

# Unequal effects of the national lockdown on mental and social health in Italy

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**Running title:** Unequal effects of the lockdown on mental health

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**Abstract:** With the exception of a few countries that chose a different approach, the worldwide reaction to the COVID-19 pandemic was a (longer or shorter) period of national lockdown. While the economic consequences of shutting down national economies were immediately evident, the sociopsychiatric implications of the social confinement of the entire population remain hidden and not fully understood. Italy has been the first European country to be severely impacted by the COVID-19 pandemic, to which it responded through strict lockdown measurements. The results of a timely survey on mental and social health, carried out by students and teachers of a middle school in Rome, might help identify the most vulnerable groups of the population. This evidence could be crucial in conceiving and enacting targeted public health policies to mitigate the consequences of the pandemic on mental health and to prevent intolerance to containment measures in some population segments, which could hamper worldwide efforts in the fight against COVID-19.

On March 5, all the schools in Italy closed as a reaction to the exponential growth in the number of COVID-19 cases, in anticipation for a nation-wide lockdown four days later. Nonetheless, all the teaching activities continued, sustained by a commendable effort by teachers to engage students from their homes through the screen of an electronic device. Teachers from the middle school *Michelangelo Buonarroti* in Rome, Italy, took a further step in this new era of online learning, by guiding and motivating their students to create an online survey to study the emotional response of the population to the national lockdown.

Similar to bird watchers who annotate the species they identify [1] or volunteers who tag images of polluted body of water on a computer screen [2], teachers and students took on themselves to create a comprehensive picture of the social and mental health consequences of the lockdown in Italy. Reaching beyond the barriers of structured, in-classroom education, this informal science endeavor constitutes an instance of citizen science spurred by the emergency posed by COVID-19. As any authentic citizen science project [3], this effort benefitted the scientific community through original data collection and its volunteers, students and teachers, who increased their scientific literacy on the topic and acquired first-hand knowledge of the impact of the virus on our lives.

This commendable initiative was recognized by the World Health Organization - European Region in April 2020 as an example of adolescence active involvement in fighting the psychological effects of the pandemic. The survey was filled by thousands of individuals of all ages starting April 17, offering a unique snapshot of how society first responded to this life-changing event. Such a snapshot could help identify the traits of the individuals who were most affected by the lockdown, thereby informing effective public health approaches in the short and long term fight against COVID-19.

The experimental protocol was approved by the institutional review board (IRB) at Istituto Comprensivo Regina Elena, Scuola Media *Michelangelo Buonarroti*, Ministry of Education (protocol number 737.I.8). The survey was designed in Google modules to include questions on demographics (age, gender, and city of residence), on economic status (possible loss of job, and variations in the economic condition), and on feelings and activities when the lockdown was announced. The complete surveys, with their answers, can be found at [https://osf.io/buahv/?view\\_only=2dfd654cf3944be49985db765b898226](https://osf.io/buahv/?view_only=2dfd654cf3944be49985db765b898226); excerpted questions underlying the variables used in the analysis, along with the possible answers, are presented below

1. Gender  
*Male | Female*
2. Age  
*10-14 | 15-19 | 20-30 | 31-50 | 51-70 | over 70*
3. What did you feel when the quarantine was announced?  
*Fear | Joy | Calm | Confusion | Anxiety | Indifference*
4. What are your feelings now, about a month since the beginning of the quarantine? (3 answers maximum)  
*Fear | Happiness | Serenity | Anxiety | Boredom | Nostalgia | Melancholy | Indifference*

The survey shares similarities to established tools, which were utilized by professional researchers to study the unfolding of the COVID-19 pandemic on mental health in the United States [4] and the effect of social distancing measures on productivity and workload of scientists across the globe [5].

Data until June 12 were exported in .csv files, which were then imported in Matlab for being analyzed. Participants were recruited by sharing the link to the survey through social media (WhatsApp, Instagram, and Facebook) and sending them emails with the following text: "Hello everybody! We are eighth grade students of the middle school Michelangelo Buonarroti in Rome,

Italy, and we did a survey about how we are living during the quarantine and we imagine the future. Thank you for responding to this school project. (All answers are subject to privacy and will be used for educational work)”.

