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Guided internet interventions for depression: impact of sociodemographic factors on treatment outcome in Indonesia

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ABSTRACT

Depression is the leading cause of disability worldwide, but an alarming treatment gap exists, especially in lower- and middle income countries (LMIC), where people are exposed to many societal and sociodemographic risk factors. As internet access increases in LMIC, online interventions could decrease this gap, especially when shown suitable for all demographics, including vulnerable groups with low socioeconomic status (SES). We used mixed-model analysis to explore moderating effects of sociodemographic factors (age, sex, education level, SES and urbanicity) on treatment effect in a recent trial in Indonesia, comparing guided online behavioral activation versus online psychoeducation only for depression, in 313 participants from (sub)urban areas. Outcome measures were self-reported Patient Health Questionnaire 9 (PHQ-9) and Inventory of Depressive Symptomatology (IDS-SR). Without correction for multiple testing, we found urbanicity to moderate treatment effect, with stronger treatment effect in suburban relative to urban participants (IDS-SR 24 weeks past baseline, p = 0.04) and a trend towards moderation by SES, with stronger treatment effect in low SES groups (PHQ-9 10 weeks past baseline, p = 0.07). These exploratory results suggest online treatments are a promising mental health intervention for all demographics in a (sub)urban LMIC setting, but hypothesis-testing studies including rural participants are warranted.

1. Introduction

In recent years, depression has emerged as the leading cause of disability worldwide, affecting over 300 million people across the globe (World Health Organization, 2017). Notably, there is an alarming gap between the number of people who require and the number of people who receive treatment for mental health problems, especially in lower- and middle income countries (LMIC) (Evans-Lacko et al., 2018). For depression specifically, the World Mental Health Survey of the World Health Organization (WHO) revealed that the proportion of people who meet 12-month criteria for major depressive disorder (MDD) and receive minimally adequate treatment is only 22.4% in high-income countries (HIC) and a problematic 3.7% in LMIC (Thornicroft et al., 2017). This is especially worrisome since LMIC populations are exposed to a multitude of risk factors for depression, such as low socioeconomic status (SES), poor living conditions, social disenfranchisement and armed conflict (Lund et al., 2010; Naslund et al., 2017). This warrants

measures to increase accessibility to mental health care in LMIC, especially in vulnerable groups with low societal and socioeconomic status and in rural areas.

In this context, the WHO initiated the Mental Health Gap Action Program, which aims to increase mental health care coverage, especially in LMIC were coverage is scarce (World Health Organization, 2008). With almost half of the world population having access to internet (International Telecommunication Union, 2017), online interventions are emerging as a promising tool to narrow the mental health treatment gap (Bockting, Williams, Carswell, & Grech, 2016; Naslund, Shidhaye, & Patel, 2019). However, whether their effect in LMIC populations is moderated by sociodemographic factors remains largely unexplored, despite the fact that such knowledge will help us to determine whether online treatments are in fact a suitable intervention for all sociodemographic subgroups in LMIC.

For this reason, we set out to explore moderating effect of sociodemographic factors on treatment effect in a recent randomized

controlled trial in Indonesia, which allocated 313 participants with a diagnosis of MDD between a guided online behavioral activation (BA) intervention (Guided Act and Feel Indonesia, GAF-ID) or online psychoeducation only (Arjadi et al., 2018). In Indonesia, a LMIC with over 250 million inhabitants, no more than 3 psychiatrist per 1 million inhabitants serve the population, most of them concentrated in the three biggest cities (Economist Intelligence Unit, 2016). The study by Arjadi et al. showed that GAF-ID efficaciously reduced depressive symptoms and increased remission rates in a LMIC setting, but moderating effect of sociodemographic characteristics of the participants was not reported on.

Importantly, studies in HIC have identified several sociodemographic factors that are thought to predict better outcome of online treatment for depression, including female sex (Donker et al., 2013; Spek, Nyklíček, Cuijpers, & Pop, 2008, higher education status (Spek et al., 2008) and marital status (Button, Wiles, Lewis, Peters, & Kessler, 2012). However, the number of studies investigating the moderating effect of such factors is limited and have mostly failed to yield significant results (Webb, Rosso, & Rauch, 2017). Recently, two individual patient data meta-analyses identified no moderating factors in unguided online interventions for depression (Karyotaki et al., 2017) and older age and native ethnicity as moderating factor in guided online interventions for depression (Karyotaki et al., 2018). Of additional interest when aiming to utilize online interventions to increase mental health care coverage in LMIC, is the question whether certain groups are more prone to dropout. Indeed, lower education, male gender and younger age are thought to predict dropout in unguided online interventions for depression in HIC (Karyotaki et al., 2015).

