

# Psychometric properties of the WHO Violence Against Women instrument in a male population-based sample in Sweden

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## ABSTRACT

**Objectives:** To explore the psychometric properties of the WHO's Violence Against Women instrument (VAWI) in a randomly selected national sample of Swedish men.

**Design:** Cross-sectional survey study.

**Setting:** Sweden.

**Participants:** A postal survey was sent to 1009 men between January and March 2009, during which 458 men (45.4%) returned the questionnaire. 49 men who did not answer any of the violence items were excluded from the analyses, resulting in a final sample of 399 men.

**Primary and secondary outcome measures:** Self-reported exposure to psychological, physical and sexual intimate partner violence.

**Results:** Cronbach's  $\alpha$  were 0.74 (psychological scale), 0.86 (physical scale), 0.82 (sexual scale) and 0.88 (total scale). Principal components analysis did not corroborate the conceptual three-dimensional model of the VAWI and other constructs were found. Past-year prevalence of physical (7.6%; 95% CI 5.0% to 10.2%) and sexual (2.3%; 95% CI 0.8% to 3.8%) violence was higher than in other Nordic studies; earlier-in-life prevalence of physical violence (6.8%; CI 95% 4.3% to 9.3%) was lower and sexual violence (2.5%; 95% CI 1.0% to 4.0%) was higher. Reported exposure rates were generally higher than those obtained from a concurrently administered instrument (NorVold Abuse Questionnaire).

**Conclusions:** The VAWI conceptual model was only partially replicated and boundaries between psychological, physical and sexual acts of violence were indistinct among men exposed to intimate partner violence (IPV). This finding suggests that there is need for research instruments assessing intimate partner violence to be validated separately in male and female samples in order to ensure their suitability for the respective groups. Furthermore, theoretical frameworks for understanding men's exposure to intimate partner violence need to be advanced and should serve to guide in the development and evaluation of gender-specific IPV assessment instruments.

## INTRODUCTION

Most prevalence surveys on intimate partner violence (IPV) have focused on violence perpetrated against women by men. However, a

## ARTICLE SUMMARY

### Article focus

- Differences in self-reported exposure to intimate partner violence (IPV) among women and men have often been found regarding motives for using violence, the context in which the violence occurs and its consequences; however, psychometric properties of instruments assessing intimate partner violence among women and men are seldom investigated in male populations.
- The aim of this study was therefore to examine aspects of the validity and reliability of the Violence Against Women instrument (VAWI) in a randomly selected national sample of men.

### Key messages

- The VAWI conceptual model was only partially replicated and boundaries between psychological, physical and sexual acts of violence were indistinct. This could indicate that different conceptual models, and possibly different assessment instruments, are needed in order to accurately assess men's experiences of IPV in heterosexual relationships.
- Research instruments assessing intimate partner violence need to be validated separately in male and female samples in order to ensure their suitability for the respective groups.
- Theoretical models for understanding men's experiences of violence in heterosexual relationships need to be advanced and should serve to guide in the development and evaluation of gender-specific IPV assessment instruments.

### Strengths and limitations of this study

- Cross-sectional study design among a male population.
- Further aspects of validity and reliability need to be explored.

burgeoning literature in mainly high-income countries has begun to assess IPV victimisation also among men.<sup>1–5</sup> While such studies often use instruments that have primarily been developed for IPV perpetrated against women, few studies have evaluated their psychometric properties in male populations.

Although research findings on prevalence are inconclusive, they generally find that women and men report similar levels of violence when the contexts, motives and consequences are not considered.<sup>6</sup> When they are considered, studies assessing IPV perpetrated by men compared to women often report gender differences regarding the types of violence, reasons for the violence, context in which the violence occurs and consequences of the violence.<sup>6-7</sup> For example, studies assessing differences in IPV find men's violence against women to be more severe, threatening and controlling<sup>8-10</sup> and involve longer-lasting victimisation, fear of bodily injury or death, more injuries and more adverse health effects.<sup>5 11 12</sup> It has also been found that women tend to use physical violence out of anger, not being able to get the partner's attention or in self-defence and retaliation,<sup>11</sup> whereas men often use it as a means to exercise coercive control.<sup>13 14</sup>