Out of the 3990 individuals who filled the survey, we selected the 3562 respondents who selected Italian as the survey language. The demographic distribution of this sample is reported in Figure 1. Our analysis focused on identifying the differences in emotional response to the pandemic in relation to gender and age. We associated binary values with the gender (0 female, 1 male), and with each of the feelings in questions 3 and 4 (0 not felt, 1 felt). Then, we computed the Phi coefficient and the corresponding *p*-values. The results of this analysis are reported in Tables 1 and 2, where *p*-values lower than 0.01 (cells in green) indicate an association between feelings and age or gender. The Matlab code can be downloaded at [https://osf.io/buahv/?view\\_only=2dfd654cf3944be49985db765b898226](https://osf.io/buahv/?view_only=2dfd654cf3944be49985db765b898226).

Here, we discuss two key results of this survey that we believe could contribute towards an improved understanding of the segments of the population that are most vulnerable to the social and mental health consequences of this pandemic. Figure 2 shows that female and male respondents dramatically differed in their emotional response to the announcement of the lockdown and in their enduring reaction to it. Female respondents tended to experience anxiety, fear, melancholy, confusion, and nostalgia more than male respondents, thereby pointing at a higher level of distress associated with the lockdown.

These results are in line with the so-called gender paradox: the combination of biological and environmental factors produces a health inequality condition in which women, although having a higher life expectancy, end up living less healthy lives [6]. In the case of COVID-19, the paradox materializes in women and girls paying a higher price to the pandemic [5], although the mortality among them is lower than men and boys.

The higher impact of the pandemic on women and girls has also been recognized by the United Nations [7]. Key environmental factors explaining the vulnerability of women and girls, advocated by the United Nations, include their higher economic fragility, increased risk of gender-based violence, and greater involvement in unpaid care work towards children and elderly that grew during the pandemic. In its simplicity, the survey conceived by middle school students and teachers of *Michelangelo Buonarroti* provides sociopsychiatric backing to the observations made by the United Nations, by identifying differences in the emotional response of women and girls.

In addition to environmental factors, differences in emotional responses could be linked to gender-specific biological traits. The gender differences in the psychological and biological reactions to distress and in the way emotions are expressed are well-assessed, as well as the higher incidence of depression and post-traumatic stress syndrome in females [8]. The same stressful events can impact women and girls more, who may feel less in control and more prone to choose emotional versus problem-focused coping styles [9]. Every brain is a unique patchwork of traits, but quantitative analyses show that some traits are more prominent in one gender or another [10]. The different reactions to the lockdown could be then partially related to the fact that the masculine brain is structured to favor the perception-action connection, while the feminine brain is organized to facilitate the connection between analytic information processing and the intuitive analysis [11].

Overall, gender differences in the response to the lockdown should be sought in environmental and biological variations between male and female respondents. Neither of them should be considered the unique mediator for the observed differences in emotional response. Irrespective of their causes, we call to identify and enact suitable policies to protect the health of women and girls. It is of greatest urgency to provide and strengthen community-based health and social services to compensate for gender inequalities, especially as women are taking a crucial role in the healthcare workforce [12].

The second key finding from the survey is reported in Figure 3, which highlights differences in the emotional experience of adults and young adolescents when the lockdown was announced and when it was in effect. A higher prevalence of joy and happiness among teenagers can be related to the indirect effects of the pandemic, with the schools closing three months earlier than usual. These results are in line with the social information processing network [13], which posits an earlier development of cerebral areas connected to emotions than areas connected to cognition. The higher incidence of joy and happiness in youth points toward a sense of immediate gratification, which is not mediated by the regulatory activity of the cognitive hub of the brain that could tune the emotional response to the seriousness of the situation [14].

However, the national lockdown not only implied early school closure, but also forced teenagers to stay home, abruptly interrupting their daily activities, including sports, meeting with their partners, socializing with friends, etc. This explains why, together with joy and happiness, teenagers also reported a higher prevalence of feelings of boredom and nostalgia.