To the best of our knowledge, we are the first to explore moderating effect of sociodemographic factors in online interventions for depression in a LMIC setting; information that could be used to increase potency of such interventions by means of tailoring them to serve all sociodemographic subgroups in society. Additionally, we will compare dropout rates between the different sociodemographic subgroups. Given the exploratory nature of this study and the limited evidence on this topic, especially in LMIC, we make no specific hypothesis on the moderating effect of the investigated factors.

2. Methods

This exploratory study reports on the moderation effect of multiple sociodemographic factors on treatment effect in a randomized controlled trial performed in Indonesia, comparing an online BA intervention guided by lay counselors (GAF-ID) with online psychoeducation only for the treatment of depression, the main results of which have been published earlier (Arjadi et al., 2018). Furthermore, we extend previous comparison of dropout rates between the different sociodemographic subgroups, as the main study only tested for differences in dropout rates with regard to age, sex and baseline depression severity.

2.1. Participants, intervention and outcome measures

In the study by Arjadi et al., 313 participants were included from 1814 people showing interest in participation between September 6, 2016 and May 1, 2017. Participants were randomly allocated to either an intervention group receiving the GAF-ID treatment program or to a control group receiving online minimal psychoeducation. All participants (and legal guardian if the participant was younger than 18 years) provided written informed consent. The study was approved by the research ethics committees of the Tarumanagara University (PPZ20152002) and the Institute of Research and Community service, Atma Jaya Catholic University of Indonesia (942/III/LPPM-PM.10.05/09/2016).

Detailed information on participant selection, randomization procedure, development of the intervention and design of the study has

been published elsewhere, including a CONSORT flowchart and checklist (Arjadi et al., 2018; Arjadi et al., 2016). In short, participants were eligible if they were at least 16 years of age, met the criteria for MDD or persistent depressive disorder in accordance with the Structured Clinical Interview for the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (First, Williams, Karg, & Spitzer, 2015), scored 10 points or more on the self-reported Patient Health Questionnaire 9 (PHQ-9) (Kroenke, Spitzer, & Williams, 2001), were proficient in Bahasa Indonesia, and could use the internet. Smartphones and reimbursement of internet costs were provided if necessary. Exclusion criteria were current or previous manic or hypomanic episode or psychotic disorder, current substance use disorder, acute suicidality, and undergoing psychological treatment with at least weekly visits at the time of recruitment.

The intervention GAF-ID was adapted from a Dutch online BA intervention and aimed to reduce depressive symptoms of participants by encouraging them to plan and undertake potentially pleasurable activities to enhance their mood (Arjadi et al., 2016; Kanter, Puspitasari, Santos, & Nagy, 2012). It consisted of eight weekly online modules that encompassed psychoeducation, monitoring of mood and behavior or activities, and development of relapse prevention strategies. The program was accessible via computer, tablet and smartphone. Participants in the GAF-ID group were guided by specially trained lay counselors, under supervision of clinical psychologists. No face-to-face contact took place. Participants in the control group were provided with personal login codes to access an online platform, which provided psychoeducation on depression and basic self-management recommendations with no additional support. All participants were provided with appropriate referral information in case of suicidality or serious deterioration, but asked to continue with the intervention and the assessments.

Self-reported PHQ-9 and Inventory of Depressive Symptomatology (IDS-SR) were used to measure depression severity at baseline, 10 weeks past baseline (post-intervention assessment), and during follow-up at 12 weeks and 24 weeks past baseline. Furthermore, PHQ-9 was measured biweekly between baseline and the post-intervention assessment. A higher score is indicative of more severe symptomatology in both rating scales (Arjadi et al., 2016).