Given that studies find women's and men's IPV exposure to differ in certain aspects, it seems important to investigate whether the instruments that have been developed to assess IPV against women by men in heterosexual relationships are as suitable for assessing women's use of violence against men. It has been proposed that if violence aetiologies differ for women compared to men, it may be that research instruments need to be adjusted as well.<sup>15</sup>

Most studies evaluating the psychometric properties of violence assessment instruments for use in men have focused on instruments assessing men's perpetration,<sup>16</sup> recidivism<sup>17</sup> or attitudes to violence.<sup>18</sup> Focusing specifically on instruments assessing exposure to violence, studies have been conducted with regard to screening IPV in emergency department settings,<sup>19 20</sup> assessing childhood experiences of abuse or neglect<sup>21 22</sup> or violence by several perpetrators.<sup>23 24</sup> Additionally, many of these instruments were validated in specific populations, such as patients in emergency clinics,<sup>19</sup> psychiatric clinics,<sup>22</sup> alcohol treatment programmes<sup>24</sup> or healthcare settings,<sup>23</sup> or they combined women and men in the same sample instead of conducting these analyses separately.<sup>22 25</sup> There is a scarcity of instruments assessing specifically IPV exposure and that have been validated for use in male general population studies.

The WHO developed a questionnaire to assess violence victimisation in population-based samples in the Multi-Country Study on Women's Health and Domestic Violence Against Women.<sup>26</sup> Included in this questionnaire is the Violence Against Women instrument (henceforth 'VAWI') assessing psychological, physical and sexual IPV. Although the VAWI was developed to assess violence primarily against women, WHO originally also planned to use it in a subpopulation of men to assess their experiences of IPV exposure. To date, the VAWI has been used in one male population of the 10 countries in the Multi-Country Study, that is, in Samoa.<sup>26</sup> More recently, a study conducted in Brazil assessed sexual IPV using the VAWI among men.<sup>27</sup>

To our knowledge, the psychometric properties of the VAWI have not previously been evaluated in a male population. The aim of this study was therefore to examine aspects of the validity and reliability of the VAWI in a randomly selected national sample of men aged 18–65 residing in Sweden.

## METHODS

Data collection procedures, questionnaires and statistical analyses were the same as those used in the companion paper and are described in greater detail there (see companion paper entitled 'Psychometric properties of the WHO Violence Against Women instrument in a female population-based sample in Sweden'). A brief description of the statistical analyses specific to the male sample is presented below.

### Procedure, study population and response rate

A postal survey was administered through Statistics Sweden. The sampling frame was based on the national population register and consisted of all registered individuals in Sweden aged 18–65. Out of these, Statistics Sweden employed a simple random sample of 1009 men. Although the sampling frame was based on registered individuals, only one survey per household was sent for ethical and safety reasons. Data collection took place between January and March 2009, during which 45.4% (n=458) returned the questionnaire. However, those who did not answer any of the violence items (n=59) were excluded from the analyses, resulting in a final sample of 399 men. Inclusion criteria for this study were: age 18–65 years, registered in Sweden, able to answer a survey written in Swedish and having been or currently in an intimate relationship.

A second data collection was performed to examine the criterion validity of the VAWI against the NorVold Abuse Questionnaire (NorAQ).<sup>23 28</sup> Statistics Sweden sent out the VAWI and NorAQ between November 2009 and January 2010 to 20% (n=92) of the respondents from the initial data collection. The response rate was 69.6% (n=64) for the VAWI and 59.8% (n=54) for NorAQ.

### Drop-out analysis

Differences between non-responders and respondents regarding age, country of birth, civil status and the respondents' yearly income before tax were tested with the two-proportion z-test with Bonferroni adjustment.

Comparing those who did not return the questionnaire (n=551) with the final sample of analysis (n=399) revealed that non-respondents were 18–29 years old, unmarried, foreign born and had low yearly income of 0–159 999 Swedish Kronor (SEK) before tax. Internal drop-out rates, that is, respondents who did not endorse any violence item (n=59), differed in a similar pattern from the final sample of analysis: they were 18–29 years old, unmarried and had a low yearly income in comparison with the final sample of analysis.

