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Prevalence of depressive symptoms and diagnosed depression among adults in Germany

Results of the German Health Interview and Examination Survey for Adults (DEGS1)

Depression is one of the most common and serious mental disorders. According to the Global Burden of Disease Study of the WHO, it is one of the main causes of disease-related disability worldwide [1] and accounts for a large part of the global disease burden [2]. Due to its high prevalence and far-reaching consequences for individuals and society as a whole, depression and the care for those affected by it are of major public health relevance [1, 3]. The general term depression is used to describe a wide clinical spectrum, ranging from isolated depressive symptoms, through light or subthreshold forms of depressive disorder, to severe major depressive disorder [3]. Subthreshold depressive symptoms are already of great relevance in this context. Even if they do not meet the criteria of a clinical disorder, they are often associated with impairment and an increased risk for the development of major depression.

Reliable information at the population level is needed to estimate the disease burden of depression and associated care needs in Germany. DEGS1, the first wave of the German Health Interview and Examination Survey for Adults ("Studie zur Gesundheit Erwachsener in Deutschland", DEGS), provides representative up-to-date data on the prevalence of depression in the general population aged 18–79 years [4]. For this, several aspects of depression are assessed in DEGS1 that need to be differentiated from one another in terms of their con-

tent (■ **Tab. 1,** [5]). In a written questionnaire, current depressive symptoms are assessed with a self-reported depression rating scale that is a well-established screening tool for depression in clinical practice [6] and a measure for depressive symptoms in health surveys [7]. Previously diagnosed depression is assessed by physician interview [5], thus allowing to estimate the diagnosis prevalence within the healthcare system and to compare it with other countries [7]. In addition, the mental health module (DEGS1-MH) assesses depressive disorders based on the established clinical criteria of the DSM-IV and ICD-10 diagnostic systems using a standardised diagnostic interview [5, 8].

This paper presents the findings of DEGS1 on the prevalence of depressive symptoms and diagnosed depression among adults in Germany 18–79 years old.

Methods

Study design and sample

The German Health Interview and Examination Survey for Adults (DEGS) is part of the health monitoring programme at the Robert Koch Institute (RKI). The concept and design of DEGS are described in detail elsewhere [5, 9, 10, 11, 12]. The first data collection wave (DEGS1) was conducted from 2008–2011 and comprised interviews, examinations and tests [4, 13]. The target population included residents

of Germany aged 18–79 years. DEGS1 has a mixed design which permits both cross-sectional and longitudinal analyses. For this purpose, a random sample from local population registries was drawn to supplement former participants from the German National Health Interview and Examination Survey 1998 (GNHIES98). A total of 8,152 persons participated, including 4,193 first-time participants (response rate 42%) and 3,959 former participants of GNHIES98 (response rate 62%). There were 7,238 persons who visited one of the 180 examination centres, and 914 were interviewed only. The net sample permits representative cross-sectional analyses for the age range of 18–79 years (n=7,988, including 7,116 in examination centres) and time trend analyses based on comparison with GNHIES98 [11]. The cross-sectional analysis presented here refers to the sample of 7,988 persons aged 18–79 years who took part in the interviews [11].

Depressive symptoms

Current depressive symptoms were assessed with a written, self-administered questionnaire [5, 13] using the depression module of the German version of the Patient Health Questionnaire (PHQ) [6, 14]. The depression module (PHQ-9) is a self-assessment instrument for measuring the presence and frequency of nine depressive symptoms within the last 2 weeks based on the diagnostic criteria for "ma-

Tab. 1	Assessment of depression in DEGS1		
Aspect of depression	**Study part**	**Instrument**	**Commentary**
Depressive symptoms	Self-administered questionnaire	PHQ-9	Dimensional assessment of the frequency of nine depressive symptoms during the last 2 weeks; quantification of depression severity based on a total score of 0–27 points
Current depressive symptoms	Self-administered questionnaire	PHQ-9	Category-based assessment of depressive symptoms with more than one depressive symptom during the last 2 weeks; derived from the PHQ-9 total score through dichotomisation at the cut-off ≥10 points
Diagnosed depression	Physician interview	Closed question: "Has a physician or psychotherapist ever diagnosed you with depression?"	Self-report of a previous diagnosis of depression in the past and during the last 12 months
Depressive disorders	Mental Health module (DEGS1-MH)	CIDI interview	Diagnosis of a depressive disorder based on the criteria of the clinical diagnostic systems DSM-IV and ICD-10

PHQ-9 Depression module of the Patient Health Questionnaire, *CIDI* Composite International Diagnostic Interview, *DSM-IV* Diagnostic and Statistical Manual of Mental Disorders, fourth edition, *ICD-10* International Statistical Classification of Diseases and Related Health Problems, 10th edition.

