



LABORATORY OF  
ENVIRONMENTAL SUSTAINABILITY  
DEPARTMENT OF BIOLOGY  
UNIVERSITY OF BARI ALDO MORO



GIANLUIGI DE GENNARO, UNIVERSITÀ DEGLI STUDI DI BARI  
CARLA ANCONA, DIPARTIMENTO DI EPIDEMIOLOGIA DEL LAZIO

# STORIE D'ARIA

## INQUINAMENTO E VIRUS

30 APRILE, ORE 18.30  
WEBINAIR



***Il virus è nell'aria ?***

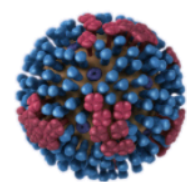
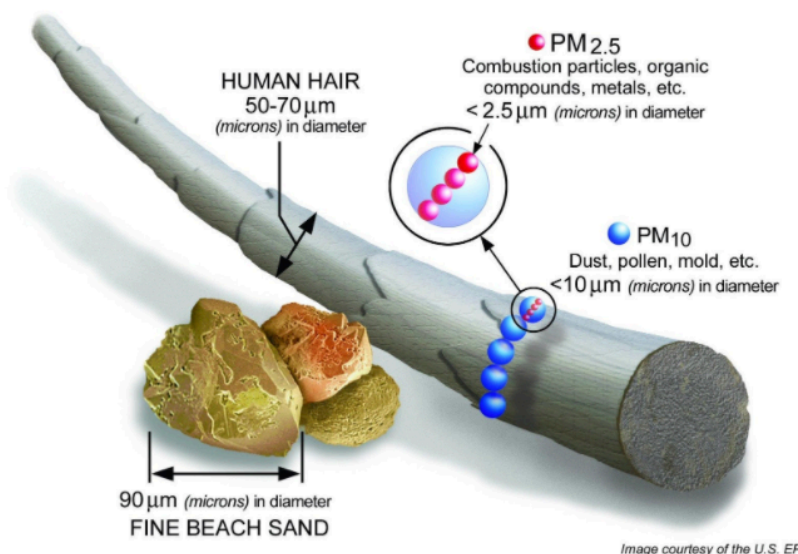
**Gianluigi de Gennaro**

**Dipartimento di Biologia**

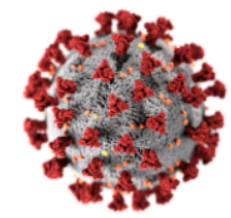
**Università degli Studi di Bari Aldo Moro**



# Virus Size



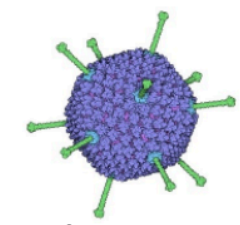
influenza  
0.1  $\mu\text{m}$



SARS-CoV-2  
0.12  $\mu\text{m}$

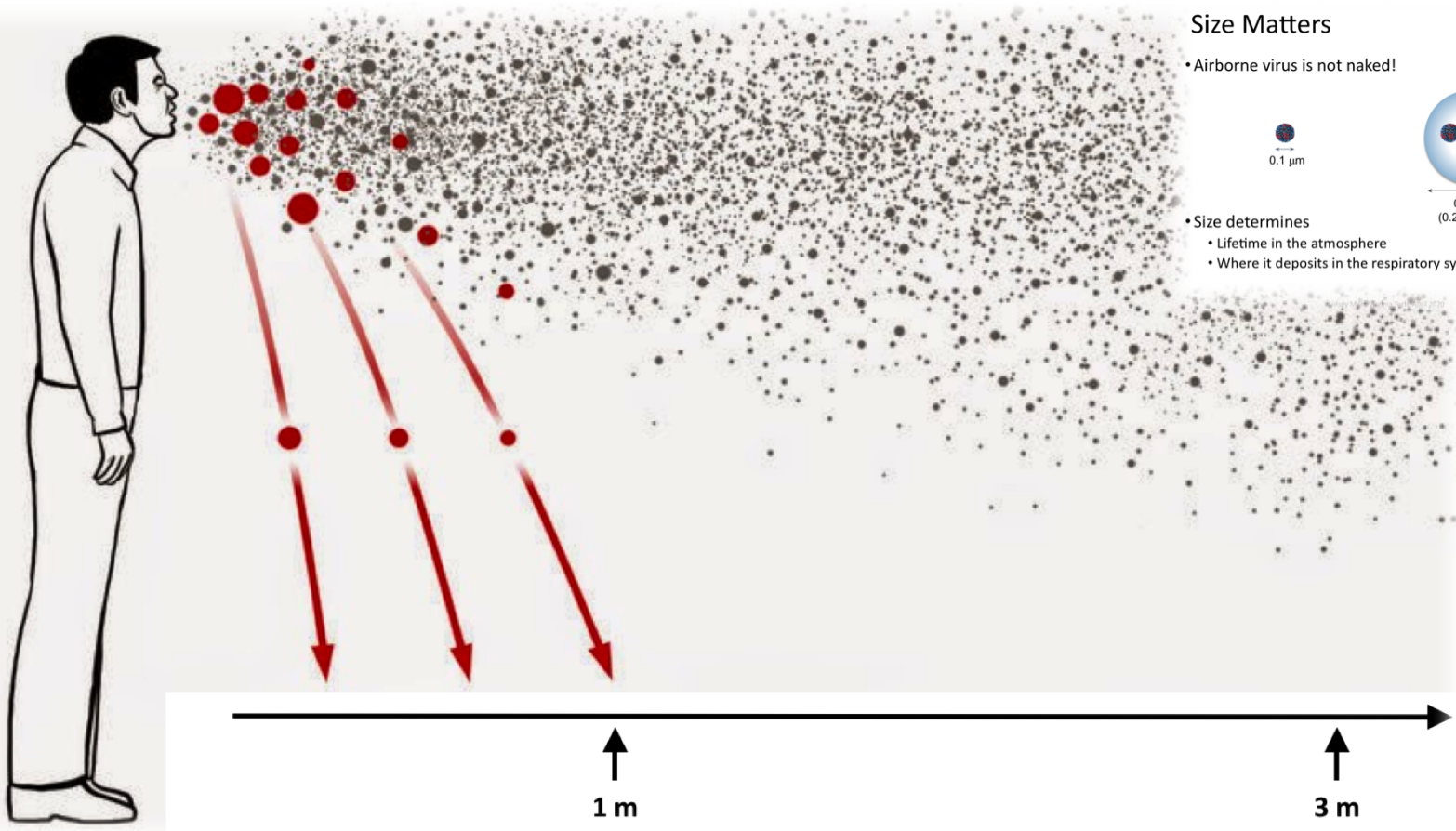


rhinovirus  
0.03  $\mu\text{m}$



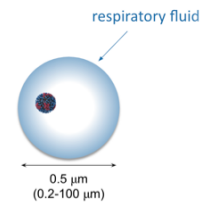
adenovirus  
0.1  $\mu\text{m}$

<https://www.cdc.gov/flu/resource-center/freeresources/graphics/Influenza/Influenza-2019-2020-seasonsdesignedforhealthcare.com/rhinovirus4>  
<https://phil.cdc.gov/Details.aspx?pid=23312>, <https://pdb101.rcsb.org/motm/132>



### Size Matters

- Airborne virus is not naked!



- Size determines
  - Lifetime in the atmosphere
  - Where it deposits in the respiratory system



# ***Ipotesi in campo***

***...per spiegare la rapida  
(anomala /non controllata) diffusione  
della malattia in alcuni territori...***



# Aerosolisti

## WHO e CDC

- **Hanno sottovalutato la trasmissione airborne**
- **Non hanno raccomandato protezione con mascherine**

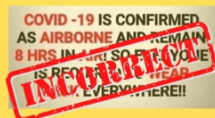
- **Diffusione non controllata:**

### FACT CHECK: COVID-19 is NOT airborne

The virus that causes COVID-19 is mainly transmitted through droplets generated when an infected person coughs, sneezes, or speaks. These droplets are too heavy to hang in the air. They quickly fall on floors or surfaces.

