

# Sedentary Lifestyle of Older Adults and Its Associated Factors: A Multicentre Cross-Sectional Study During COVID-19 Pandemic in Indonesia

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## ABSTRACT

**Background:** COVID-19 is here to stay, and humans ought to decide how to adapt. We aimed to describe lifestyle changes during COVID-19 pandemic, and to determine the prevalence and factors associated with sedentary lifestyle among older adults. **Methods:** We obtained data from community-dwelling older adults aged  $\geq 60$  years. We presented the data descriptively and used multivariate analysis to assess the association between Physical Activity Scale for the Elderly (PASE) -based sedentary lifestyle and other variables in several tertiary geriatric centres. **Results:** Among 601 participants, 21.1% had sedentary lifestyle. Ethnic groups with the highest prevalence of sedentary lifestyle were Minang, Balinese, and Sundanese. Changes related to food intake, body weight, and physical activity were seen in a small proportion of older adults. Sun exposure habit was described. Sedentary lifestyle was associated with less consumption of food (OR 2.59, 95% CI 1.07-6.30), weight loss (OR 3.00, 95% CI 1.64-5.48), and higher intensity of snacking (OR 0.45, 95% CI 0.20-0.99). **Conclusion:** During COVID-19 pandemic, one out of five older adults had sedentary lifestyle, which was positively associated with less consumption of food and weight loss, and negatively associated with higher intensity of snacking. The

*prevalence of sedentary lifestyle varied across ethnic groups. Adequate and appropriate food intake may be crucial to keep older adults active, preventing them from entering vicious cycle of malnutrition, sarcopenia, and frailty.*

**Keywords:** *sedentary behavior, life style, COVID-19, coronavirus, lifestyle.*

## INTRODUCTION

The world population experienced a life-changing challenge due to COVID-19 pandemic.<sup>1</sup> At the same time, the world has been living with another pandemic for years, namely sedentary behaviour.<sup>1-4</sup> It is linked to increased risk of disability, chronic diseases and various poor health outcomes.<sup>5</sup> Unfortunately, COVID-19 is here to stay, and there could be outbreak of disease in the future with similar droplet transmission.

Studies showed contradictory results regarding physical activity of older adults during COVID-19 pandemic.<sup>6-9</sup> Although, a systematic review of observational studies recently concluded that the level of physical activity in older adults decreased during the quarantine period of COVID-19 worldwide.<sup>10</sup> The review included limited amount of studies representing the Asian population. Asian community is diverse, and a multicentre study involving several ethnic groups is warranted, e.g. Indonesian indigenous ethnic groups and people of Chinese descent.

Lifestyle changes during the pandemic may include changes in the pattern of food consumption and sun exposure habit. Sun exposure habit became more popular as a study published in early phase of COVID-19 pandemic showed that sunlight correlated significantly with recovered cases of COVID-19,<sup>11</sup> which might be linked to ultraviolet B (UVB) -induced gene downregulation.<sup>12</sup> It is crucial to understand the lifestyle changes of older adults during the pandemic before establishing evidence-based recommendations for the public.

We aimed to describe lifestyle changes, and to determine the prevalence and factors associated with sedentary lifestyle among older adults in a multi-ethnic Asian community. The findings can in turn be used to build strategies to improve health of older adults in the region.

## METHODS

We conducted a cross-sectional observational study in 12 geriatric care centres in Indonesian archipelago from April to October 2022. The centres were Payangan Public Health Centre in Gianyar, Bali, Dr Soetomo General Hospital in Surabaya, Dr Wahidin Sudirohusodo General Hospital in Makassar, Haji Adam Malik General Hospital in Medan, Siti Khadijah Islamic Hospital in Palembang, Dr Mohammad Hoesin General Hospital in Palembang, Dr Moewardi General Hospital in Surakarta, Dr Kariadi General Hospital in Semarang, Dr Mohammad Djamil General Hospital in Padang, Dr Saiful Anwar General Hospital in Malang, Dr Hasan Sadikin General Hospital in Bandung, Atma Jaya Private Hospital in North Jakarta, and Cipto Mangunkusumo National General Hospital in Central Jakarta.

We obtained the data from multi-ethnic Asian adults aged 60 years and older through interviewer-administered questionnaire survey. The interviewers were trained physicians caring for older adults. We excluded patients with acute illness(es), acute exacerbation of chronic illness(es), and/or incomplete data.