Tab. 2	Prevalence of current depressive symptoms (PHQ-9 ≥10 points) by sex and age group in percent (95% confidence interval), n=7,524						
	18–29 years	**30–39 years**	**40–49 years**	**50–59 years**	**60–69 years**	**70–79 years**	**Total**
Women	11.8 (9.0–15.3)	10.5 (7.3–14.7)	9.9 (7.6–12.8)	10.4 (8.1–13.3)	9.8 (7.1–13.4)	7.7 (5.1–11.4)	10.2 (8.9–11.5)
Men	8.0 (5.5–11.5)	5.3 (2.9–9.5)	7.0 (5.0–9.7)	6.1 (4.5–8.3)	4.5 (2.9–6.9)	4.2 (2.6–7.0)	6.1 (5.2–7.2)
Total	9.9 (7.8–12.3)	7.9 (5.7–10.8)	8.4 (6.7–10.5)	8.2 (6.7–10.1)	7.2 (5.6–9.2)	6.1 (4.3–8.6)	8.1 (7.3–9.1)

jor depression" as defined in DSM-IV (little interest or pleasure, depressed mood, sleep disturbances, tiredness or little energy, poor appetite or overeating, feelings of worthlessness or guilt, trouble concentrating, psychomotor retardation or agitation, suicidal thoughts). Depending on the reported frequency of symptoms, scores of 0 ("not at all"), 1 ("several days"), 2 ("more than half the days") or 3 ("nearly every day") points are assigned to each item. Item scores are summed for the PHQ-9 total score, which ranges from 0 and 27 points. A total score of 10 or more points indicates current depressive symptoms [6, 14].

Diagnosed depression

In the standardised, computer-assisted personal interview (CAPI) conducted by a study physician [5, 13], previously diagnosed depression was assessed by asking the question: "Have you ever been diagnosed with depression by a physician or a psychotherapist?" If they answered "yes", the participants were additionally asked whether they had been diagnosed with depression during the last 12 months: "Was the depression present during the past 12 months?"

Covariables

Socioeconomic status (SES) was determined using an index which was based on information from the written questionnaire on school education and vocational training, occupational status and net household income (need-weighted), permitting classification into low, medium and high status groups [15].

The size of municipality was defined using the official administrative municipal code for the place of residence to assign the latter to the following aggregated categories for municipality size: rural (<5,000 inhabitants), small town (5,000 to <20,000 inhabitants), medium-sized town (20,000 to <100,000 inhabitants) and large town (≥100,000 inhabitants) [11].

Statistical analysis

The point prevalence of current depressive symptoms and the lifetime and 12-month prevalence of diagnosed depression were calculated as percentages with 95% confidence intervals (95% CI) of the total numbers of all participants who gave valid answers. Participants who provided no or incomplete answers to the PHQ-9 and those who gave no answer or replied "Don't know" to the questions on diagnosed depression were excluded from the relevant analyses.

Associations between the above prevalences and age group, sex, SES and size of municipality were examined using logistic regression analyses. Differences were considered statistically significant if p values were <0.05.

A weighting factor was used for all analyses which corrects sample deviations from population structure (as of 31 Dec 2010) with regard to age, sex, region, nationality, type of municipality and education [11]. Calculation of the weighting factor for the former participants in GNHIES98 took account of the probability of repeated participation based on a logistic regression model. A non-responder analysis and a comparison of selected indicators with data from official statistics indicate that the sample is highly representative of the resident population aged 18–79 years in Germany [11].

In order to take account of both the weighting and the correlation of participants within a sample point, confidence intervals and p values were calculated using survey procedures in Stata 12.1.

Results

Depressive symptoms

The full version of the written questionnaire was completed by 7,807 participants (97.7% of the 7,988 participants). Complete PHQ-9 data were available for 7,524 of these respondents (96.4%): 3,940 women and 3,584 men.