You can be infected by breathing in the virus if you are within 1 metre of a person who has COVID-19, or by touching a contaminated surface and then touching your eyes, nose or mouth before washing your hands.

To protect yourself, keep at least 1 metre distance from others and disinfect surfaces that are touched frequently. Regularly clean your hands thoroughly and avoid touching your eyes, mouth, and nose.

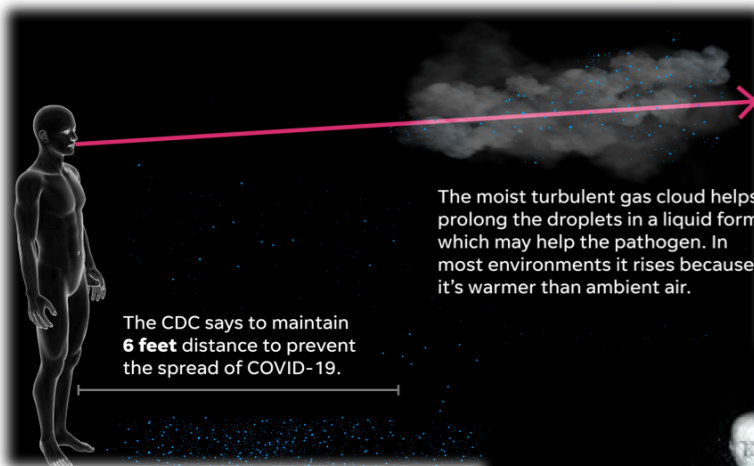


This message spreading on social media is incorrect. Help stop misinformation. Verify the facts before sharing.



March 28 2020

#Coronavirus #COVID19



The moist turbulent gas cloud helps prolong the droplets in a liquid form which may help the pathogen. In most environments it rises because it's warmer than ambient air.



- **Ospedali**
- **Mezzi di trasporto**
- **Sistemi di condizionamento aria**
- **Luoghi pubblici affollati confinati**
- **Outdoor a distanze fino a 3 metri**
- **In fila, seguendo la scia,....**



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PERSPECTIVE  
They Call Us and We Go

Notable Articles of 2019  
12 practice-changing articles

CASE RECORDS OF THE MGH  
Case 11.2020: A 37-Year-Old Man with Facial Droop, Dysarthria, and Kidney Failure...



ORIGINAL ARTICLE  
Selumetinib in Children with Inoperable Plexiform Neurofibromas



IMAGE CHALLENGE  
What is the diagnosis?

CORRESPONDENCE

Aerosol and Surface Stability of SARS-CoV-2 as Compared with SARS-CoV-1

## COVID-19 PANDEMIC

### How is the virus transmitted?



If the droplets land on surfaces, the virus may survive for as long as 24 hours on cardboard and up to 3 days on stainless steel and plastic, according to a recent study.



Source: AL JAZEERA | Last updated: 11:30 GMT, March 24, 2020



# ***Direttisti***

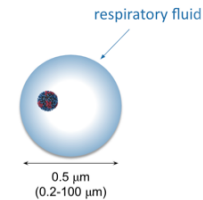
- ***(a) L'esposizione progressa a polveri fini ha determinato un danno biologico che rende più suscettibile/meno resistente l'organismo umano al virus***
- ***(b) Le polveri fini inalate insieme al virus (anche successivamente) determinano un danno biologico che rende più suscettibile/meno resistente l'organismo umano al virus***



# Particellaristi

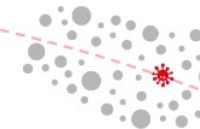
## Size Matters

• Airborne virus is not naked!



• Size determines

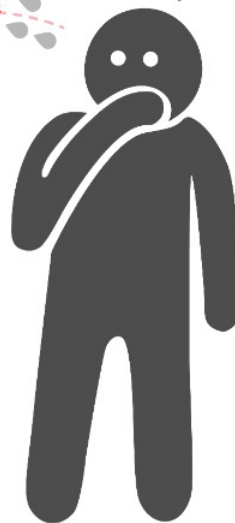
- Lifetime in the atmosphere
- Where it deposits in the respiratory system



PARTICULATE MATTER



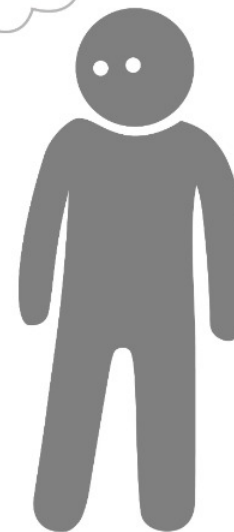
DROPLETS  
NUCLEI < 5 $\mu\text{m}$



DROPLETS  
NUCLEI > 5 $\mu\text{m}$



AEROSOL



DIRECT CONTACT

AIRBONE

HIGHWAY

Safety distance

1 - 2 meters

7 - 8 meters

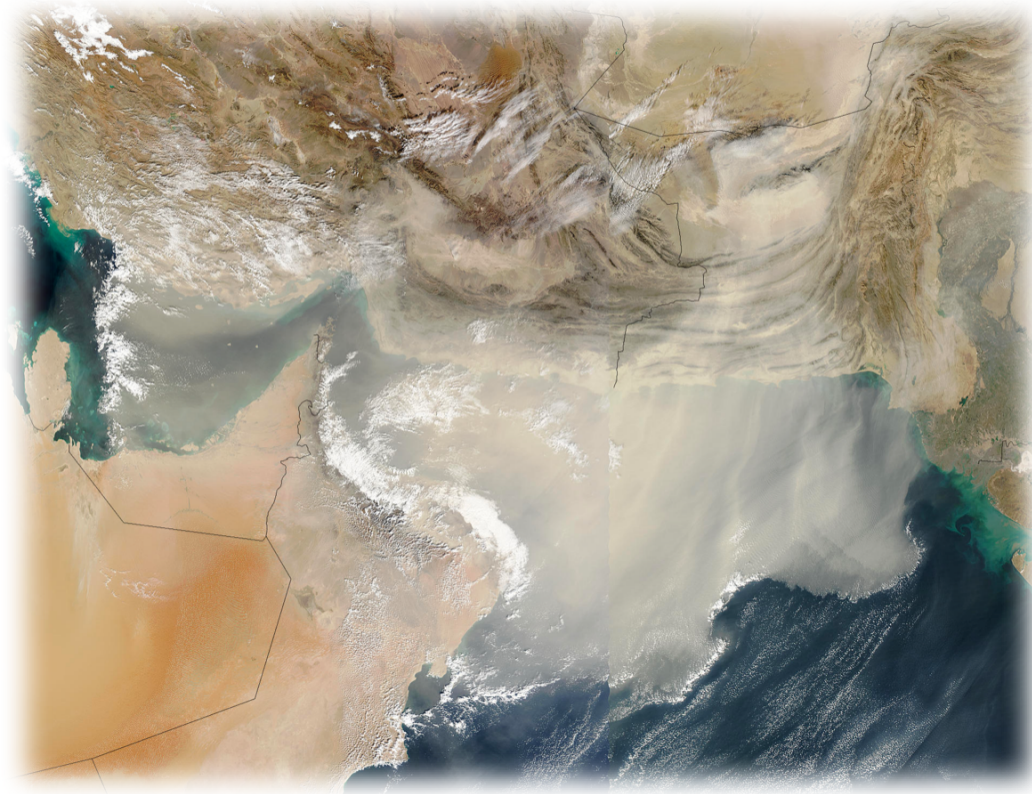
> 8 meters





# *Trasportisti*

- *Trasporto a lunga distanza*





## *Altre Ipotesi*

- ***Temperatura***
- ***Cambiamenti climatici***
- ***Spandimenti in agricoltura***
- ***.....***
- ***Negazionisti/attendisti***



