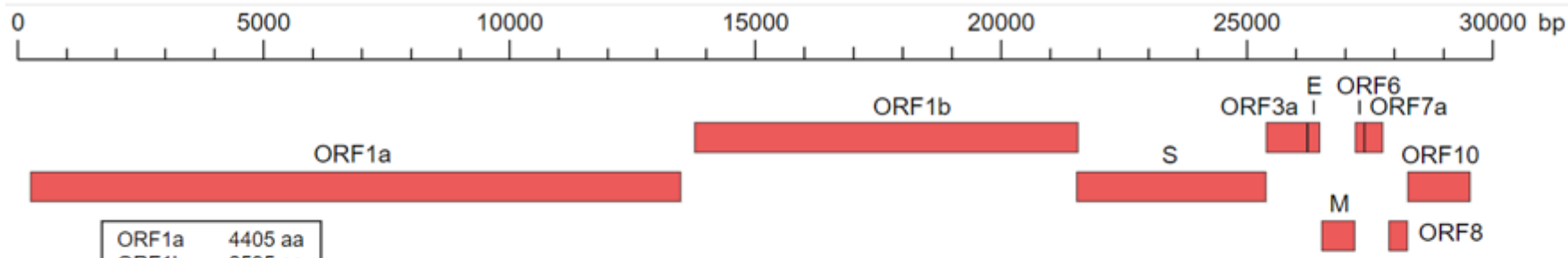
«A virus is a piece of bad news wrapped in proteins»

Peter Medawar



Data Source: Wuhan Municipal Health Commission (listed in the source code)

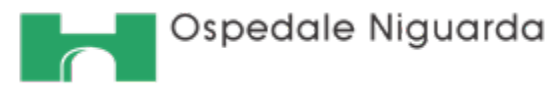
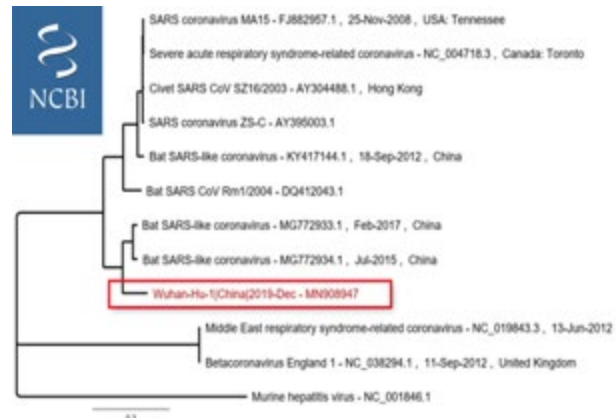
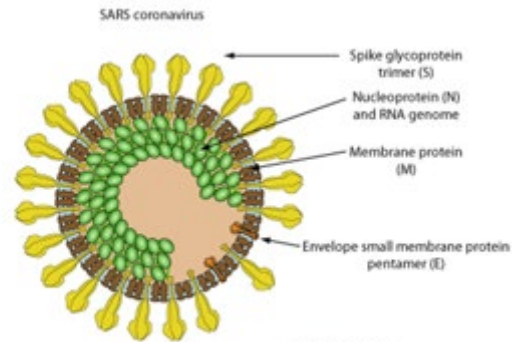
Note: The condition “Critical” was added on 2020-01-19



ORF1a	4405 aa
ORF1b	2595 aa
S	1282 aa
ORF3a	275 aa
E	75 aa
M	222 aa
ORF6	61 aa
ORF7a	121 aa
ORF8	121 aa
ORF10	419 aa

Wuhan-Hu-1 (GenBank MN908947)

Di Furfur - Opera propria, using NCBI ORFfinder GenBank: Wu, F., Zhao, S., Yu, B., Chen, Y.-M., Wang, W., Hu, Y., Song, Z.-G., Tao, Z.-W., Tian, J.-H., Pei, Y.-Y., Yuan, M.L., Zhang, Y.-L., Dai, F.-H., Liu, Y., Wang, Q.-M., Zheng, J.-J., Xu, L., Holmes, E.C. and Zhang, Y.-Z. A novel coronavirus associated with a respiratory disease in Wuhan of Hubei province, China. Accession MN908947., CC BY-SA 4.0, <https://commons.wikimedia.org/w/index.php?curid=86175627>