We believe that teenagers' feelings during the lockdown are an indicator of a stronger drive to return to the behaviors that were not allowed. Their emotional experience during lockdown might induce the violation of social distancing rules - which are crucial in containing the pandemic and preventing second or third waves - and might reinforce the tendency, typical of their age, to take imprudent behaviors that could increase morbidity [15].

Indeed, the prefrontal cortex, one of the main hubs of the cerebral circuits involved in human decisional processes, is subject to substantial changes during adolescence. Since decisional processes are inherently related to emotions and decision-making skills are only partially developed in teenagers, the additional emotional baggage associated with the lockdown could push teenagers toward riskier behaviors [16], with a less cogent judgement of the consequences of their decisions and more limited control and monitoring of their actions [17].

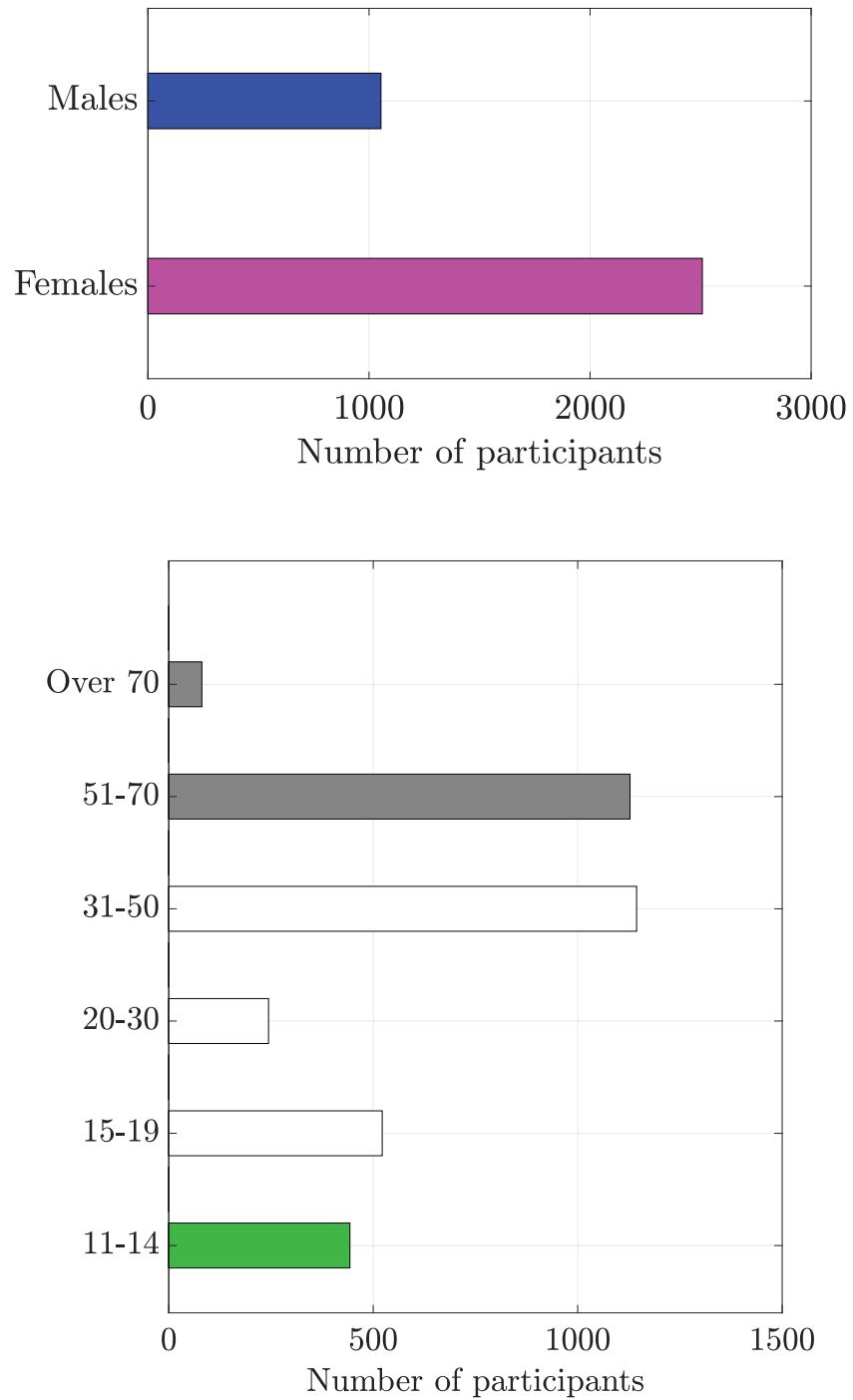
Teenagers could represent a vulnerable segment of the population that needs targeted measures for ensuring compliance with containment measures that are needed to halt the diffusion of the virus and prevent future waves, especially considering that the average age of infected individuals is decreasing in several countries [18,19].