Current depressive symptoms (PHQ-9 score ≥10 points) are present in 8.1% of adults aged 18–79 years (**Tab. 2**), with women (10.2%) showing a significantly higher prevalence than men (6.1%) (p<0.0001). Prevalence is highest in the age group from 18–29 years (11.8 and 8.0%) and decreases thereafter. This decrease in prevalence with increasing age is statistically significant overall (p_{Trend}=0.01) and among men (p_{Trend}=0.02) but not among women (p_{Trend}=0.09). The lowest prevalence is found among women and men aged 70–79 years (7.7 and 4.2%). Women show a higher prevalence than men in all age groups.

Overall, there is an inverse relationship between socioeconomic status and the prevalence of current depressive symptoms (**Tab. 4**). The prevalence among persons with low SES (13.6%) is almost twice as high as among those with high SES (4.6%, p_{Trend}<0.0001). This social gradient is more marked among women than men (p_{Trend}<0.0001 in each case).

With regard to size of municipality, the lowest overall prevalence of current depressive symptoms is found among persons who live in small towns (5.8%, 95% CI 4.7–7.1), compared to persons from large towns (9.4%, 95% CI 7.6–11.6, p=0.03), medium-sized towns (9.1%, 95% CI 7.5–11.0, p=0.02) and rural areas (7.4%, 95% CI 6.0–9.1, p=0.8). This relationship is similar for men and women and also remains after statistical adjustment for age, sex and SES.

Diagnosed depression

Data from the CAPI on previously diagnosed depression were available for 7,912 participants (99.1%): 4,146 women and 3,766 men. Of these, 7,900 (99.9%) also provided details regarding diagnosed depression during the previous 12 months.

The overall lifetime prevalence of diagnosed depression is 11.6% (**Tab. 3**). Women (15.4%) report a previously diagnosed depression almost twice as frequently as men with 7.8% (p<0.0001). Lifetime prevalence increases with increasing age and is highest among women and men aged 60–69 years (22.9 and 11.6%), after which it falls again. The lowest prevalence is found among young adults aged 18–29 years (8.5 and 4.2%).

Compared to the 60–69 year olds, prevalence levels are lower overall (p≤0.001 in each case) in all other age groups with the exception of the 50–59 year olds.

A total of 6.0% of participants report diagnosed depression during the previous 12 months, and here again the prevalence is around twice as high among women (8.1% versus 3.8% for men, p<0.0001). The 12-month prevalence among women and men is also lowest in the age group

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Abstract

In the German Health Interview and Examination Survey (DEGS1), current depressive symptoms were assessed with the Patient Health Questionnaire (PHQ-9) in a representative population-based sample of 7,988 adults 18–79 years old. In addition previously diagnosed depression was assessed by physician interview. The prevalence of current depressive symptoms (PHQ-9 ≥10 points) is 8.1% (women 10.2%; men 6.1%). For both sexes, the prevalence is highest among 18- to 29-year-olds and decreases with age. Persons with higher socioeconomic status (SES) are less likely to have current depressive symptoms. The lifetime prevalence of diagnosed depression is 11.6% (women 15.4%; men 7.8%) and is highest among persons 60–69 years old. The 12-month prevalence is 6.0% (women 8.1%; men 3.8%) and is highest among 50–59 year olds. In women, but not in men, prevalences decrease with increasing SES. The results describe the distribution of two important aspects of depression among the adult population in Germany and confirm previously observed associations with age, gender and SES.

Keywords

Depressive symptoms · Depression · Prevalence · Health survey · Population

Prävalenz von depressiver Symptomatik und diagnostizierter Depression bei Erwachsenen in Deutschland. Ergebnisse der Studie zur Gesundheit Erwachsener in Deutschland (DEGS1)