2.2. Sociodemographic moderators

In the current study, we explore the moderating effect of multiple sociodemographic factors on treatment effect, specifically the PHQ-9 and IDS-SR scores, in the above-outlined trial. We investigated sex, age, SES, level of education and level of urbanicity of the area of residence. Sex was analyzed as categorical variable and all others as continues variable. In the descriptive statistics, median age was used to delineate old and young. Socioeconomic status was determined by monthly household expenditure in Indonesian rupiah (IDR). Cutoff values were derived from a 2013 *Boston Consultancy Group* report using data from Statistics Indonesia (BPS), which categorized monthly expenditure of <1 million IDR as 'poor', 1–5 million IDR as 'aspirant middle class' to 'upper middle class' and >5 million IDR as 'affluent' or 'elite' (Rastogi, Tong, Tamboto, & Simburisit, 2013). Furthermore, participants were deemed 'lower educated' if junior or senior high school or vocational training was the highest completed degree and 'higher educated' if the participant held a university bachelor's or master's degree. Participants were classified as living in 'rural', 'suburban' or 'urban' areas. Rural areas were regions with agriculture as main activity, as oppose to urban areas, with non-agricultural main activities and characterized by a centralized function with regard to governmental and social services, in accordance with criteria in the Indonesia Spatial Planning Act of 2007 (Ministry of Public Works 2007). Regions with mixed spatial activities and service level were classified as suburban. Since only two participants lived in rural areas, we chose to include them in the suburban group in the moderation and dropout analyses.

2.3. Statistical analyses

Treatment effect (E) in the current analyses was defined as the magnitude of the interaction between time and randomized group in their effect on the outcome measures. Analyses took place on an intention-to-treat basis, using restricted maximum-likelihood linear mixed effects modelling with random effects for participants. In these models, dependent variables were the repeated depression score measures and independent variables were treatment allocation, and an interaction term 'time*treatment'. We analyzed the moderating effect of the sociodemographic factors on treatment effect by adding, for each factor separately, a three-way interaction term 'treatment*time*moderating factor' to the independent variables. Statistical significance of this term indicates moderation of treatment effect by the corresponding sociodemographic factor. We calculated treatment and interaction effects as measured by PHQ-9 and IDS-SR scores at 10 and 24 weeks past baseline. In addition, we compared dropout rates between different subgroups with regard to SES, level of education and area of residence, testing for differences using chi-square tests. Since testing multiple potential moderators may introduce the risk of multiplicity issues, we chose to evaluate p-values using both corrected and uncorrected levels of significance. The uncorrected level of significance is set at 0.05, with values between 0.05 and 0.10 reported as trends. Bonferroni-corrected level of significance is set at $0.05/5 = 0.01$, adjusted for the number of potential moderators included in the analyses.

All analyses were performed using SPSS version 25.

3. Results

Sociodemographic characteristics of the study participants were similar between the intervention and control group, as shown in Table 1. Furthermore, characteristics between subgroups within either intervention or control group were equally distributed (data not shown). Median age of the study population was 23 years (range 16–51) and 81% of participants was female. With regard to socioeconomic characteristics, almost two third of the participants fell in the middle SES category. The remaining participants were equally distributed between the low and high SES category. Little over half of the participants held a higher education degree. Approximately 60% of participants in lived in urban areas. Only two participants, one in each study arm, resided in rural areas (in the moderation and dropout analyses, they were included in the suburban category).

Table 1
Baseline characteristics.

	Guided Act and Feel Indonesia (n = 159)	Online psychoeducation (n = 154)
Age group		
Young adult (≤23 years)	75 (47%)	84 (55%)
Adult (>23 years)	84 (53%)	70 (45%)
Sex		
Male	31 (19%)	29 (19%)
Female	128 (81%)	125 (81%)
Socioeconomic status		
Low	32 (20%)	27 (18%)
Middle	98 (62%)	100 (65%)
High	29 (18%)	27 (18%)
Level of education		
Lower or secondary	70 (44%)	73 (47%)
Higher	89 (56%)	81 (53%)
Area of residence		
Urban	93 (58%)	96 (62%)
Suburban	65 (41%)	57 (37%)
Rural	1 (1%)	1 (1%)

data are n (%).