Although the pandemic is far from being defeated, from a sociopsychiatric perspective, there is an understandable desire to declare its social end, forgetting the fear and recovering the habits and behaviors of the pre-COVID-19 era [20]. How dramatic will be the second wave as teenagers are returning to school? Will the distancing measurements and guidelines that governments are setting in place worldwide be sufficient? We believe that these rules alone cannot be enough, and that public health campaigns targeted to teenagers will be crucial to proactively involve them in

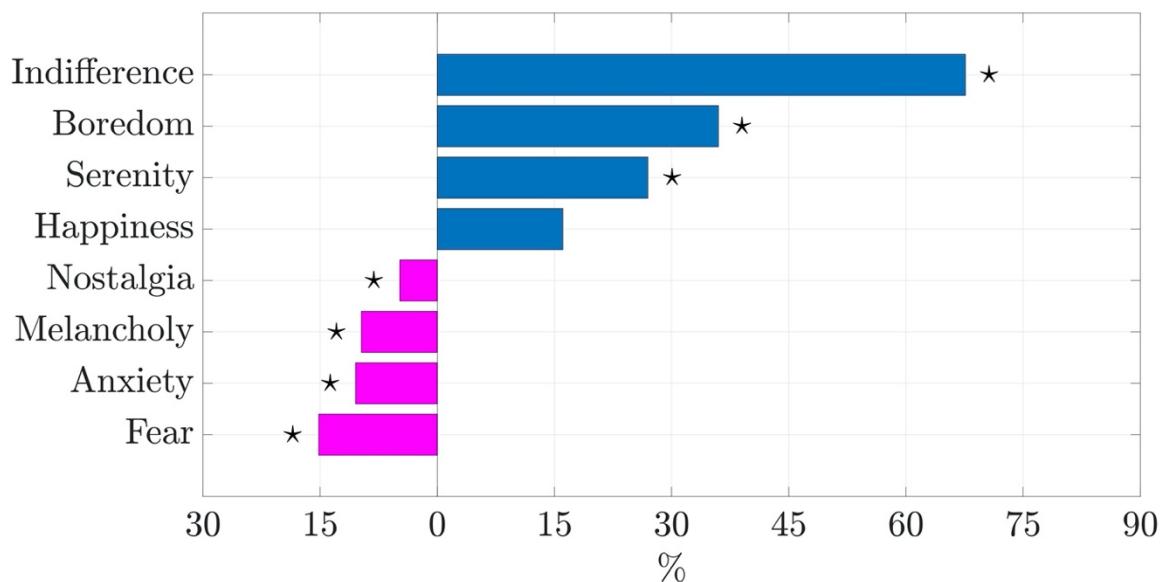
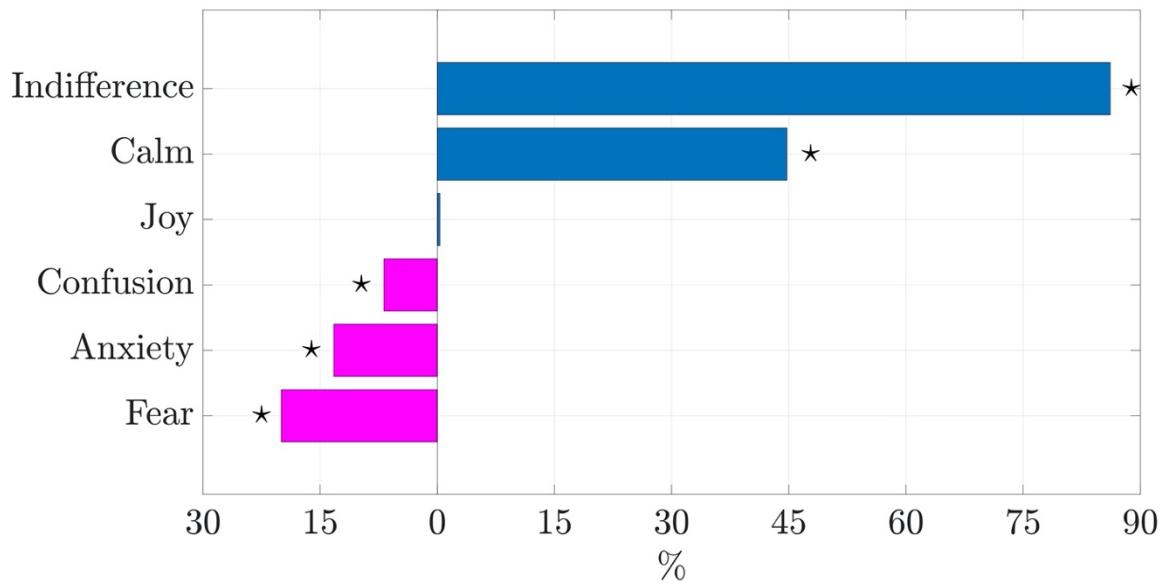
containing the pandemic, so that the social end of the pandemic will be as close as possible to its clinical end.