Zusammenfassung

In der Studie zur Gesundheit Erwachsener in Deutschland (DEGS1) wurden von 2008 bis 2011 in einer bevölkerungsrepräsentativen Stichprobe von 7988 Personen im Alter von 18 bis 79 Jahren aktuelle depressive Symptome mit dem „Patient Health Questionnaire" (PHQ-9) erfasst. Zusätzlich wurden diagnostizierte Depressionen in einem ärztlichen Interview erfragt. Eine depressive Symptomatik (PHQ-9 ≥10 Punkte) besteht bei 8,1% der Erwachsenen (Frauen 10,2%; Männer 6,1%). Bei beiden Geschlechtern ist die Prävalenz bei 18- bis 29-Jährigen am höchsten und fällt danach ab. Bei Männern und Frauen mit höherem sozioökonomischem Status besteht seltener eine depressive Symptomatik. Die Lebenszeitprävalenz einer diagnostizierten Depression beträgt 11,6% (Frauen 15,4%; Männer 7,8%) und ist am höchsten bei 60- bis 69-Jährigen; die 12-Monats-Prävalenz liegt bei 6,0% (Frauen 8,1%; Männer 3,8%) und ist am höchsten bei 50- bis 59-Jährigen. Bei Frauen, aber nicht bei Männern sinken die Diagnoseprävalenzen mit steigendem sozioökonomischem Status. Die Ergebnisse beschreiben die weite Verbreitung von depressiver Symptomatik und diagnostizierter Depression in der Erwachsenenbevölkerung in Deutschland und bestätigen bekannte Zusammenhänge von Depression mit Alter, Geschlecht und sozioökonomischem Status.

Schlüsselwörter

Depressive Symptomatik · Depression · Prävalenz · Gesundheitssurvey · Bevölkerung

Tab. 3 Lifetime prevalence and 12-month prevalence of diagnosed depression by sex and age group in percent (95% confidence interval)

	18–29 years	30–39 years	40–49 years	50–59 years	60–69 years	70–79 years	Total
Lifetime prevalence (n=7,912)							
Women	8.5 (5.8–12.2)	12.4 (9.1–16.7)	16.0 (13.0–19.4)	19.4 (16.5–22.6)	22.9 (18.8–27.5)	14.0 (10.8–17.9)	15.4 (14.0–17.0)
Men	4.2 (2.5–7.0)	7.5 (5.2–10.9)	6.8 (4.8–9.6)	10.1 (7.7–13.1)	11.6 (8.9–14.8)	7.9 (5.2–11.9)	7.8 (6.7–9.0)
Total	6.3 (4.6–8.5)	9.9 (7.9–12.5)	11.3 (9.3–13.7)	14.7 (12.7–17.0)	17.3 (14.7–20.2)	11.2 (9.0–14.0)	11.6 (10.7–12.6)
12-month prevalence (n=7,900)							
Women	5.1 (3.2–8.2)	7.3 (4.7–11.3)	8.5 (6.2–11.6)	10.9 (8.6–13.6)	10.7 (8.0–14.2)	5.9 (3.8–9.1)	8.1 (7.0–9.4)
Men	2.1 (1.1–4.0)	3.4 (1.7–6.5)	3.6 (2.2–5.8)	6.0 (4.3–8.4)	5.0 (3.2–7.7)	2.7 (1.2–5.8)	3.8 (3.1–4.7)
Total	3.6 (2.4–5.2)	5.3 (3.7–7.7)	6.0 (4.5–7.9)	8.4 (6.9–10.4)	7.9 (6.2–10.0)	4.5 (3.0–6.6)	6.0 (5.3–6.7)

Tab. 4 Prevalence of current depressive symptoms (PHQ-9 ≥10 points) and diagnosed depression (lifetime and 12-month prevalence) by sex and socioeconomic status (SES) in percent (95% confidence interval)

	Low SES	Medium SES	High SES
Current depressive symptoms (n=7,876)			
Women	16.0 (12.7–19.9)	9.9 (8.3–11.7)	5.0 (3.5–7.0)
Men	11.1 (8.1–15.0)	5.3 (4.3–6.5)	4.3 (2.9–6.3)
Total	13.6 (11.2–16.5)	7.6 (6.6–8.8)	4.6 (3.6–6.0)
Diagnosed depression: lifetime prevalence (n=7,800)			
Women	19.8 (16.2–24.0)	14.3 (12.6–16.1)	13.9 (11.7–16.5)
Men	8.8 (6.2–12.2)	7.6 (6.3–9.2)	6.6 (5.0–8.8)
Total	14.5 (12.1–17.3)	11.0 (9.9–12.3)	9.9 (8.5–11.4)
Diagnosed depression: 12-month prevalence (n=7,789)			
Women	12.9 (9.7–17.0)	7.0 (5.9–8.4)	5.5 (3.8–8.1)
Men	3.7 (2.2–6.2)	3.6 (2.7–4.8)	3.7 (2.3–5.7)
Total	8.5 (6.6–10.9)	5.4 (4.6–6.3)	4.5 (3.4–6.0)