We utilized Physical Activity Scale for the Elderly (PASE) to determine sedentary lifestyle of older adults, which was developed and evaluated by Washburn in 1990s.<sup>13</sup> PASE is a 12-item document with good test-retest reliability with an intraclass correlation coefficient of 0.75. We also chose PASE because it has been validated in other Asian population as well, e.g. in Hong Kong<sup>14</sup> and Malaysia.<sup>15</sup> We included additional questions in the interview related to lifestyle changes during COVID-19 pandemic. The questions were about difficulties in obtaining daily needs, difficulties in obtaining fresh food, less consumption of food, weight loss, weight gain, higher intensity of snacking, reduction in physical activity, reduction in exercise.

The sample size needed for the study was determined based on the formula for the sample size of the estimated proportion.<sup>16</sup> Since we analysed 12 independent variables in the bivariate analysis with a sample proportion of 36.3%,<sup>17</sup> the minimum sample size would be 331. Ethical approval was obtained from the Faculty of Medicine, Universitas Indonesia.

### Data Collection

We collected primary data related to subject characteristics from history taking. Sex categories were documented as (1) Male and (2) Female. Age was classified as (1) 60-69 years and (2)  $\geq 70$  years old. The categories were made based on the cut-off point used by community-dwelling older adults studies in Southeast Asia, including a report in Indonesia<sup>18</sup> and Malaysia.<sup>19</sup> Ethnic groups were classified into Javanese, Chinese, Minang, Balinese, Malay, Sundanese, Batak, Betawi, Buginese, and Others. Malay ethnic group includes people native to the regions on the east coast of Sumatra island, such as Deli Malay and Palembang Malay. Current employment status was documented as (1) Working and (2) Not working. Smoking history was documented as (1) Never-smoker, (2) Former smoker, or (3) Current smoker. History of COVID-19 was documented as (1) No or (2) Yes.

Self-reported sun exposure habit was documented as (1) No sun exposure habit, (2) 1-3 time(s) a week, or (3)  $> 3$  times a week. Following the Holick's rule,<sup>20</sup> we classified the time of sun exposure to (1) 9.00 a.m. onward or (2) before 9.00 a.m.

We calculated total PASE score by multiplying the amount of time spent in each activity (hours per day over the past seven-day period) by the respective weights and summing up the scores of all activities. The PASE score ranges from 0 to 793, with higher scores indicating greater physical activity.<sup>13,21</sup> We classified the score into (1) Sedentary lifestyle for the total score of  $<40$ ,<sup>22</sup> and (2) Non-sedentary lifestyle for the total score of 40 or higher. Self-reported responses to additional questions in the interview related to lifestyle changes were documented as (1) No or (2) Yes.

### Statistical Analysis

We analysed the data with SPSS version 21 (IBM, Armonk, New York, USA). We provided descriptive data regarding lifestyle changes of older adults. Afterwards, we used Chi-square test to perform the bivariate analysis utilizing data from independent variables related to physical activity, food intake, weight changes, work and history of COVID-19. Variables with p value  $< 0.25$  in bivariate analysis were included for multivariate analysis with multiple logistic regression method to assess the association between sedentary lifestyle and the independent variables. A p value  $< 0.05$  was considered significant.

### RESULTS

A total of 601 older adults were included in the study. The demographic characteristics of the older adults are presented in Table 1. 56.7% were female and 47.4% were aged 70 years and older. The ethnic distribution was 25.8% Javanese, 17.8% Chinese, 13.5% Minang, 12.0% Balinese, 10.3% Malay, 9.3% Sundanese, 4.8%

**Table 1.** Subject Characteristics (n=601).

Characteristics	Total (n=601) N (%)
<b>Sex</b>	
- Male	260 (43.3)
- Female	341 (56.7)
<b>Age</b>	
- 60 – 69 years old	316 (52.6)
- $\geq 70$ years old	285 (47.4)
<b>Ethnic group</b>	
- Javanese	155 (25.8)
- Chinese	107 (17.8)
- Minang	81 (13.5)
- Balinese	72 (12.0)
- Malay	62 (10.3)
- Sundanese	56 (9.3)
- Batak	29 (4.8)
- Betawi	11 (2.8)
- Buginese	6 (1.0)
- Others	20 (3.3)
<b>Employment status</b>	
- Working	92 (15.3)
- Not working	509 (84.7)
<b>Smoking history</b>	
- Never-smoker	423 (70.4)
- Former smoker	146 (24.3)
- Current smoker	32 (5.3)
<b>History of COVID-19</b>	
- No	563 (93.7)
- Yes	38 (6.3)