Failing to improve the risk perception and to promote prudent social behaviors and compliance of rules might lead to a further decrease in the age of infected individuals, with the youngest becoming the main carriers of the infection. The involvement of the target audience in the process of self-reflection has been proposed to be key for meaningful and sustainable changes in cognition and behavior [21]. During this pandemic, education is paramount to encourage students to become advocates for disease prevention and control in their homes, schools, and local community [22]. The survey makes a critical step in this direction by increasing students' awareness about the complexity of the moment we are living and making them active citizen scientists in the study of the COVID-19.

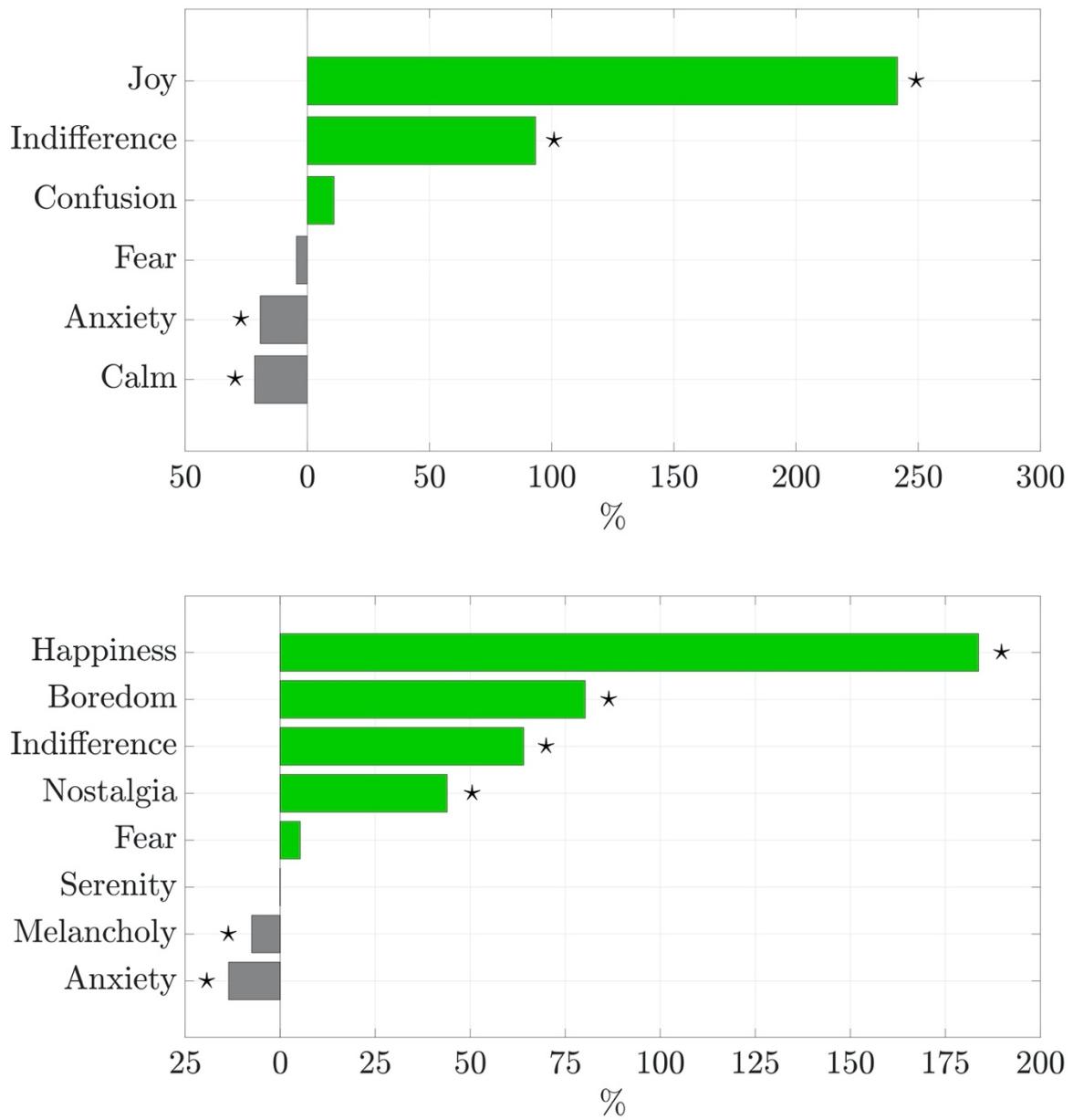
## Figures



**Figure 1.** Gender (top panel) and age (bottom panel) distribution of the selected sample of participants.



**Figure 2.** Feelings experienced when lockdown was announced (top panel) and during the lockdown (bottom panel). The magenta horizontal bars identify the feelings that were experienced more among the female rather than the male population, and their width corresponds to the increment (in percentage) compared to the entire population. Similarly, the blue bars identify the feelings that were experienced more among the male population. An asterisk identifies the feelings that were significantly correlated with gender (Phi coefficient,  $p$ -value less than 0.01).



**Figure 3.