In the second data collection (n=92), response rates were lowest among men who were unmarried, divorced or widowed.

### Assessment instruments: VAWI and NorAQ

The VAWI consists of behaviour-specific items related to psychological (four items), physical (six items) and sexual IPV (three items). The physical violence items are further divided into 'moderate' (the two first items) and 'severe' (the following four items) violence based on the likelihood of physical injury.<sup>26</sup> The VAWI items were translated and adapted to a Swedish context by a senior researcher (third author) with extensive knowledge about intimate partner violence. NorAQ was developed to measure abuse in the health care system as well as emotional (three items), physical (three items) and sexual (four items) abuse by different perpetrators (see online supplementary figure S1). NorAQ has been shown to have good validity and reliability in a Swedish context.<sup>23 28</sup>

### Statistical analyses

Principal components analysis (PCA) with a promax rotation was conducted to explore the internal construct validity of the violence items. Two component solutions were examined: (1) component extraction based on a parallel analysis, proportion of variance explained, Kaiser's eigenvalue-greater-than-one rule and on the examination of Cattell's scree plot and (2) a three-component solution as originally conceptualised in the VAWI.

The internal reliability of the VAWI was assessed with the Cronbach's  $\alpha$  for each subscale (psychological, physical and sexual violence) and for the total violence scale.

Prevalence of psychological, physical and sexual violence was calculated for the past year and for earlier in life, for comparisons with prevalence rates presented in other studies.

Furthermore, life-time prevalence of IPV was compared between the VAWI and the NorAQ. Only those respondents who had answered both the VAWI and NorAQ were included (n=50) in this analysis. Fisher's exact test (95% CI level) was used to test for differences in prevalence found between the two instruments.

### Ethical considerations

The Regional Ethics Review Board located in Gothenburg gave approval for this study (Dnr: 527-08) and the WHO ethical and safety recommendations for research on domestic violence against women as applicable to a postal survey were followed.<sup>29</sup> For example, a letter informing about the upcoming survey was sent to prospective respondents in advance so they could decline the survey before receiving it. Also, only one survey per household was sent out for safety reasons. Additionally, full anonymity and confidentiality were guaranteed and contact information to a general practitioner (third author on this study), a psychologist and a contact person at Statistics Sweden was provided for additional information and/or referral.

## RESULTS

### Study population

Nearly half of the men had completed high school (n=173; 43.7%) and the mean age was 45 years (SD=13). Of the total sample, 87.9% (n=349) were currently in a relationship (ie, boyfriend or girlfriend, married, registered partnership or cohabiting), of which the majority were heterosexual (n=394; 98.7%). The rest of the sample was single, widowed or divorced. These and other sociodemographic characteristics of the sample are described in table 1.

### Internal validity

The Kaiser-Meyer-Olkin measure of sampling adequacy was 0.89 and Bartlett's test of Sphericity was significant ( $p<0.05$ ), verifying a good fit of the data to the PCA. The parallel analysis and Kaiser's criterion suggested two components; however, the third component had an eigenvalue equal to one after decimal rounding and Cattell's scree test suggested three components.

**Table 1** Socio-demographic and psychosocial factors of the total sample (N=399)

	N (%)
Age groups	
18–29	57 (14.3)
30–39	77 (19.3)
40–49	96 (24.1)
50–59	98 (24.6)
60–65	71 (17.8)
Partner status	
Single/widowed/divorced	48 (12.1)
Boyfriend/girlfriend	53 (13.4)
Married/cohabitant/registered partnership	296 (74.6)
Heterosexual relationship	394 (98.7)
Same-sex relationship	5 (1.3)
Educational level (highest)	
University	156 (39.4)
High school (10–12 years)	173 (43.7)
Compulsory ( $\leq 9$ years)	67 (16.9)
Annual income (before tax, SEK)	
0–159999	77 (19.3)
160000–234999	52 (13.0)
235000–309999	107 (26.8)
310000 or more	163 (40.9)
Employment status	
Employed	329 (83.3)
Student	20 (5.1)
Retired	23 (5.8)
Sick leave (more than 3 months)	5 (1.3)
Parental leave or leave of absence	2 (0.5)
Unemployed	11 (2.8)
Other	5 (1.3)
Country of birth	
Sweden	356 (89.2)
Other Nordic country	7 (1.8)
Other European country	10 (2.5)
Country outside Europe	26 (6.5)

The two component solution (not in table) explained 68.6% of the total variance: the first component contained the item assessing threat of physical violence ('Threatened to hurt me or someone I care about'), the last three physical violence items and all sexual violence items. This component predominantly included items describing acts that presumably would lead to physical injury. The second component consisted of the three first psychological and the three first physical violence items.