**Table 2.** Sun exposure and lifestyle changes of older adults during the pandemic.

Variables	Total (n=601) N (%)
<b>Sun exposure</b>	
- No sun exposure habit	4 (0.7)
- 1-3 time(s) a week	338 (56.2)
- > 3 times a week	259 (43.1)
<b>Time of sun exposure</b>	
- 9.00 a.m. onward	279 (46.4)
- Before 9.00 a.m.	322 (53.6)
<b>Sedentary lifestyle</b>	
- No	474 (78.9)
- Yes	127 (21.1)
<b>Difficulties in obtaining daily needs</b>	
- No	528 (87.9)
- Yes	73 (12.1)
<b>Difficulties in obtaining fresh food</b>	
- No	561 (93.3)
- Yes	40(6.7)
<b>Less consumption of food</b>	
- No	570 (94.8)
- Yes	31 (5.2)
<b>Weight loss</b>	
- No	536 (89.2)
- Yes	65 (10.8)
<b>Weight gain</b>	
- No	541 (90.0)
- Yes	60 (10.0)
<b>Higher intensity of snacking</b>	
- No	521 (86.7)
- Yes	80 (13.3)
<b>Reduction in physical activity</b>	
- No	433 (72.0)
- Yes	168 (28.0)
<b>Reduction in exercise</b>	
- No	431 (71.7)
- Yes	170 (28.3)

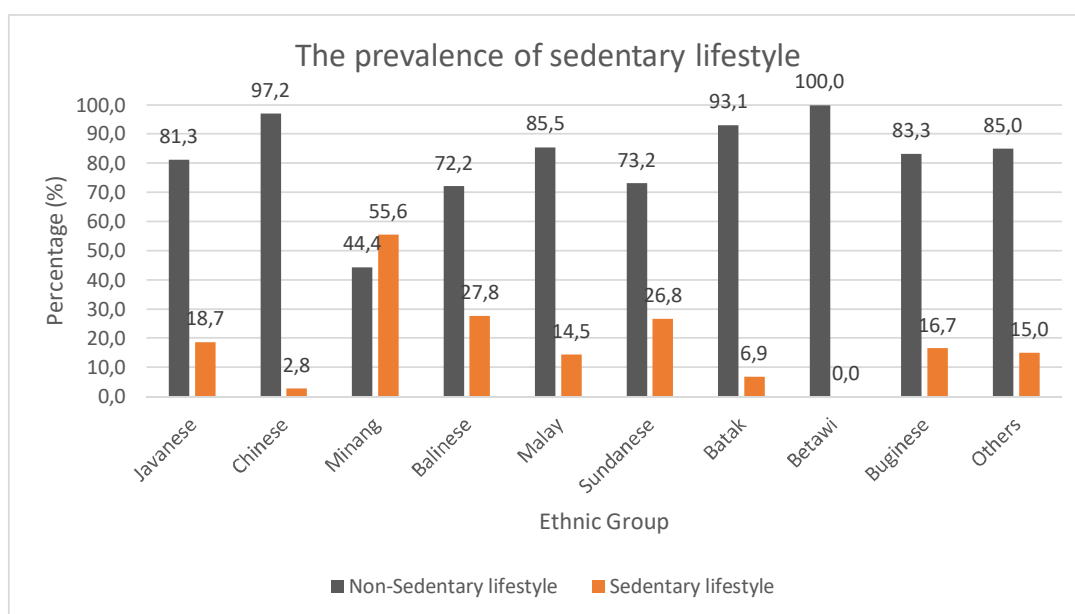
Batak, 2.8% Betawi, 1.0% Buginese, and 3.3% others. Only 15.3% of them were still working during the data collection. 5.3% of participants were current smokers and 6.4% had history of COVID-19.

The data related sun exposure and lifestyle changes of older adults during the pandemic are presented in Table 2. 0.7% of older adults had no sun exposure habit, whereas 56.2% of the participants reported 1-3 time(s) a week of sun exposure. 43.1% of older adults reported more than 3 times of sun exposure per week.