## POSITION PAPER

### Relazione circa l'effetto dell'inquinamento da particolato atmosferico e la diffusione di virus nella popolazione

Leonardo Setti - Università di Bologna  
Fabrizio Passarini - Università di Bologna  
Gianluigi de Gennaro - Università di Bari  
Alessia Di Gilio - Università di Bari  
Jolanda Palmisani - Università di Bari  
Paolo Buono - Università di Bari  
Gianna Fornari - Università di Bari  
Maria Grazia Perrone - Università di Milano  
Andrea Piazzalunga - Esperto Milano  
Pierluigi Barbieri - Università di Trieste  
Emanuele Rizzo - Società Italiana Medicina Ambientale  
Alessandro Miani - Società Italiana Medicina Ambientale



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### The Potential role of Particulate Matter in the Spreading of COVID-19 in Northern Italy: First Evidence-based Research Hypotheses

Leonardo Setti, Fabrizio Passarini, Gianluigi De Gennaro, Pierluigi Barbieri, Maria Grazia Perrone, Andrea Piazzalunga, Massimo Borelli, Jolanda Palmisani, Alessia Di Gilio, PRISCO PISCITELLI, Alessandro Miani  
doi: <https://doi.org/10.1101/2020.04.11.20061713>

**This article is a preprint and has not been certified by peer review [what does this mean?]. It reports new medical research that has yet to be evaluated and so should not be used to guide clinical practice.**

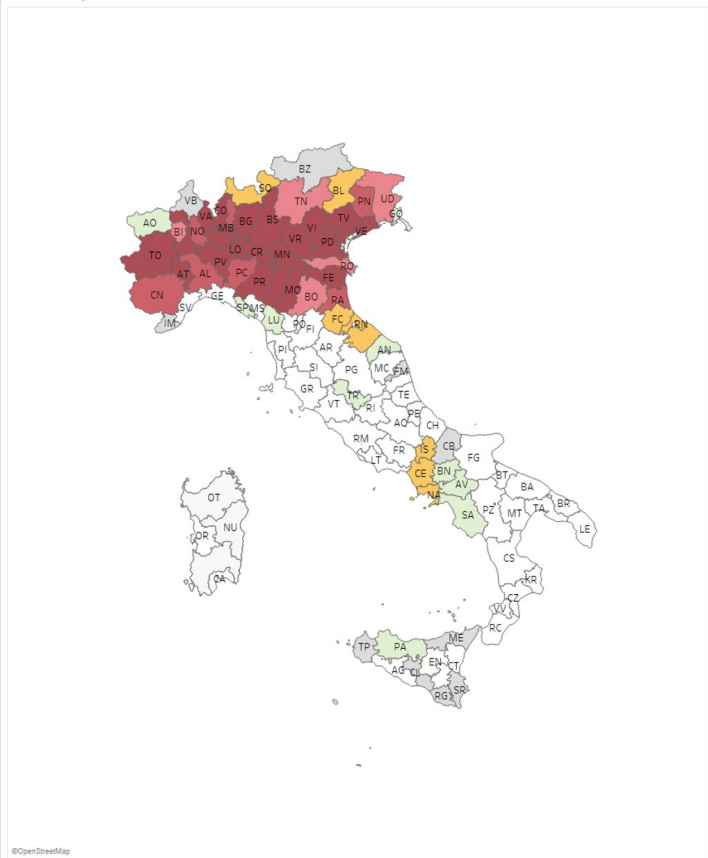




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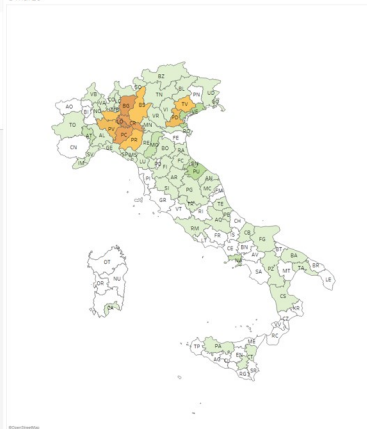
Media superamenti



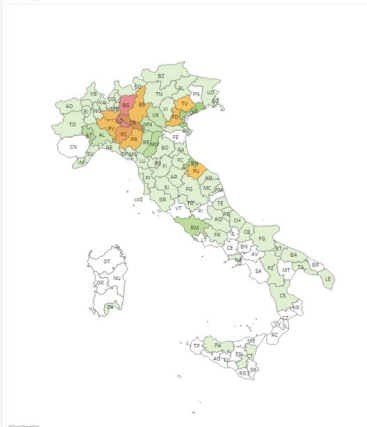
Media superamenti

- 0
- 0,95-1,10
- 1,25-2,50
- 2,50-4,50
- 4,50-6,00
- >6,00
- nd

3 marzo



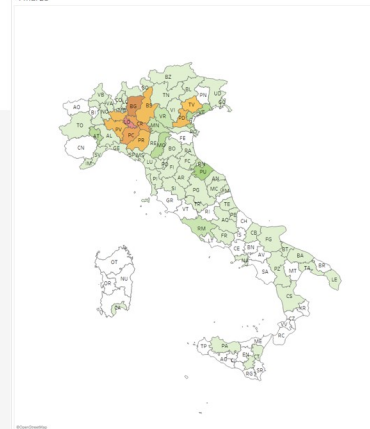
5 marzo



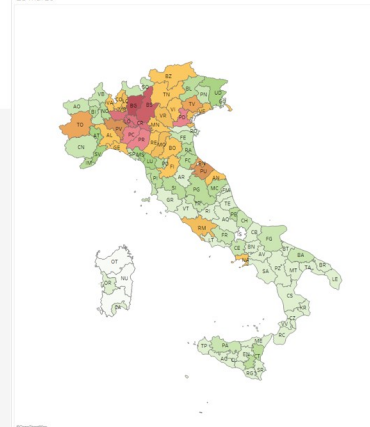
Contaghi 3 marzo

- 0
- 1-20
- 21-40
- 41-60
- 61-80
- 81-100
- 101-200
- 201-300
- 301-400
- 401-500
- 501-1000
- 1001-1500
- 1501-2000
- 2001-3000