Treatment effect estimates and interaction effects of each of the investigates sociodemographic factors are displayed in Table 2. Without multiplicity correction, area of residence of participants was found to moderate treatment effect, with participants living in suburban areas showing stronger treatment effect of GAF-ID relative to their urban counterparts, as measured by IDS-SR scores 24 weeks past baseline (E: −8.67, 95% CI -13.11 to −4.23, p 0.04). Furthermore, we detected a trend towards moderation of treatment effect by SES, with participants with low SES showing stronger effect, as measured by PHQ-9 score 10 weeks past baseline (E: −5.37, 95% −1.46 to −9.29, p 0.07). However, when correcting for multiple testing, the corresponding p-values were no longer indicative of (trend towards) significance. We found no moderating effects of age, sex and level of education. As reported earlier, no adverse events were recorded during the trial (Arjadi et al., 2018).

Dropout rates in the different sociodemographic subgroups regarding age, sex, SES, level of education, and area of residence are shown in Table 3. Age and sex were previously reported not to be associated with risk of dropout (Arjadi et al., 2018). Furthermore, neither level of education nor area of residence were associated with risk of dropout. However, without multiplicity correction, we found a trend toward higher dropout rates in the high SES group (25.00%), when compared to the middle (13.13%) and low (13.56%) SES group ($\chi^2 = 4.913$, p = 0.09). Differences in dropout rates with regard to baseline depression severity was reported earlier, showing that participants who dropped out were significantly less depressed at baseline (data not shown) (Arjadi et al., 2018).

4. Discussion

The main purpose of this study was to explore the moderating effect of sociodemographic factors on treatment effect in a randomized controlled trial in Indonesia, comparing an online BA program guided by lay counselors (GAF-ID) with online psychoeducation only for the treatment of depression (Arjadi et al., 2018). In this trial, depressive symptoms among participants diagnosed with MDD reduced in both the GAF-ID and the online psychoeducation group, with significantly lower depression scores in the GAF-ID group. We found a moderating effect of area of residence, with participants in suburban areas showing a stronger treatment effect as measured by IDS-SR score 24 weeks past baseline, relative to urban participants. Furthermore, we detected a trend towards moderation by SES, with lower SES groups showing stronger treatment effect relative to middle or high SES groups, as measured by PHQ-9 at 10 weeks past baseline. In addition, we found a trend toward higher dropout rates among participants with high SES. However, when adjusted for multiple testing, the corresponding p-values were no longer indicative of (trend toward) significance. There was no moderating effect of age, sex and level of education on treatment effect of GAF-ID.

This study has several limitations that require consideration before interpreting the results. First of all, this is an exploratory study that uses data from a trial powered to detect differences in treatment effect between an intervention and control group, but not differences between the smaller subgroups, meaning conclusions from the moderation analyses must be drawn with caution. Low statistical power is a frequent problem in studies aiming to identify treatment moderators. Individual patient data meta-analyses might be a helpful tool to increase power and enable identification of treatment moderators in online intervention in LMIC (Karyotaki et al., 2018, 2017). Second, since we included five potential moderators in our analyses, we should consider the risk of multiplicity issues. We therefore interpreted p-values using both corrected and uncorrected level of significance. However, since this is an exploratory study, we deem unadjusted results to be most informative, as adjustment for multiple testing increases the risk of a type II error, limiting our ability to detect possibly interesting trends (Li et al., 2017). Third, ability to use the internet was an

Table 2

Treatment effect estimates of GAF-ID vs online psychoeducation and p-value interaction effects of sociodemographic factors.