Based on PASE score, 21.1% of older adults had sedentary lifestyle (PASE score of < 40). The prevalence of sedentary lifestyle in Javanese, Chinese, Minang, Balinese, Malay, Sundanese, Batak, Betawi and Buginese cohort was 18.7%, 2.8%, 55.6%, 27.8%, 14.5%, 26.8%, 6.9%, 0.0%, and 16.7%, respectively. On the other hand, the prevalence of sedentary lifestyle in other ethnic minority groups combined was 15%. (**Figure 1**)

#### Lifestyle in Different Ethnic Groups

During COVID-19 pandemic, 12.1% of all older adults in this study reported difficulties in obtaining daily needs, whereas 6.7% reported difficulties in obtaining fresh food. 5.2% of older adults reported less consumption of food, 10.8% reported weight loss, whereas 10.0% reported weight gain. 13.3% of older adults had higher intensity of snacking during the pandemic.

**Figure 1.** The prevalence of sedentary

Reduction in physical activity and exercise were reported by 28.0% and 28.3% of older adults, respectively. Our data suggested unremarkable differences in reduction of physical activity and exercise between those who had sedentary lifestyle and those who had non-sedentary lifestyle.

Bivariate analysis results presented in **Table 3** suggested several variables had p value of below 0.25, which were female sex, age 70 years or older, not working, difficulties in obtaining fresh food, less consumption of food, weight loss, weight gain, higher intensity of snacking, and

history of COVID-19. Of all older adults with sedentary lifestyle (n=127), 52% were female, 53.5% were aged 70 years and older, 89.8% were not working, 11.8% reported difficulties in obtaining daily needs, 9.4% reported difficulties in obtaining fresh food, 12.6% reported less consumption of food, 22.8% reported weight loss, 7.1% reported weight gain, 9.4% reported higher intensity of snacking, 26.8% reported reduced physical activity, and 27.6% reported reduced exercise during COVID-19 pandemic.

Multivariate analysis results presented in **Table 4** suggested that sedentary lifestyle in

**Table 3.** Bivariate analysis results

Variables	Sedentary lifestyle		Crude OR (95% CI)	p-value
	No; [n (%)]	Yes; [n (%)]		
<b>Sex</b>				
- Male	199 (42.0)	61 (48.0)	1	
- Female	275 (58.0)	66 (52.0)	0.78 (0.53-1.16)	0.222
<b>Age</b>				
- 60 – 69 years old	257 (54.2)	59 (46.5)	1	
- ≥70 years old	217 (45.8)	68(53.5)	1.37 (0.92-2.02)	0.120
<b>Employment status</b>				
- Working	79 (16.7)	13 (10.2)	1	
- Not working	395 (83.3)	114 (89.8)	1.75 (0.94-3.27)	0.074
<b>Difficulties in obtaining daily needs</b>				
- No	416 (87.8)	112 (88.2)	1	
- Yes	58 (12.2)	15 (11.8)	0.96 (0.53-1.76)	0.896
<b>Difficulties in obtaining fresh food</b>				
- No	446 (94.1)	115 (90.6)	1	
- Yes	28 (5.9)	12 (9.4)	1.66 (0.82-3.37)	0.155
<b>Less consumption of food</b>				
- No	459 (96.8)	111 (87.4)	1	
- Yes	15 (3.2)	16 (12.6)	4.41 (2.12-9.19)	<0.001
<b>Weight loss</b>				
- No	438 (92.4)	98 (77.2)	1	
- Yes	36 (7.6)	29 (22.8)	3.60 (2.11-6.15)	<0.001
<b>Weight gain</b>				
- No	423 (89.2)	118 (92.9)	1	
- Yes	51 (10.8)	9 (7.1)	0.63 (0.30-1.32)	0.220
<b>Higher intensity of snacking</b>				
- No	406 (85.7)	115 (90.6)	1	
- Yes	68 (14.3)	12 (9.4)	0.62 (0.33-1.19)	0.149
<b>Reduction in physical activity</b>				
- No	340 (71.7)	93 (73.2)	1	
- Yes	134 (28.3)	34 (26.8)	0.93 (0.60-1.44)	0.738
<b>Reduction in exercise</b>				
- No	339 (71.5)	92 (72.4)	1	
- Yes	135 (28.5)	35 (27.6)	0.96 (0.62-1.48)	0.838
<b>History of COVID-19</b>				
- No	447 (94.3)	116 (91.3)	1	
- Yes	27 (5.7)	11 (8.7)	1.57 (0.76-3.26)	0.223