4 marzo



13 marzo

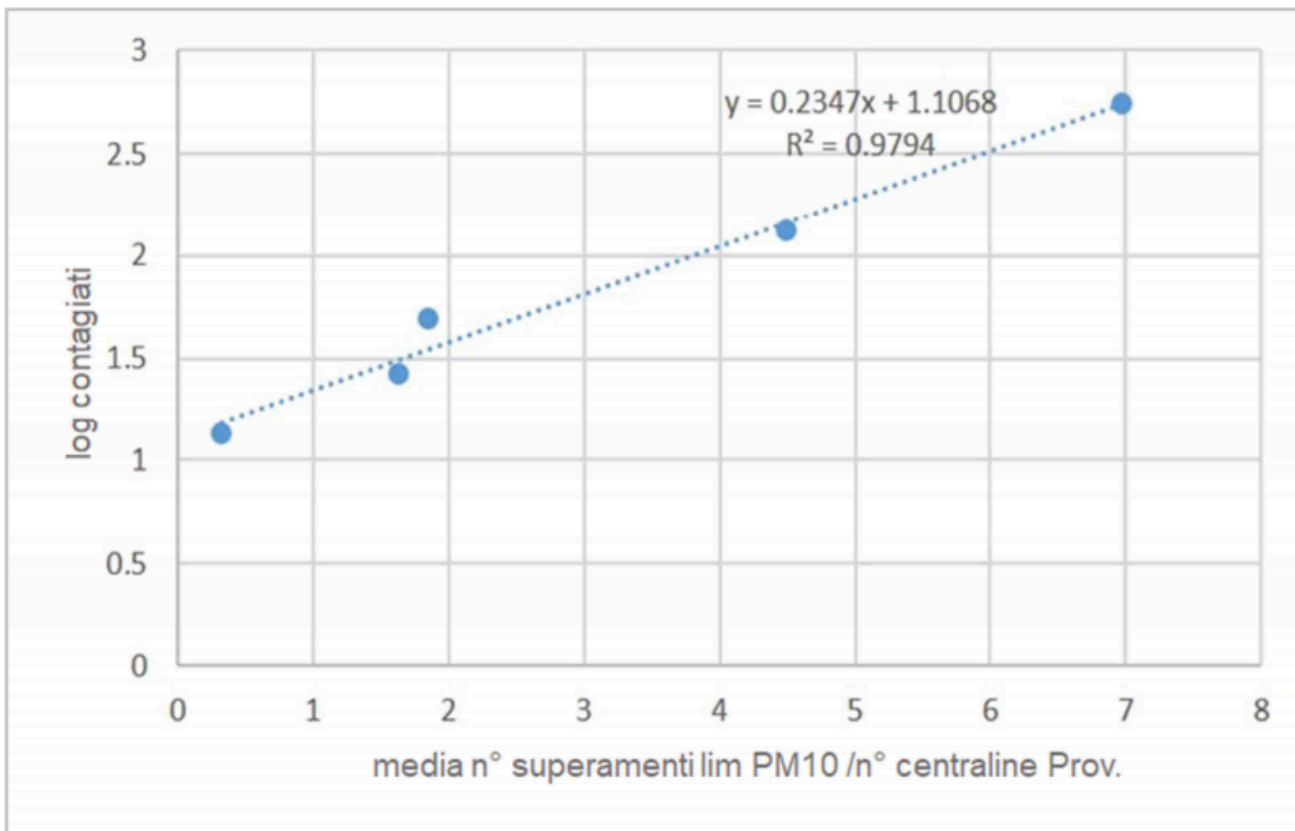


Contaghi 5 marzo

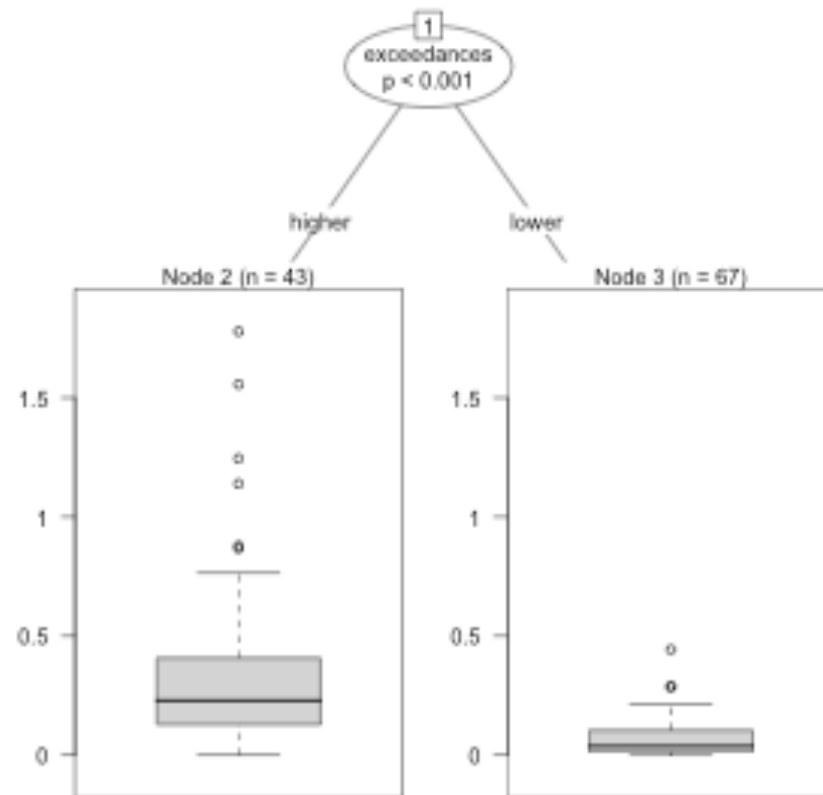
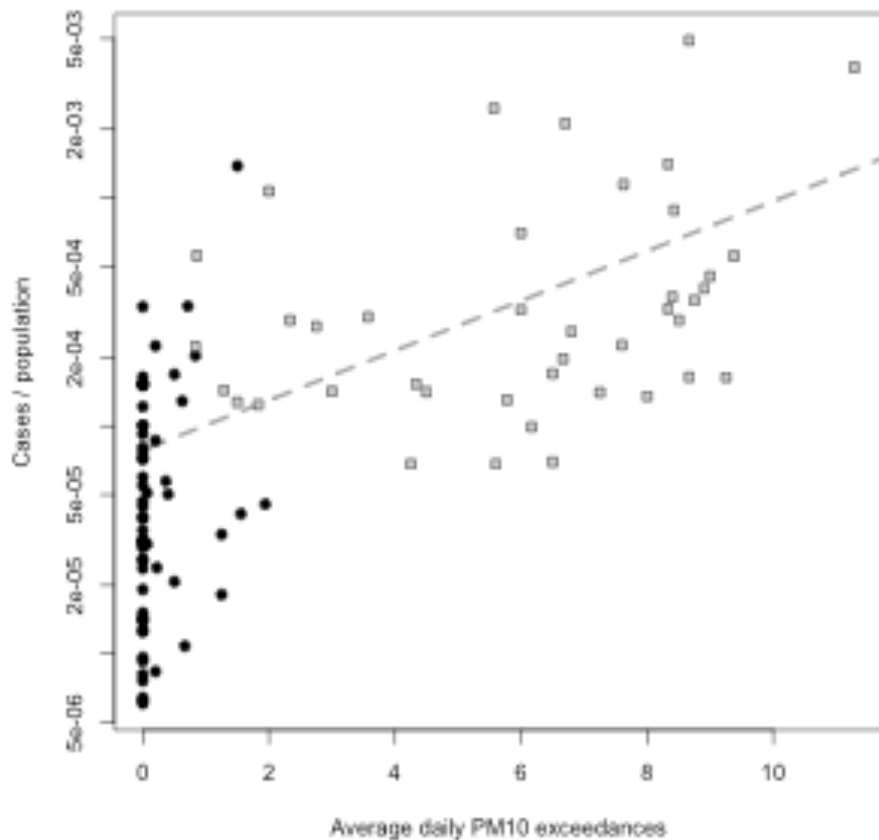
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- 1-20
- 21-40
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- 61-80
- 81-100
- 101-200
- 201-300
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- 401-500
- 501-1000
- 1001-1500
- 1501-2000
- 2001-3000

Contaghi 13 marzo

- 0
- 1-20
- 21-40
- 41-60
- 61-80
- 81-100
- 101-200
- 201-300
- 301-400
- 401-500
- 501-1000
- 1001-1500
- 1501-2000
- 2001-3000