from 18–29 (5.1 and 2.1%), thereafter steadily increasing to the highest prevalence levels among the 50–59 year olds (10.9 and 6.0%) before falling again. On the whole, prevalence levels are significantly lower in all age groups (apart from the 60–69 year olds) relative to the 50–59 year olds.

Women show an inverse relationship between socioeconomic status and the lifetime and 12-month prevalence of diagnosed depression (◘ **Tab. 4**). Both prevalences decrease significantly with rising SES (p_{Trend}=0.01 and <0.0001), and the difference is particularly marked between women with high and women with medium or low SES. At 12.9%, the 12-month prevalence among women

with low SES is more than twice as high as among women with high SES. In contrast, no clear social gradient is found among men. The age group-specific analysis shows a social gradient among men in the middle age groups (40–59 years) but not below the age of 40 or above the age of 59 years.

Overall, the lifetime and 12-month prevalence of diagnosed depression are highest in large towns (13.7 and 7.6%), followed by mid-sized towns (11.4 and 5.5%) and rural areas (10.5 and 5.7%), while they are lowest in small towns (9.9 and 4.4%). The significant association between 12-month prevalence and size of municipality is found in equal measure among men and women, whereas with

regard to lifetime prevalence it is only found with women.

Discussion

The results of DEGS1 presented here make a contribution towards estimating the care needs and disease burden due to depression in Germany. The results provide up-to-date information on the prevalence and distribution of two important aspects of depression among the adult population. The last time representative nationwide data were collected on the prevalence of depressive disorders in the German adult population was in the context of the mental health module of the German National Health Interview and Examination Survey 1998 (GNHIES98) which included persons aged 18–65 years [16]. The current data from DEGS1 extend the GNHIES98 findings by also including older people up to the age of 79 in the assessment of mental health; it also includes information from all participants in the main survey about two additional key indicators for depression that are well-established in international health surveys.

Depressive symptoms

To date, no comparative data for Germany are available on the prevalence of current depressive symptoms among the general adult population. However, the National Health and Nutrition Examination Survey (NHANES) and the Behavioral Risk Factor Surveillance System (BRFSS) in the USA have been recording current depressive symptoms for many years using the PHQ-9 with a cut-off of ≥10 points [7]. The measured point prevalences of 6.8% (NHANES 2005–2008) and 8.7% (BRFSS 2006) are similar to the overall prevalence of 8.1% now recorded by DEGS1. The differences between men and women are also of similar magnitudes (BRFSS 10.5 and 6.8% [17], DEGS1 10.2 and 6.1%). Moreover, the prevalence measured by the BRFSS has been stable for a number of years [7].

Diagnosed depression

The use of different assessment instruments makes it difficult to compare the prevalence of diagnosed depression found in DEGS1 with the prevalence of depression in the mental health module of GNHIES98 (GNHIES98-MH). In GNHIES98-MH, depressive disorders were diagnosed using the standardised CIDI interview that is based on diagnostic criteria. The 12-month prevalence of depression was estimated at 11% in women and 6% in men aged 18–65 years [16]. The slightly lower prevalence in DEGS1 based on self-reports of previously diagnosed depression may be due to the fact that non-diagnosed depression was not recorded and that some participants with diagnosed depression did not report it. As a result, the estimates for the prevalence of depression based on the DEGS1 question on diagnosed depression should be considered conservative compared to the findings of diagnostic interviews, as only reported cases of previously diagnosed depression are captured. Other studies have estimated the overall 12-month prevalence of major depression at 6.9% in Europe (without evidence for an increase or decrease between 2005 and 2011) [18] and 6.6% in the USA [19]. The mental health module of DEGS1 (DEGS1-MH), in which depressive disorders were also diagnosed using a standardised CIDI interview (◘ **Tab. 1,** [8]), allows comparisons of DEGS1 with GNHIES98-MH and international data.