**Table 4.** Multivariate analysis results

Factors	Coefficient B	Standard error	p-value	OR (95% CI)
Female sex	-0.225	0.213	0.289	0.80 (0.53-1.21)
Age 70 years or older	0.302	0.212	0.154	1.35 (0.89-2.05)
Not working	0.491	0.330	0.137	1.63 (0.86-3.12)
Difficulties in obtaining fresh food	0.167	0.418	0.689	1.18 (0.52-2.68)
Less consumption of food	0.952	0.453	0.036	2.59 (1.07-6.30)
Weight loss	1.097	0.308	<0.001	3.00 (1.64-5.48)
Weight gain	0.067	0.447	0.880	1.07 (0.45-2.57)
Higher intensity of snacking	-0.806	0.409	0.048	0.45 (0.20-0.99)
History of COVID-19	0.491	0.388	0.206	1.63 (0.76-3.50)

older adults during the pandemic was associated with less consumption of food (odds ratio [OR] 2.59, 95% confidence interval [CI] 1.07-6.30) and weight loss (OR 3.00, 95% CI 1.64-5.48). Sedentary lifestyle was negatively associated with higher intensity of snacking (OR 0.45, 95% CI 0.20-0.99).

## DISCUSSION

Our study suggested that less consumption of food and weight loss to be associated with sedentary lifestyle in Indonesian older adults. In contrast, higher intensity of snacking during the pandemic was inversely associated with sedentary lifestyle.

Our study cohort was multiethnic older adults from different geriatric care centres in Indonesia (**Table 1**). Of all older adults, only 6.3% had prior documented history of COVID-19.

Our study suggested that 99.3% of Indonesian older adults had sun exposure habit. This means that only 0.7% of older adults did not have sun exposure habit, unlike the proportion suggested in a study before the pandemic suggesting a proportion as high as 8.1%.

Unfortunately, more than half of the older adults in our study (53.6%) had a habit of obtaining sun exposure before 9.00 a.m. This was not in accordance with the Holick's rule suggesting that exposure to sunlight at the face and both arms 3 times a week for 25 min at 9.00 a.m. should maintain adequate vitamin D status.<sup>20</sup> A study from the region also suggested the highest intensity of UVB occurred at 11.00 a.m. to 1.00 p.m.<sup>23</sup>

As stated above, evidence suggested sun exposure was linked to more COVID-19

cases of recovery.<sup>11</sup> This might be better explained by the findings of previous study suggesting the role of UVB-irradiation exposed to melanocytes using UVB lamps in causing significant downregulation of DPP9, CCR2, IFNAR2, TYK2, OAS1, and HSPA1L. DPP9 was known to encode for dipeptidyl peptidases involved in immune regulation,<sup>12,24</sup> whereas CCR2, IFNAR2, TYK2 are the key regulators for immune cell-mediated excessive inflammatory response in various viral infections. There was association between both OAS1 and HSPA1L and increased susceptibility to SARS-CoV-2 infection through enhanced viral replication and survival in host cells. In vitro study also showed that SARS-CoV-2 virus lost its viability after sunlight exposure stimulation for 107 minutes in mucus and 37 minutes in culture media.<sup>25</sup>

The prevalence of sedentary lifestyle in older adults in this study was 21.1%. Thus, approximately 1 of 5 older adults Indonesia had sedentary lifestyle. PASE-subscores used in this study may reflect work, leisure and domestic life. Higher total PASE score signifies more physical activity during the previous week. Prolonged sedentary time appears to be harmful in older adults.<sup>26</sup> Breaking up sedentary time was associated with improved health outcomes.<sup>26,27</sup> Once sedentary lifestyle is detected by PASE score, PASE can be used to monitor habitual physical inactivity and to identify motivations to optimize health promotion.<sup>28</sup>

Ethnic groups with the highest prevalence of sedentary lifestyle in our study were Minang, Balinese, and Sundanese. On the other hand, ethnic groups with the lowest prevalence of sedentary lifestyle were Betawi, Chinese, and

Batak (**Figure 1**). We should therefore encourage strategies to maintain physical condition with physical exercises that meet the needs of older adults in the current pandemic scenario.<sup>10</sup> Strategies should also be developed for similar disease outbreak in the future. Since different ethnic groups speak different languages and have distinctive customs, healthy lifestyle promotion might need to be prepared in a multilingual manner, especially in older adults in rural areas who may not understand official languages such as English, Chinese and Indonesian.