**Figura 1**

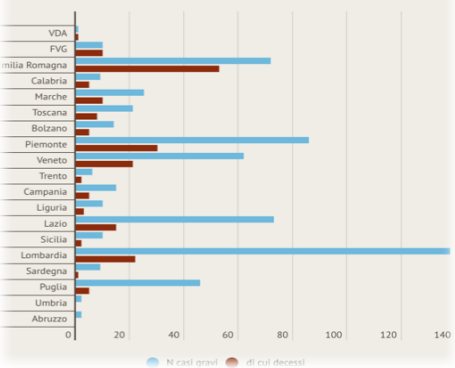




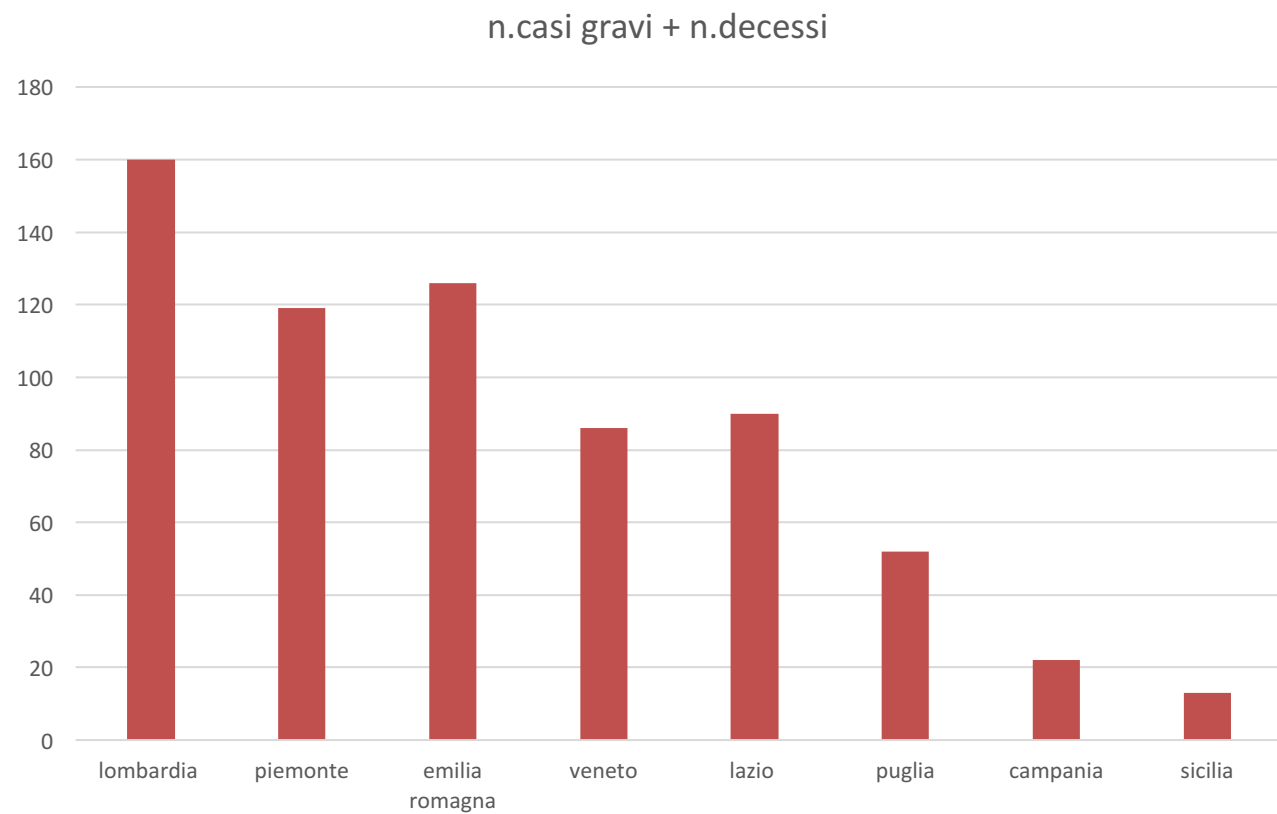




Casi gravi e decessi (regioni ordinate in ordine crescente per gap fra casi gravi e decessi)