	PHQ-9 10 weeks		PHQ-9 24 weeks		IDS-SR 10 weeks		IDS-SR 24 weeks	
	Effect estimates (95% CI)	P-value	Effect estimates (95% CI)	P-value	Effect estimates (95% CI)	P-value	Effect estimates (95% CI)	P-value
Overall treatment effect	−2.35 (−0.77 to −3.93)	–	−1.80 (−0.38 to −3.23)	–	−5.04 (−2.38 to −7.71)	–	−5.18 (−2.45 to −7.90)	–
Age group								
Young adult	−2.27 (0.04 to −4.58)	0.57	−2.57 (−0.51 to −4.62)	0.79	−6.33 (−2.60 to −10.06)	0.27	−7.07 (−3.22 to −10.91)	0.23
Adult	−2.33 (−0.15 to −4.51)		−0.92 (1.05 to −2.90)		−3.73 (0.14 to −7.60)		−3.15 (0.75 to −7.05)	
Sex								
Male	−3.56 (−0.23 to −6.90)	0.48	−2.16 (0.64 to −4.97)	0.83	−6.34 (−0.42 to −12.27)	0.65	−8.06 (−2.35 to −13.77)	0.32
Female	−2.07 (−0.28 to −3.87)		−1.72 (−0.08 to −3.35)		−4.76 (−1.75 to −7.76)		−4.52 (−1.44 to −7.61)	
Socioeconomic status								
Low	−5.37 (−1.46 to −9.29)	0.07	−3.64 (−0.32 to −6.96)	0.21	−5.38 (1.53 to −12.29)	0.91	−8.81 (−2.31 to −15.30)	0.19
Middle	−1.70 (0.23 to −3.62)	0.22	−1.53 (0.23 to −3.29)	0.62	−5.15 (−1.82 to −8.49)	0.95	−4.41 (−0.99 to −7.83)	0.52
High	−1.72 (2.29 to −5.72)	0.71	−0.68 (2.98 to −4.35)	0.48	−4.42 (1.38 to −10.22)	0.81	−3.33 (3.09 to −9.75)	0.55
Education								
Lower or sec.	−2.55 (−0.19 to −4.92)	0.82	−1.65 (0.47 to −3.77)	0.63	−5.56 (−1.50 to −9.62)	0.73	−4.94 (−0.81 to −9.07)	0.88
Higher	−2.15 (0.01 to −4.30)		−1.92 (0.02 to −3.86)		−4.60 (−1.03 to −8.17)		−5.38 (−1.73 to −9.03)	
Area of residence								
Urban	−1.87 (0.24 to −3.99)	0.48	−0.98 (0.85 to −2.82)	0.18	−5.45 (−1.98 to −8.92)	0.73	−2.78 (0.68 to −6.25)	0.04
Suburban	−3.10 (−0.71 to −5.50)		−2.98 (−0.71 to −5.25)		−4.49 (−0.24 to −8.48)		−8.67 (−4.23 to −13.11)	

Abbreviations: CI = confidence interval; GAF-ID = Guided Act and Feel Indonesia; IDS-SR = self-reported Inventory of Depressive Symptomatology; PHQ-9 = self-reported Patient Health Questionnaire 9.

Table 3

Drop-out rates in the sociodemographic subgroups.

	Non drop-outs (n = 265)	Drop-outs (n = 48)	t or χ² (p-value)
Age, mean (SD)	24.42 (5.21)	24.85 (4.21)	−0.552 (0.58)
Female sex	216 (81.51%)	37 (77.08%)	0.514 (0.47)
Socioeconomic status			
Low	51 (86.44%)	8 (13.56%)	4.913 (0.09)
Middle	172 (86.87%)	26 (13.13%)	
High	42 (75.00%)	14 (25.00%)	
Education			
Lower or secondary	124 (86.71%)	19 (13.29%)	0.851 (0.36)
Higher	141 (82.94%)	29 (17.06%)	
Area of residence			
Suburban	106 (85.48%)	18 (14.52%)	0.106 (0.75)
Urban	159 (84.13%)	30 (15.87%)	

Data are n (%), unless specified otherwise.

inclusion criterion for this trial. This has likely resulted in selection bias, excluding Indonesians with the lowest standard of living (i.e. no access to electricity and/or internet) or (internet device) illiteracy. Notably, none of the participants accepted the offer to receive a device to access the internet or reimburse internet costs. The fact that the effect of GAF-ID was not moderated by SES suggests that online interventions can potentially be used to treat mental disorders in vulnerable groups in a LMIC setting, at in least in (sub)urban areas. Fourth, we were only able to include two participants living in rural areas. Given that most mental health facilities in Indonesia are in major cities, whilst 45% of the population lives in rural areas, the added value of a (guided) online intervention lies in part in the potential to reach people living outside urban areas, especially considering the rising internet access in rural Indonesia, recently estimated at 48.25% (Arjadi, Nauta, & Bockting, 2018; World Bank, 2018). It is possible that our recruitment methods, using traditional media (banners, newspapers, magazine), social media and referral from mental health institutions, favored people living in (sub)urban area, where there are higher levels of internet penetration (Arjadi, Nauta, & Bockting, 2018), more mental health facilities and possibly a higher coverage by traditional media outlets. Lower acceptability is unlikely to explain the low number of rural participants, as Indonesians living further away from mental health facilities are thought to be more open to online treatment as substitute for face-to-face contact (Arjadi, Nauta, & Bockting, 2018). Future randomized clinical trials of online mental health interventions in LMIC should