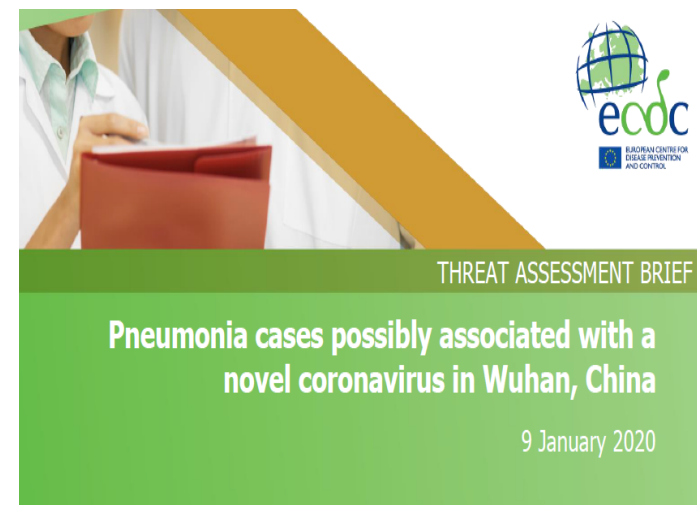
Dear EVD-LabNet members,

A first follow-up on yesterday's e-mail about the emergence of a novel human coronavirus in China.

The ECDC has published a threat assessment which can be found [here](#).

WHO has published a new statement which can be found [here](#).

best wishes Chantal

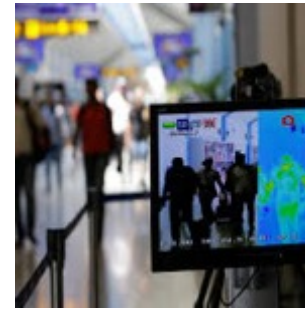


Event background

On 31 December 2019, the [Wuhan Municipal Health Commission](#) reported a cluster of 27 pneumonia cases of unknown aetiology, including seven severe cases, with a common reported link to Wuhan's South China Seafood City market (a wholesale fish and live animal market selling different animal species). The cases showed symptoms common to several respiratory diseases such as fever, dyspnoea, and radiological tests compatible with bilateral lung infiltrative lesions. Authorities placed all cases under isolation, initiated contact tracing activities and applied hygiene and environmental sanitation activities at the market, which was closed to the public on 1 January 2020. Preliminary investigations suggested viral pneumonia, meanwhile analyses were performed to identify the pathogen. According to the Chinese authorities, no significant human-to-human transmission has been observed. No cases among healthcare workers have been reported.

By 5 January 2020, [Chinese authorities](#) had reported 32 additional pneumonia cases of unknown aetiology in Wuhan with dates of onset ranging from 12–29 December 2019. This adds up to 59 cases, seven of which are severely ill. Contact tracing activities have identified 163 close contacts. Laboratory investigations have ruled out seasonal and avian influenza viruses, adenovirus, SARS and MERS coronaviruses as the causative agents of these cases. Environmental cleaning of the South China Seafood City market has been completed and further hygiene investigations are ongoing.





Case definition for surveillance

Suspected case requiring diagnostic testing (not be reported at European level)

Patients with acute respiratory infection (sudden onset of at least one of the following: cough, sore throat, shortness of breath) requiring hospitalisation or not

AND

In the 14 days prior to onset of symptoms, met at least one of the following epidemiological criteria:

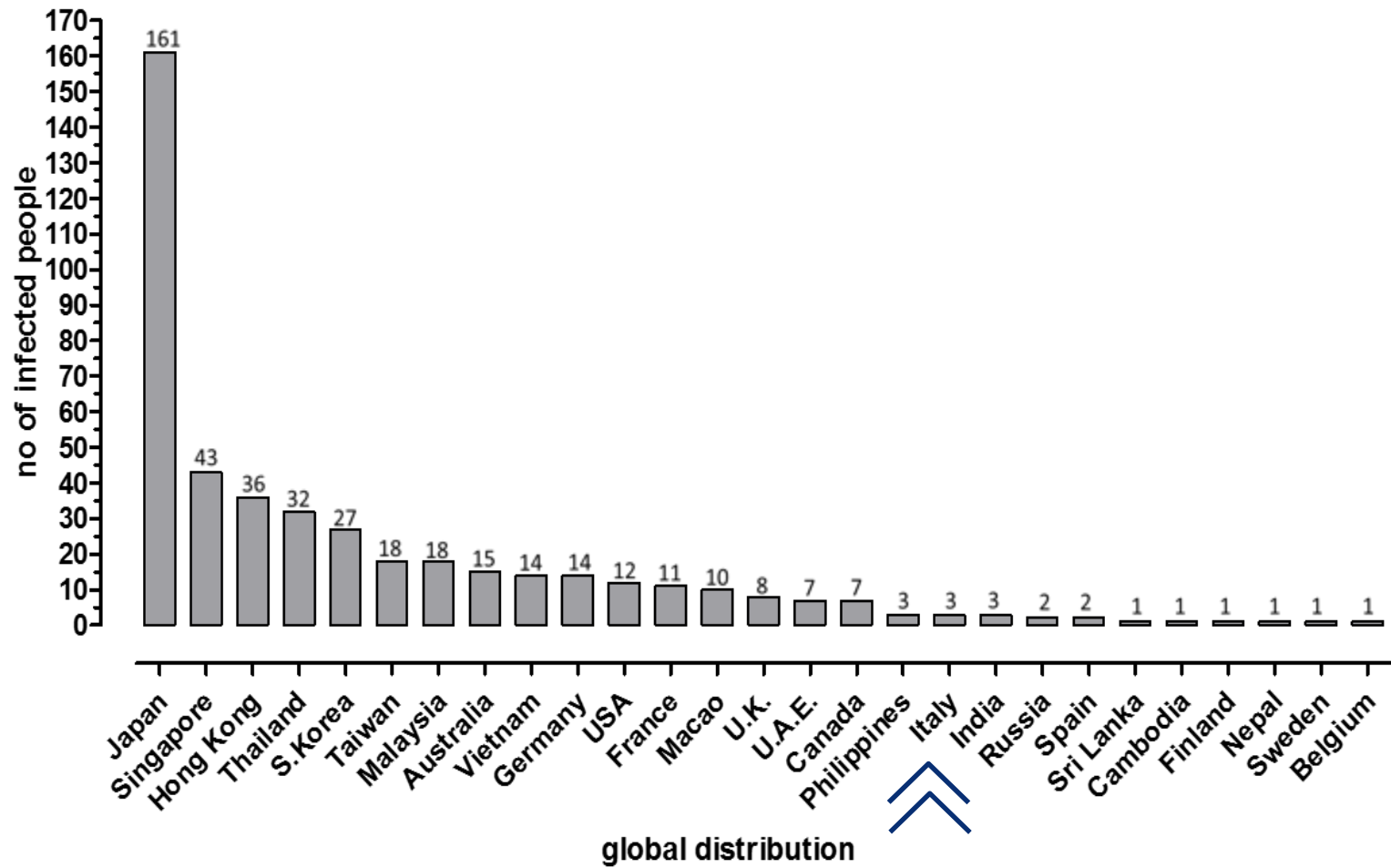
> were in close contact with a confirmed or probable case of 2019-nCoV infection:

OR

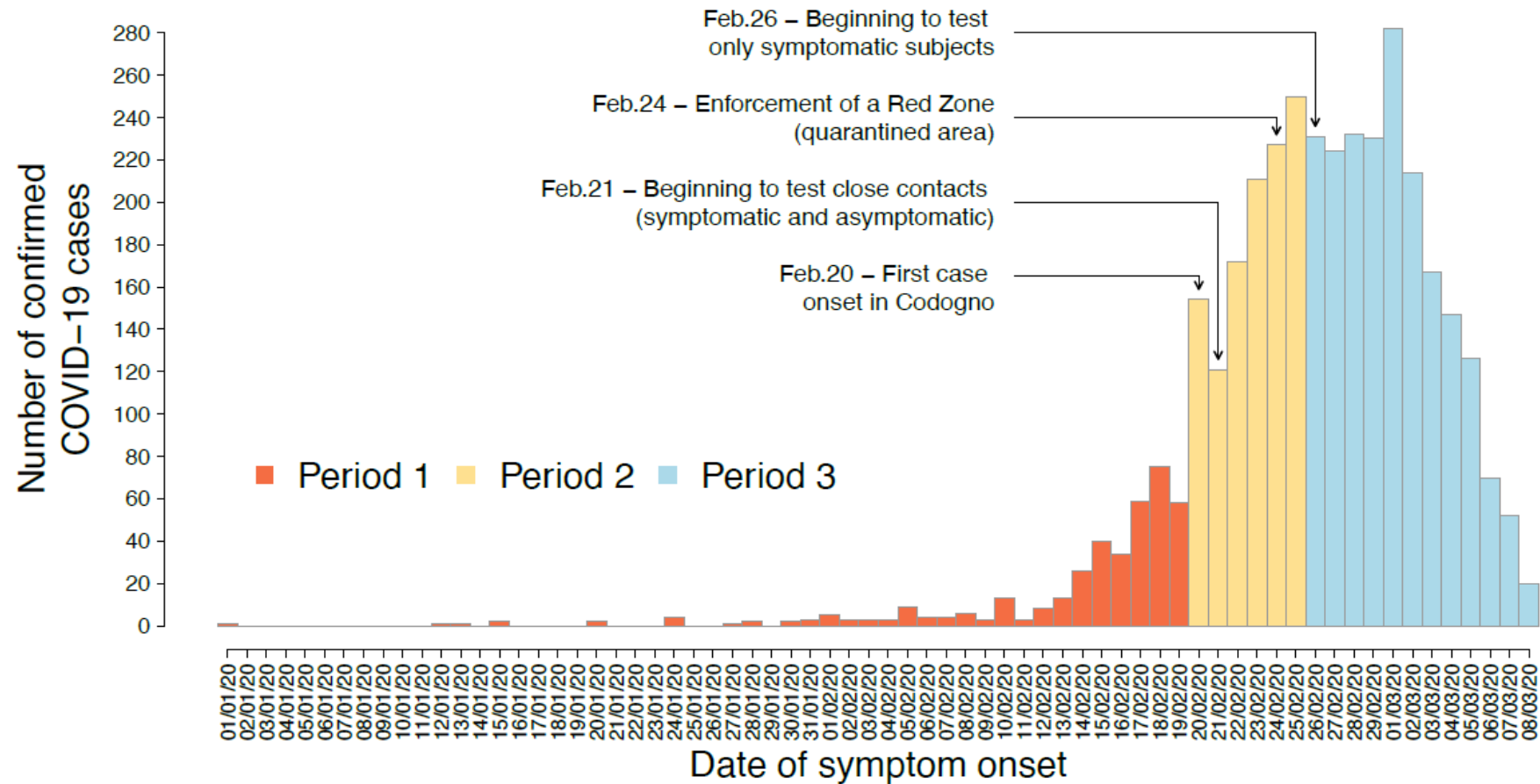
> had a history of travel to **areas with presumed ongoing community transmission of 2019-nCoV**

OR

> worked in or attended a health care facility where patients with 2019-n-CoV infection were being treated

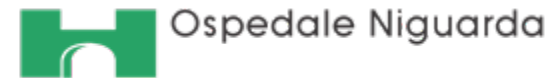


Distribution of 452 cases of COVID-19 infection outside China (updated 09/02/2020)