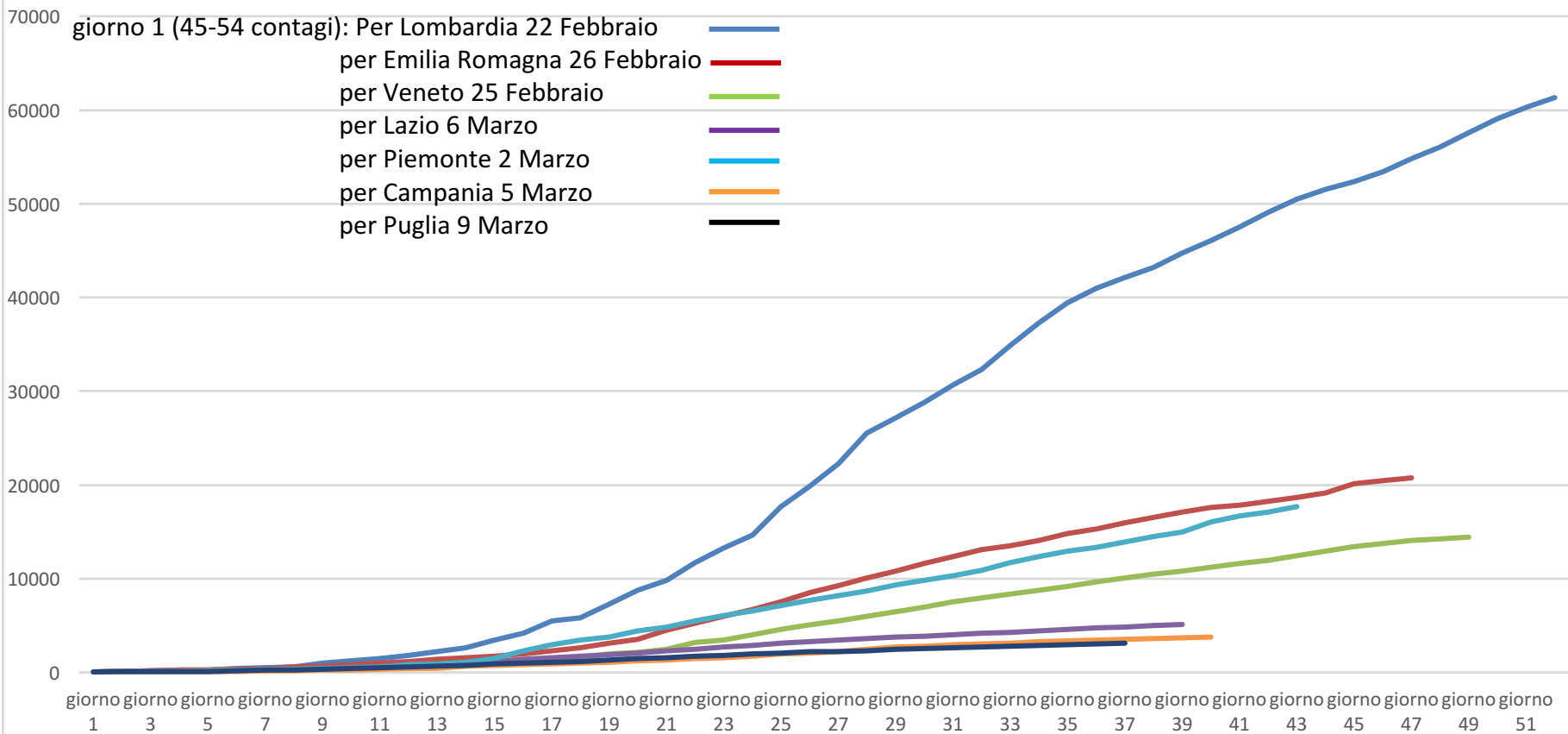


# Stagione influenzale 2018-2019



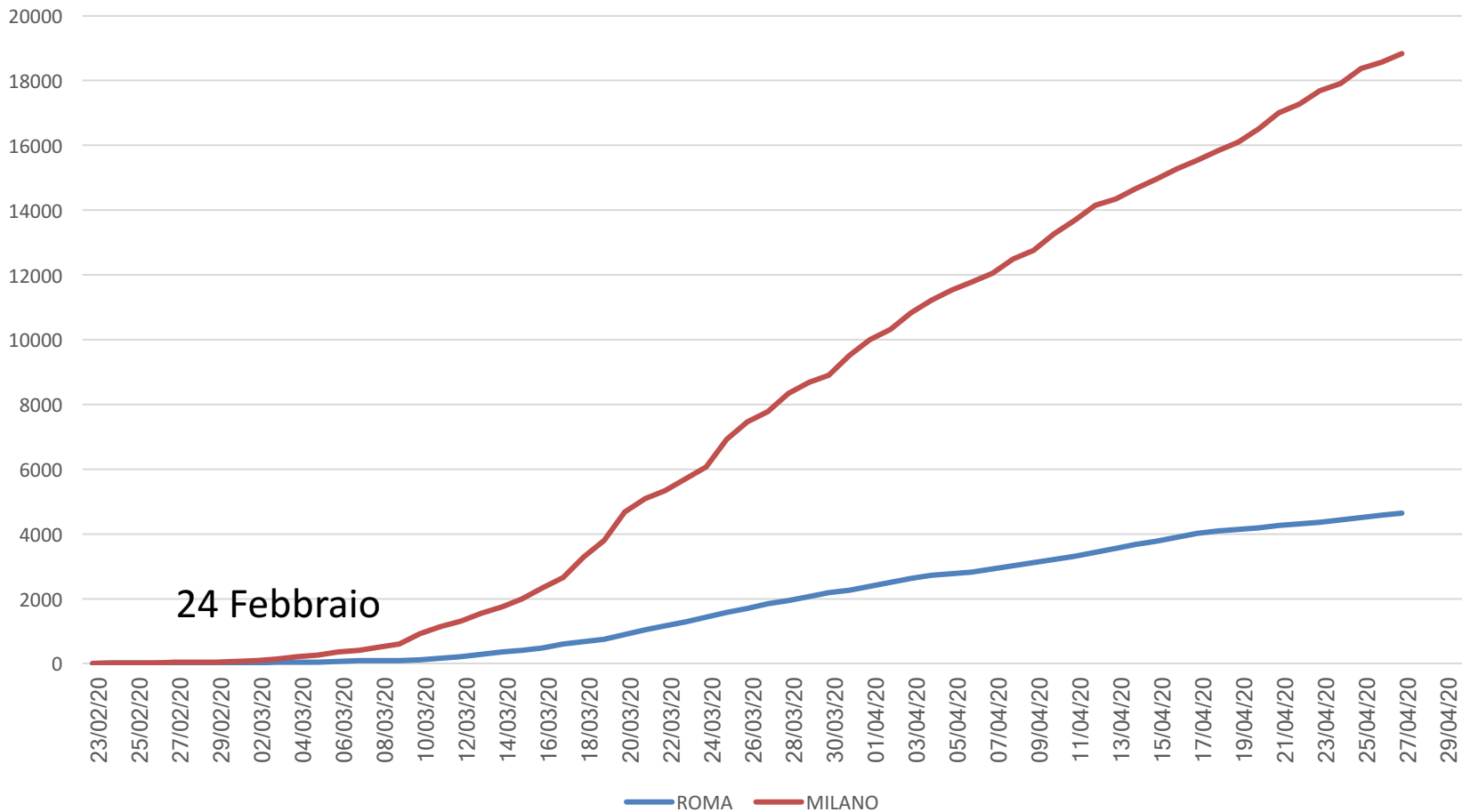


Curve contagi



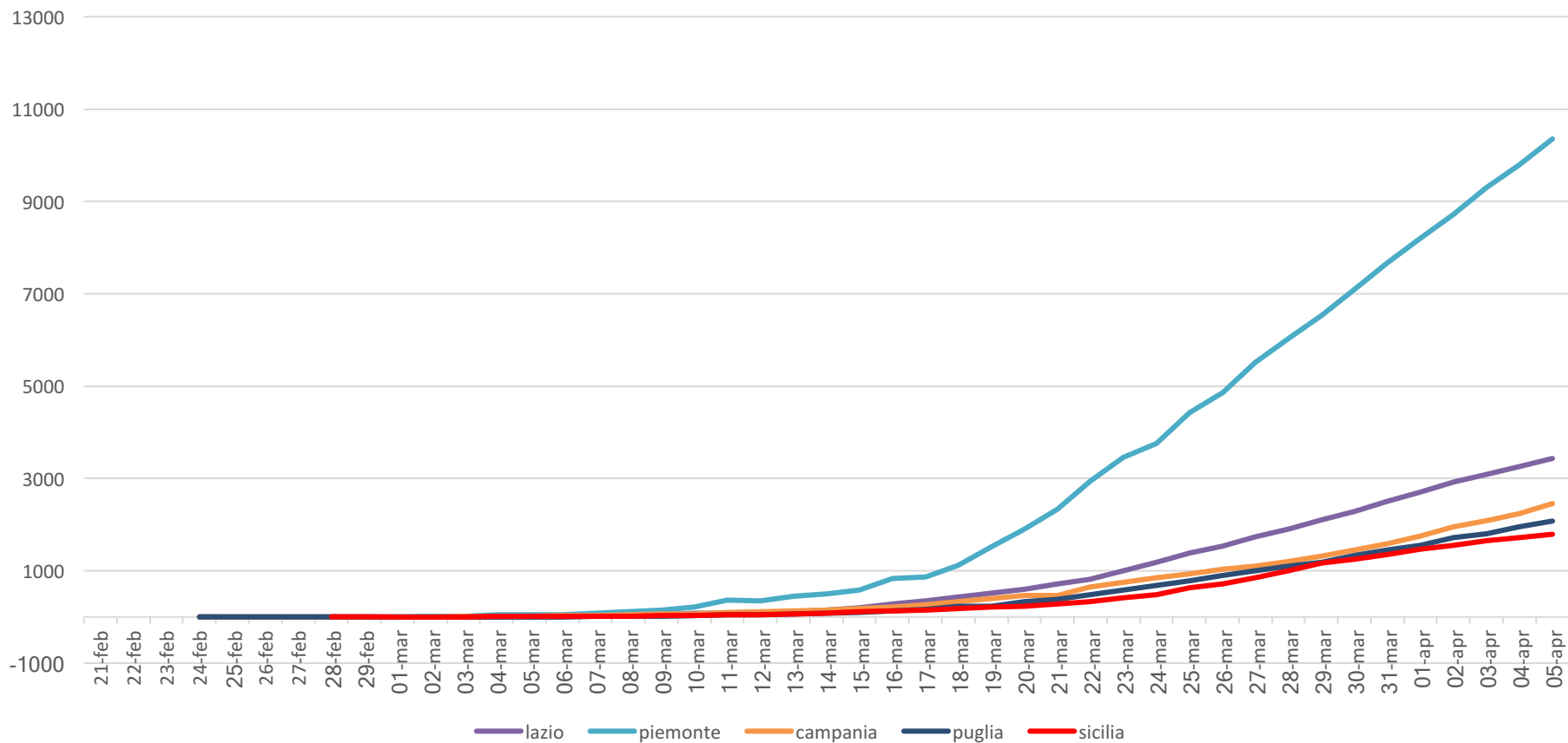


Confronto ROMA vs MILANO











## Piemontesi indisciplinati





*Editorial*

## Airborne Transmission Route of COVID-19: Why 2 Meters/6 Feet of Inter-Personal Distance Could Not Be Enough

Leonardo Setti <sup>1,\*</sup>, Fabrizio Passarini <sup>2</sup>, Gianluigi De Gennaro <sup>3</sup>, Pierluigi Barbieri <sup>4</sup>,  
Maria Grazia Perrone <sup>5</sup>, Massimo Borelli <sup>6</sup>, Jolanda Palmisani <sup>3</sup>, Alessia Di Gilio <sup>3</sup>,  
Prisco Piscitelli <sup>7,8</sup> and Alessandro Miani <sup>8,9</sup>



*Editorial*

## Searching for SARS-COV-2 on Particulate Matter: A Possible Early Indicator of COVID-19 Epidemic Recurrence

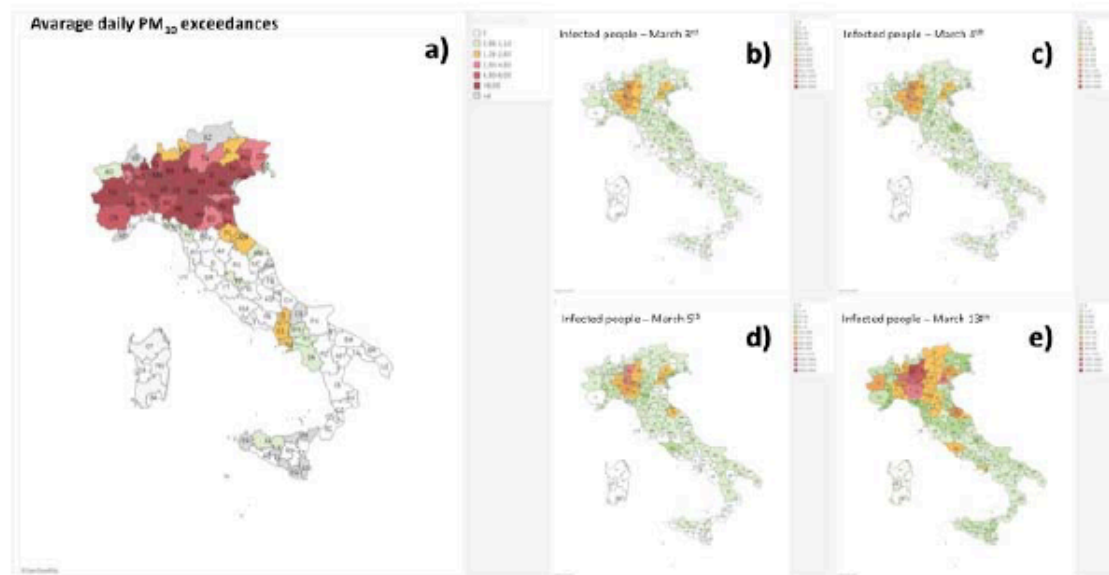
Leonardo Setti <sup>1</sup>, Fabrizio Passarini <sup>2</sup>, Gianluigi De Gennaro <sup>3</sup>, Pierluigi Barbieri <sup>4</sup>, Alberto  
Pallavicini <sup>5</sup>, Maurizio Ruscio <sup>6</sup>, Prisco Piscitelli <sup>7,8</sup>, Annamaria Colao <sup>8</sup> and Alessandro Miani <sup>7,8,9,\*</sup>