increase efforts to include participants from rural areas in order to ascertain efficacy in this group, especially since one study in China suggested an online treatment for traumatized persons was less effective in rural areas (Wang, Wang, & Maercker, 2013). Since rural populations in Indonesia are very community-oriented, a more personized recruitment strategy using key-figures in rural communities might increase participation, as this strategy was previously found successful in a study in Indonesian minorities in the Netherlands (Bodewes & Kunst, 2016). Lastly, our study population was relatively young, with a mean age of 24 (range 16–51), meaning the results might not apply to an older age group. Even though older age has been reported to increase likelihood to respond to online treatment for depression in HIC, this has not been investigated yet in LMIC (Karyotaki et al., 2018). Future studies to ascertain efficacy of online interventions for depression in older adults in LMIC are especially warranted since some studies suggest risk of depression in these countries increases with age (Shidhaye, Lyngdoh, Murhar, Samudre, & Krafft, 2017).

This study adds to a limited body of research on the moderating effect of sociodemographic factors on outcome for guided online interventions for depression, especially in LMIC. These results could guide further research on this topic, particularly performing hypothesis-testing studies in larger samples. The exploratory results of this study substantiate the potential of online interventions as a way to decrease the alarmingly high mental health treatment gap in LMIC. The finding that treatment effect was not moderated by the sometimes unfavorable socioeconomic characteristics of our participants (i.e. lower level of education or SES group) is hopeful, especially when considering that low SES in our study implied a maximum daily expenditure of little over 2 USD* per day (Rastogi, Tong, Tamboto, & Simburisit, 2013), inadvertently increasing exposure in this group to factors associated with depression, such as financial distress and poor housing conditions (Lund et al., 2010). Indeed, a study performed by Tampubolon et al. showed that Indonesians living on less than 2 USD per day had a 5% higher depression score (10-item Center for Epidemiologic Studies Depression scale) then their wealthier counterparts, even after adjusting for covariates such as gender, education and marital status (Tampubolon & Hanandita, 2014).

The finding that dropout rates we similar across all sociodemographic subgroups is contrast with evidence from HIC, that suggest that male sex, younger age and lower education predict dropout in

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* In accordance with exchange rates on April 18th, 2019.

online treatments (Karyotaki et al., 2015).

In conclusion, the results presented suggest that guided online treatment programs for depression in a LMIC setting might be a suitable intervention across all demographics, including socioeconomically disadvantaged groups in (sub)urban areas. This provides a hopeful prospect in using online interventions to decrease the mental health treatment gap in LMIC. However, additional moderation studies aimed to corroborate these findings in larger samples including participants from rural areas are warranted.

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Declaration of interests

MHN reports grants from the Indonesia Endowment Fund for Education (awarded to RA to do her PhD at the University of Groningen) during the study, and developed and translated cognitive behavioral therapy treatment manuals, including a blended internet-based treatment program unrelated to the current project, for which she receives no direct payments. MHN also reports travel expenses, some subsistence, and speaker honoraria for lectures or clinical training workshops paid for by mental health centers. CLHB developed the intervention used in the GAF-ID trial, but does not receive any direct payment from it. She reports grants from the Indonesia Endowment Fund for Education (awarded to RA to do her PhD at the University of Groningen) during the study, is a member of the Dutch multi-disciplinary guideline for anxiety and depression (non-remunerated), a co-editor of PLoS One and European Psychology (non-remunerated), and a member of the scientific board in the Dutch national statutory insured package, for which she receives an honorarium. She has received honoraria for keynote addresses at the European Association for Behavioural and Cognitive Therapies, the European Psychiatry Association, and the European Conference Association, and for clinical training workshops (paid by mental health centers), and receives book royalties. All other authors declare no competing interests.

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