The early phase of COVID-19 outbreak in Lombardy, Italy

Cereda D^{1*}, Tirani M^{1,2 *°}, Rovida F^{3 *}, Demicheli V⁴, Ajelli M⁵, Poletti P⁵, Trentini F⁵, Guzzetta G⁵, Marziano V⁵, Barone A⁶, Magoni M⁷, Deandrea S², Diurno G¹, Lombardo M⁸, Faccini M⁴, Pan A⁹, Bruno R^{10,11}, Pariani E¹², Grasselli G^{13,14}, Piatti A¹, Gramegna M¹, Baldanti F^{3,11#}, Melegaro A^{15,16#}, Merler S^{5#}



Symptoms or risk factors	no	%
Fever	4	20
Fatigue	2	10
Cough	1	5
Cold	2	10
Sore throat	1	5
Anosmia and dysgeusia	3	15
Muscularpain	1	5
Diarrhea	1	5
High risk contact with COVID-19 positive subjects	7	35

Table 1. COVID-19 related symptoms and risk factor during the 30 days before the sample collection reported in 20 BDs with positive SARS-CoV-2 RNA in nasal swabs.

Prevalence of COVID-19 specific neutralizing antibodies in blood donors from Lodi Red Zone in Lombardy, Italy

Elena Percivalle¹, Giuseppe Cambiè², Irene Cassaniti^{1,3}, Edonardo Vecchio Nepita^{1,3}, Roberta Maserati¹, Raffaella Di Martino^{1,3}, Paola Isernia⁴, Francesco Mojoli^{3,5}, Raffaele Bruno^{3,6}, Marcello Tirani^{7,8}, Danilo Cereda⁸, Carlo Nicora⁹, Massimo Lombardo¹⁰, Fausto Baldanti^{1,3}

In Italy, the first case was identified on the 20th February in Castiglione d’Adda in the Lodi province of the Lombardy Region, Northern Italy (*Livingston E. JAMA 2020*). An initial strict contacts-tracing activity revealed several other cases, thus confirming the presence of a large COVID-19 outbreak in the area. Within few hours, a Regional and National emergency plan was set up, including the complete lock-down of social and commercial activity in an area of 169 Km² which included 10 municipalities (Codogno, Castiglione d’Adda, Casalpusterlengo, Fombio, Maleo, Somaglia, Bertonico, Terranova dei Passerini, San Fiorano, Castelgerundo) and with about 51,500 inhabitants (the Lodi Red Zone).

Eurosurveillance, 2020

COVID-19	RT-PCR +	RT-PCR -	Total
NT-Abs +	3	88	91
NT-Abs-	17	282	299
Total	20	370	390

Table 2. COVID-19 RT-PCR and NT-Abs results in a group of 390 BDs.