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## The Potential role of Particulate Matter in the Spreading of COVID-19 in Northern Italy: First Evidence-based Research Hypotheses

Leonardo Setti<sup>1</sup>, Fabrizio Passarini<sup>2</sup>, Gianluigi De Gennaro<sup>3</sup>, Pierluigi Barbieri<sup>4</sup>, Maria Grazia Perrone<sup>5</sup>, Andrea Piazzalunga<sup>6</sup>, Massimo Borelli<sup>7</sup>, Jolanda Palmisani<sup>3</sup>, Alessia Di Gilio<sup>3</sup>, Prisco Piscitelli<sup>8</sup>, Alessandro Miani<sup>8</sup>



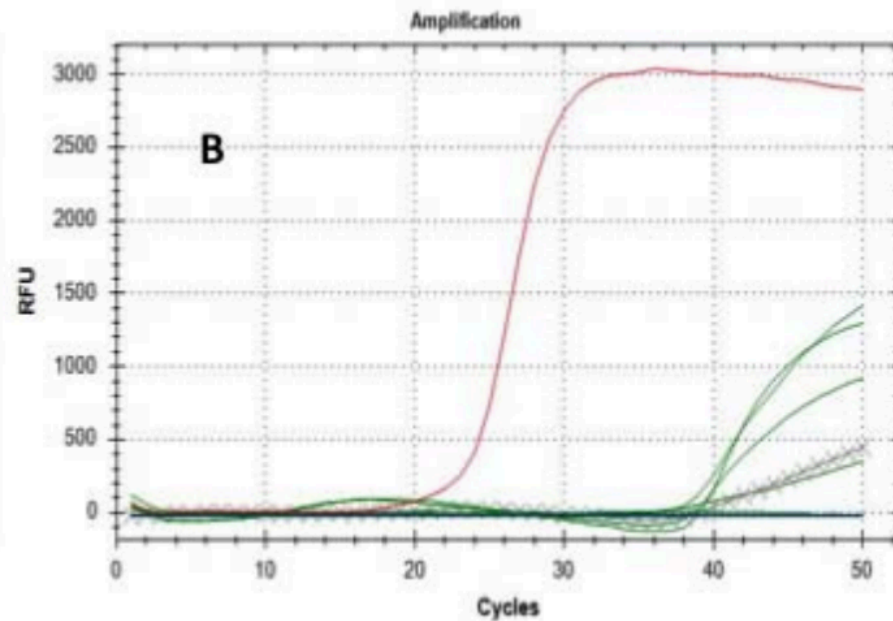
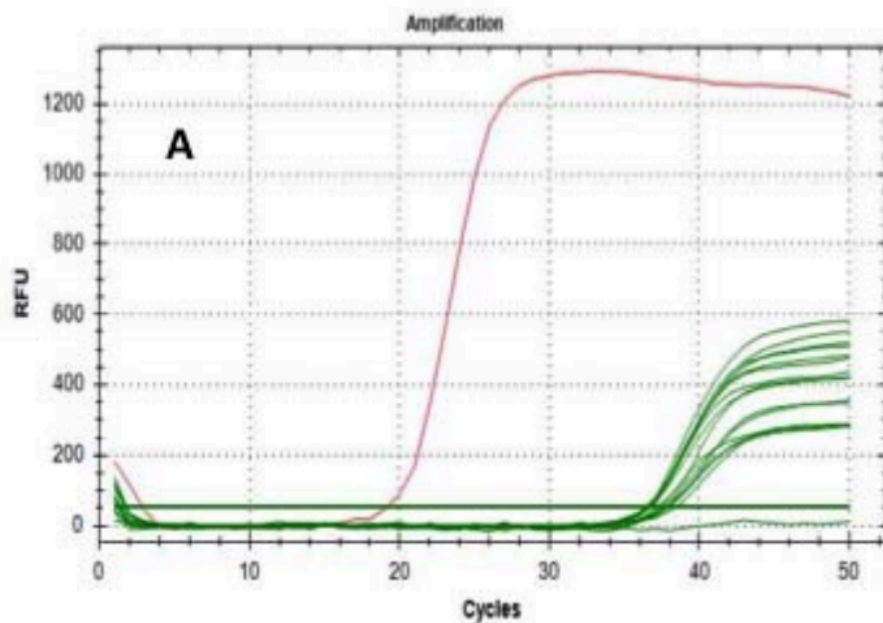


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*Letter to the Editor*

### SARS-Cov-2 RNA Found on Particulate Matter of Bergamo in Northern Italy: First Preliminary Evidence

Leonardo Setti<sup>1</sup>, Fabrizio Passarini<sup>2</sup>, Gianluigi De Gennaro<sup>3</sup>, Pierluigi Barbieri<sup>4</sup>, Maria Grazia Perrone<sup>5</sup>, Massimo Borelli<sup>6</sup>, Jolanda Palmisani<sup>3</sup>, Alessia Di Gilio<sup>3</sup>, Valentina Torboli<sup>6</sup>, Alberto Pallavicini<sup>6</sup>, Maurizio Ruscio<sup>7</sup>, Prisco Piscitelli<sup>8</sup>, Alessandro Miani<sup>8</sup>





## Aerodynamic analysis of SARS-CoV-2 in two Wuhan hospitals

Yuan Liu, Zhi Ning [✉](#), Yu Chen [✉](#), Ming Guo, Yingle Liu, Nirmal Kumar Gali, Li Sun, Yusen Duan, Jing Cai, Dane Westerdahl, Xinjin Liu, Ke Xu, [Kin-fai Ho](#) [✉](#), Haidong Kan [✉](#), Qingyan Fu [✉](#) & Ke Lan [✉](#)

*Nature* (2020) | [Cite this article](#)

64k Accesses | 1778 Altmetric | [Metrics](#)

Category	Sites	Sample Type	Concentration (copies m <sup>-3</sup> )
<b>Patient Areas (PAA)</b>			
Fangcang Hospital	1. Zone A Workstation <sup>#</sup>	TSP <sup>a</sup>	1
		TSP <sup>b</sup>	9
	2. Zone B Workstation	TSP	1
	3. Zone C Workstation <sup>#</sup>	TSP <sup>a</sup>	5
		TSP <sup>b</sup>	0
Renmin Hospital	4. Patient Mobile Toilet Room	TSP	19
	5. Intensive Care Unit (ICU)	TSP	0
	6. Intensive Care Unit (ICU)	Deposition	31*
	7. Intensive Care Unit (ICU)	Deposition	113*
	8. Coronary Care Unit (CCU)	TSP	0
	9. Ward Zone 16	TSP	0
<b>Medical Staff Areas (MSA)</b>			
Fangcang Hospital	10. Zone A Protective Apparel Removal Room (PARR) <sup>#</sup>	TSP <sup>a</sup>	16
		TSP <sup>b</sup>	0
	11. Zone B Protective Apparel Removal Room (PARR)	Size Segregated	42
	12. Zone C Protective Apparel Removal Room (PARR) <sup>#</sup>	Size Segregated <sup>a</sup>	20
		TSP <sup>b</sup>	0
	13. Male Staff Change Room	TSP	20
	14. Female Staff Change Room	TSP	11
	15. Medical Staff's Office	Size Segregated	20
	16. Meeting Room	TSP	18
		TSP	21
		TSP	0
Renmin Hospital	18. Passageway for Medical Staff	TSP	6
	19. Dining Room for Medical Staff	TSP	6
<b>Public Areas (PUA)</b>			
	20. Fangcang Hospital Pharmacy	TSP	3
	21. Renmin Hospital Doctor Office	TSP	0
	22. Renmin Hospital Outpatient Hall	TSP	0
	23. Renmin Hospital Outdoor	TSP	7
	24. University Office Doorside	TSP	0
	25. University Hospital Outpatient Hall	TSP	0
	26. Community Check Point	TSP	0
	27. Residential Building	TSP	0
	28. Supermarket	TSP	0
	29. Department Store 1	TSP	11
	30. Department Store 2	TSP	3
	31. Blank Control <sup>#</sup>	Field Blank <sup>a</sup>	0
		Field Blank <sup>b</sup>	0