The high level of agreement between DEGS1 results and findings of the study German Health Update (GEDA) 2009, however, indicates that the prevalence of diagnosed depression is a robust indicator of depression. In GEDA, diagnosed depression was assessed using a question similar to that in DEGS1 [20]. The 12-month prevalence of 8% in women and 4.5% in men is very close to the prevalence found in DEGS1 at a similar survey time.

An analysis of the prevalence of diagnosed depression in ambulatory care based on claims data for all people in Germany with statutory health insurance in 2007 showed a 12-month prevalence of 10.2%, higher than the preva-

lence found in DEGS1 [21]. However, this analysis did not specify an upper age limit and the age-specific prevalence showed two peaks, with an additional marked increase among people over the age of 80. Furthermore, the study design of DEGS1 probably means that people with acute severe depression are underrepresented in DEGS1 [5, 11].

Associations with sociodemographic factors

The prevalences of current depressive symptoms and diagnosed depression are both clearly associated with age but show different characteristic age-related patterns. The finding that the prevalence of current depressive symptoms is highest among young adults and then steadily decreases with increasing age confirms the results of the BRFSS health survey in the USA [17]. It is also known from other surveys that the lifetime and 12-month prevalence of diagnosed depression initially rises in younger adults, is highest between the ages of 50 and 69 and then falls again as people get older [17, 20]. These age-related effects may partly be explained by the differential impact of stress and resilience factors in different age groups as well as biographical influences [3, 22]. Moreover, old age is often associated with atypical types of depression (e.g. with physical symptoms playing a key role) that are less likely to be detected by the assessment instruments used in DEGS1 and that are also diagnosed less frequently in clinical practice [3, 23]. In addition, the possibility of an age-related information bias cannot be ruled out, as a result of older people remembering, experiencing or reporting depressive symptoms and disorders less frequently than their younger counterparts [3, 22].

Several German and international studies have shown a higher prevalence of depressive disorders and depressive symptoms among women overall and in specific age groups [3, 7, 16, 19, 20, 21, 24]. These findings are also confirmed by DEGS1. The difference between the sexes is probably due to a variety of different neurobiological, hormonal, psychosocial, behaviour-related and other factors as well as differences in the percep-

tion and communication of depressive symptoms [3, 25, 26].

Low socioeconomic status is associated with an increased risk of depression and other mental disorders [24, 27, 28]. This relationship has previously been shown for Germany by GNHIES98-MH [16] and GEDA2009 [20] and is now reconfirmed by the results of DEGS1.

The aforementioned analysis of claims data for ambulatory care in 2007 also showed that the type of residential region influenced the prevalence of diagnosed depression, irrespective of age, sex and socioeconomic status [21]. As in DEGS1, prevalence was highest in large towns, but high prevalences were also found in rural regions.

Strengths and limitations

DEGS1 is a nationwide study that is representative of the general population and that allows generalisations on the distribution of depression among adults living in Germany. Further analyses will use additional health-related data from DEGS1 to examine the influence of risk and protective factors for depression, health effects of depressive symptoms and diagnosed depression, and the resulting care needs.

An important limitation of this study is that the data presented here are based on self-reports provided by the participants. It will be possible, however, to verify and supplement the collected data on depressive symptoms and diagnosed depression in further analyses by using data from the diagnostic interview in DEGS1-MH [8]. Moreover, it can be assumed that persons with current severe depression are underrepresented in the study sample. As a result, the prevalence estimates reported here are to be seen as conservative. As the assessment instruments used in DEGS1 were not used in GNHIES98, it is not possible to examine prevalence trends over time. As mentioned above, this gap will be filled by trend analyses and longitudinal analyses using data from DEGS1-MH. Due to the differences in the assessed aspects of depression and the assessment instruments in DEGS1 and DEGS1-MH, clear differences are to be expected in the resulting esti-

mates for prevalence and distribution of depression in the population. Although the assessed aspects are closely related, the corresponding prevalences cannot be directly compared due to the differences in content.

Conclusion

These results of the first wave of the German Health Interview and Examination Survey for Adults (DEGS1) describe the high prevalence of current depressive symptoms and diagnosed depression among the adult population of Germany and confirm the known relationships between depression and age, sex and socioeconomic status.

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Conflict of interest. On behalf of all authors, the corresponding author states that there are no conflicts of interest.

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