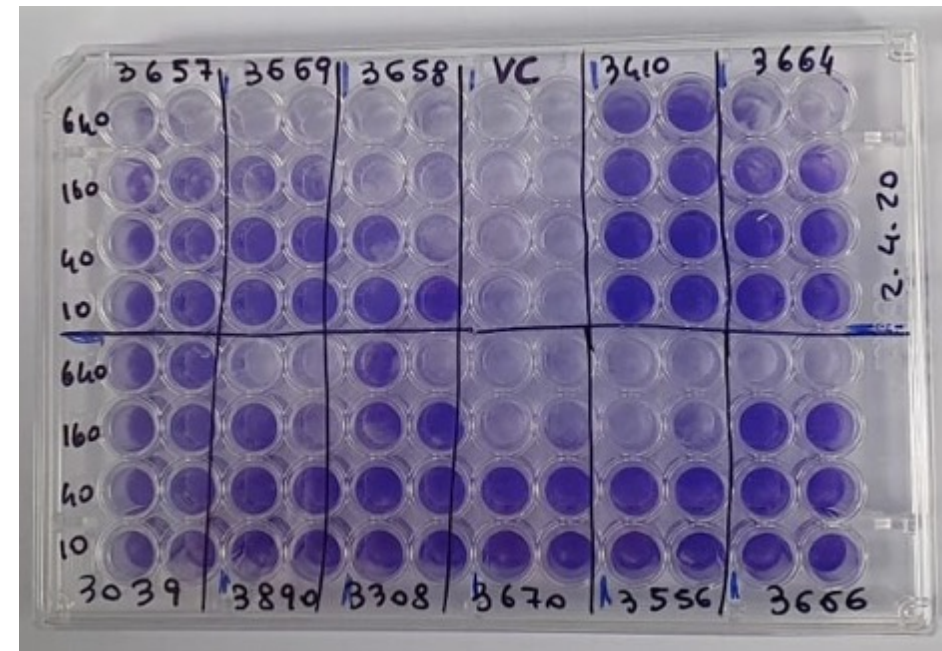
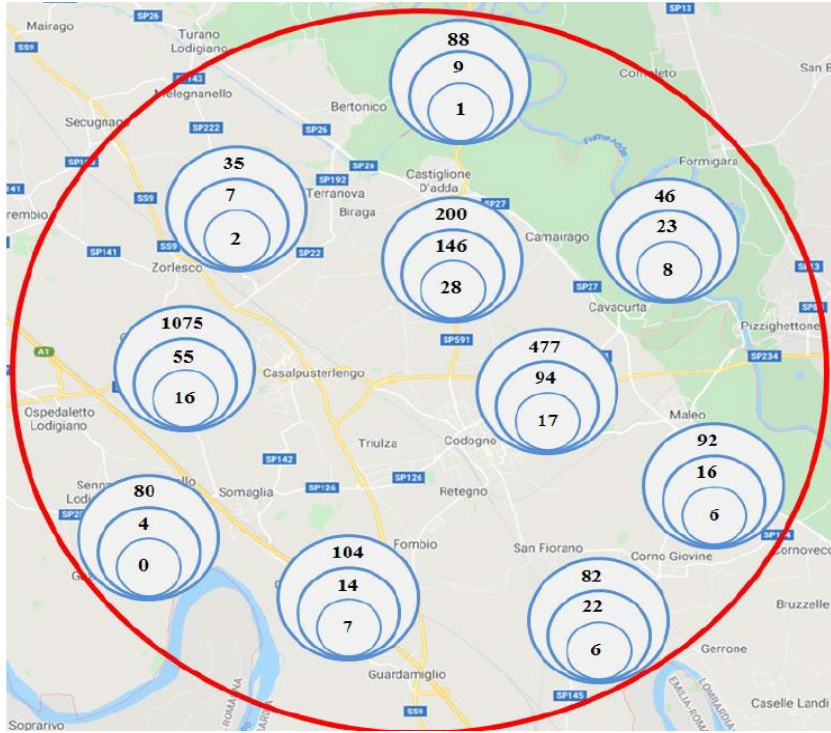


Figure 1. A picture of exemplificative microneutralization plate is shown. All the samples are tested in duplicate in four-fold scalar dilution (numbers 10, 40, 160 and 640 on the left). Blue staining of wells indicated the presence of neutralizing antibodies; VC, virus control; 4-digit numbers at the top and bottom of the plate are pts identification numbers; 2.4.20 on the right of the plate indicate the reading date (April 2, 2020).



Distribution of BD in the 10 municipalities of the Lodi Red Zone is shown (outer circle). The distribution of the 390 BD tested by NT-Abs and nasal swab real time RT PCR is reported in the middle circle, while the internal circle reports the number of the 91 NT-Abs positive BDs.

- Based on our results, only **23.3% (91/390)** of BD in an area highly involved by the SARS-CoV2 epidemics experienced this new virus without symptoms or with very mild symptoms while showing evidence of immunologic memory. If counting also the real-time RT PCR-positive BDs, the prevalence of individuals with SARS-CoV2 infection raises to **27.6% (108/390)**. However, this low frequency of individuals with already present or (hopefully) future SARS-CoV2 neutralizing activity poses the issue of the high risk of this virus transmission among the susceptible population, which remain the large majority. **Indeed, it might be estimated that as many as 9,087 individuals in the 19-70 yrs range could have been infected by SARS CoV2 in the Lodi Red Zone (51,500 inhabitants).**
- **5 sera collected on Feb 12-17 were positive for SARS CoV2 NT Abs.**
- **Considering that NT Abs develop 3-4weeks after infection, it can be estimated that the virus circulated at least since mid January, masked by the ongoing influenza season**