Note:

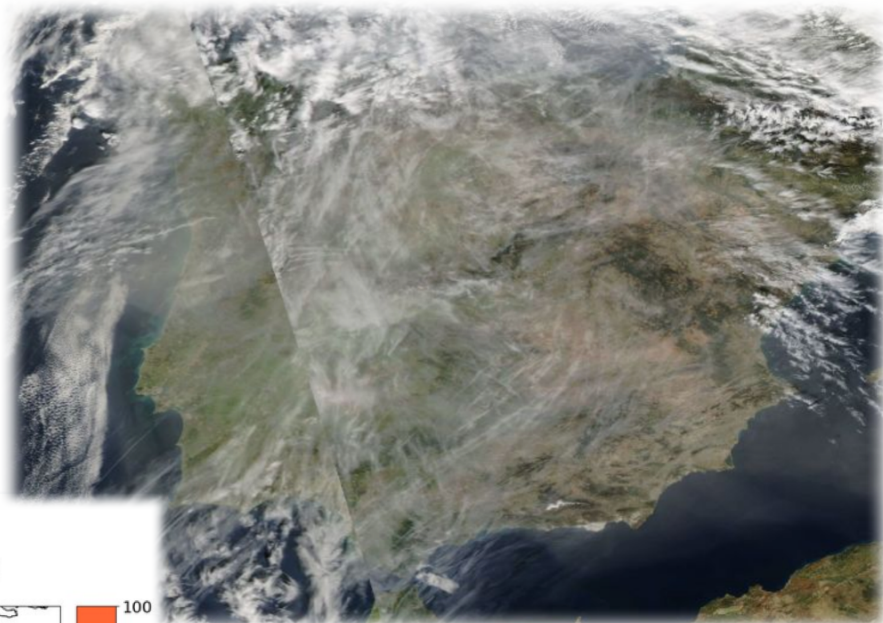
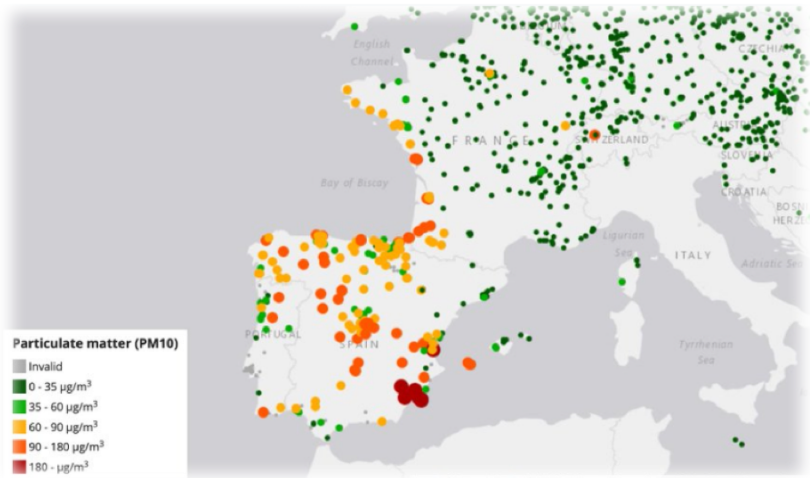




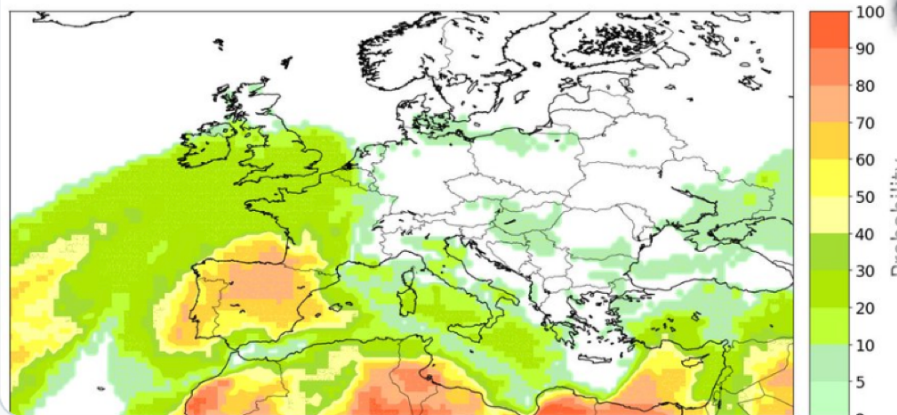


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Daily Maximum of **Dust SFC Concentration**  
Probability of exceeding **50  $\mu\text{g}/\text{m}^3$**   
ENS members: **10** Run: 27/02/2020 Valid for: **28/02/2020**





Agente nazionale per le nuove tecnologie,  
l'energia e lo sviluppo economico sostenibile



ISPRA  
Istituto Superiore per la Protezione  
e la Ricerca Ambientale



Sistema Nazionale  
per la Protezione  
dell'Ambiente

### Comunicato stampa

## **Coronavirus: ENEA, ISS E SNPA lanciano progetto PULVIRUS su legame fra inquinamento e COVID-19**

**In particolare il progetto vuole approfondire:**

- **il discusso legame fra inquinamento atmosferico e diffusione della pandemia,**
- **le interazioni fisico-chimiche-biologiche fra polveri sottili e virus**
- **gli effetti del “lock down” sull’inquinamento atmosferico e sui gas serra.**



# Conclusioni

- **Studio della letteratura multidisciplinare**
- **Si parla prima o dopo la fine della tragedia?**
  - **Applicazione Principio di Massima Precauzione**
  - **Allarmisti: -> Preparazione consapevole fase II (gestione luoghi pubblici e dei luoghi confinati)**
    - **Distanziamento**
    - **Protezione (mascherine)**
    - **Riduzione delle emissioni**
    - **Gestione della complessità**

**Necessità di visione sistemica (non corporativismo) oltre che studi di dominio**

**ATTENZIONE AGLI EQUILIBRI**



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# Grazie

GIANLUIGI DE GENNARO, UNIVERSITÀ DEGLI STUDI DI BARI  
CARLA ANCONA, DIPARTIMENTO DI EPIDEMIOLOGIA DEL LAZIO

**STORIE D'ARIA**  
INQUINAMENTO E VIRUS

30 APRILE, ORE 18.30  
WEBINAR



**Gianluigi de Gennaro**  
Dipartimento di Biologia  
Università degli Studi di Bari Aldo Moro  
[gianluigi.degennaro@uniba.it](mailto:gianluigi.degennaro@uniba.it)

Leonardo Setti - Università di Bologna  
Fabrizio Passarini - Università di Bologna  
Gianluigi de Gennaro - Università di Bari  
Alessia Di Gilio - Università di Bari  
Jolanda Palmisani - Università di Bari  
Paolo Buono - Università di Bari  
Gianna Fornari - Università di Bari  
Maria Grazia Perrone - Università di Milano  
Andrea Piazzalunga - Esperto Milano  
Pierluigi Barbieri - Università di Trieste  
Emanuele Rizzo - SIMA  
Alessandro Miani - SIMA