** Feelings experienced when lockdown was announced (top panel) and during the lockdown (bottom panel). The green horizontal bars identify the feelings that were experienced more among the younger (less than 15 years of age) rather than the elder (more than 50 years of age) population, and their width corresponds to the increment (in percentage) compared to the population composed of youth and elderly. Similarly, the grey bars identify the feelings that were experienced more among the elder population. An asterisk identifies the feelings that were significantly correlated with age (Phi coefficient,  $p$ -value less than 0.01).

## Tables

		Feelings when lockdown was announced					
		Fear	Joy	Calm	Confusion	Anxiety	Indifference
Age		0.02	-0.36	0.20	-0.04	0.17	-0.19
Gender		-0.10	0.00	0.14	-0.08	-0.11	0.18

**Table 1.** Phi coefficient for the association between age or gender and reaction to lockdown. When age is considered, we only focus on two categories of respondents, that is, *younger* (below 15 years of age) and *elder* (beyond 50 years of age), respectively. Cells in green correspond to  $p$ -values lower than 0.01.

	Feelings during lockdown							
	Fear	Happiness	Serenity	Anxiety	Boredom	Nostalgia	Melancholy	Indifference
Age	-0.01	-0.19	0.00	0.15	-0.33	-0.24	0.09	-0.10
Gender	-0.09	0.02	0.09	-0.11	0.16	-0.07	-0.12	0.12

**Table 2.** Phi coefficient for the association of age or gender to the feelings during lockdown. When age is considered, we only focus on two categories of respondents, that is, *younger* (below 15 years of age) and *elder* (beyond 50 years of age), respectively. Cells in green correspond to  $p$ -values lower than 0.01.

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## **Competing interests**

The authors declare no competing interests.