A small proportion of older adults in this study reported difficulties in obtaining daily needs (12.1%), difficulties in obtaining fresh food (6.7%), or less consumption of food (5.2%). During the pandemic 13.3% of older adults also reported higher intensity of snacking. Some community-dwelling older adults across the world also reported increased snacking during the pandemic.<sup>29,30</sup>

Of 10 older adults, approximately one reported weight loss and one reported weight gain. Nearly a quarter of older adults reported reduced physical activity. Likewise, approximately a quarter of older adults also reported reduced exercise during the pandemic. Our findings showed that only a minority of older adults experienced change(s) in physical activity during the pandemic. Evidence suggested that among all age groups including young adults, older adults had the smallest decrease in physical activity during the pandemic,<sup>8</sup> and were less likely to have changed their physical activity levels during the pandemic.<sup>9</sup>

Our bivariate and multivariate analyses results suggested that sedentary lifestyle was positively associated with less consumption of food and weight loss. In the absence of acute illness or acute exacerbation of chronic illness, weight loss in older adults occurred commonly due to a reduction in food consumption.<sup>31</sup> Decreased nutrition intake or anorexia of ageing may act as the culprit of sarcopenia and be linked with nutritional frailty.<sup>32</sup> Low daily energy intake of 21 kcal/kg or lower is significantly associated with frailty of older adults.<sup>33</sup> Experts have

already warned the vicious cycle of malnutrition, sarcopenia, frailty, falls, illness, hospitalisation and death.<sup>32</sup>

A low body mass index (BMI) may in turn increase the risk of disability<sup>34</sup> and mortality.<sup>31,35</sup> Our study suggested that PASE score of <40 was linked to weight loss. Weight loss, sarcopenia, and nutritional frailty may occur independently of each other. However, Curcio, et al. found that PASE score was significantly lower in noninstitutionalized older adults with sarcopenia. Lower PASE score was also related to muscle mass and strength.<sup>22</sup> The findings may help explain why weight loss is related to sedentary lifestyle in our study.

In the opposite manner, higher intensity of snacking was negatively associated with sedentary lifestyle. Snacking patterns throughout the life span may be beneficial for maintaining health.<sup>36</sup> Good nutrition may slow physical deterioration of older adults.<sup>37</sup> However, food consumption recommendation should be provided cautiously and be made specific, as inappropriate snacking may lead to overnutrition.<sup>30</sup>

After understanding the lifestyle changes of older adults during the pandemic, key health messages for this population include: (1) Adequate and appropriate food intake is crucial to keep older adults active, preventing them from entering vicious cycle of malnutrition, sarcopenia, and frailty (2) older adults living in locations with intense UVB radiation.

To the best of our knowledge, this cross-sectional study was the first multicentre study to examine the changes in lifestyle among older adults during COVID-19 pandemic. Our study proved that only a small proportion of older adults changed their lifestyle during the pandemic. However, small changes might have important consequences. The result of this study may help doctors and the Ministry of Health provide lifestyle recommendations in future outbreak of disease with droplet transmission requiring large-scale social restriction. We realized the limitation of cross-sectional study design and thus causal relationship between statistically significant study variables could not be established.

## CONCLUSION

One out of five older adults had sedentary lifestyle during COVID-19 pandemic. Nearly all older adults had sun exposure behaviour, but more than half of the older adults had inappropriate timing of sun exposure. Sedentary lifestyle was positively associated with less consumption of food and weight loss, and negatively associated with higher intensity of snacking. The prevalence of sedentary lifestyle varied across ethnic groups. Adequate and appropriate food intake may be of paramount importance to keep older adults active, preventing them from entering vicious cycle of malnutrition, sarcopenia, and frailty.

## COMPETING INTERESTS

The authors declare that they have no competing interests.

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