A three-component solution (table 2) explained 76% of the total variance. The first component (C1), explaining 55.4% of the variance, consisted of all the VAWI's sexual violence items as well as the three (of four) physical violence items conceptualised to reflect severe forms of violence likely to produce physical injury.<sup>26</sup> This component was labelled 'Injury inducing violence'. The second component (C2) was called 'Intimidation and moderate violence' and consisted of the remaining three physical violence items mainly reflecting milder forms of violence and the last two psychological violence items ('Tried to scare and intimidate me on purpose' and 'Threatened to hurt me or someone I care about'). The last component (C3) was named 'Humiliation' and comprised the two first psychological violence items 'Insulted me in a way that made me feel bad about myself' and 'Belittled and humiliated me in front of other people'. The question assessing threat of psychological violence loaded on both the first (0.51) and the second (0.49) components. All other items loaded

higher on their main components than on other components and main component loadings were all above 0.60.

### Internal reliability

Cronbach's  $\alpha$  coefficients (table 3) showed satisfactory internal reliability for all conceptualised VAWI scales: 0.74 for psychological violence, 0.86 for physical violence and 0.82 for sexual violence.  $\alpha$  for the sexual violence scale would augment from 0.82 to 0.92 by deletion of the first item ('Demanded to have sex with me even though I did not want to (but did not use physical force)'). Cronbach's  $\alpha$  for the total scale was 0.88.

### External validity

#### Comparison of prevalence rates to other studies

As assessed with the VAWI, 24% (n=92) of the respondents reported exposure to psychological violence, 7.6% (n=29) to physical violence and 2.3% (n=9) to sexual violence during the past 12 months. Earlier-in-life exposure was 13.8% (n=55) for psychological, 6.8% (n=27) for physical and 2.5% (n=10) for sexual violence (table 4).

#### VAWI and NorAQ

A comparison between VAWI and NorAQ was conducted to assess criterion validity (n=50; see table 5). NorAQ was chosen as it is the only questionnaire measuring violence that has been validated in Sweden in both a male and female (see companion article) population-based sample. The VAWI yielded higher prevalence rates than the NorAQ in relation to all three violence scales. However, only the difference in psychological IPV was statistically significant (30.6% vs 10.2%;  $p<0.05$ ). This difference owed principally to the VAWI items 'Insulted me in a way that made me feel bad about myself' (24%) and 'Belittled and humiliated me in front of other people' (16%). Prevalence rates for the other items on this scale were similar to corresponding items in the NorAQ (see online supplementary figure S1).

## DISCUSSION

The VAWI conceptual model was only partially replicated and boundaries between psychological, physical and sexual acts of violence were indistinct. This finding underlines the importance of investigating psychometric properties of instruments assessing IPV separately for male and female populations. Although the dimensionality of the VAWI was not supported, items composing the three sub-scales, that is, psychological, physical and sexual violence, showed good internal consistency. Higher prevalence rates for past-year physical and sexual violence were found than those reported in the literature, and than those yielded by a concurrently administered violence questionnaire (NorAQ).

### Internal validity

Extraction criteria suggested both a two-component and a three-component solution; however, a three-component solution was chosen for comparison with the VAWI

**Table 2** The two-component and three-component solutions for the WHO's Violence Against Women instrument psychological, physical and sexual violence items (N=386)

Conceptual model	Three-component solution		
	C1	C2	C3
Psychological violence			
1		0.32	<b>0.73*</b>
2			<b>0.87</b>
3		<b>0.80</b>	
4	0.49	<b>0.51</b>	
Physical violence			
1		<b>0.77</b>	
2		<b>0.61</b>	
3		<b>0.85</b>	
4	<b>0.85</b>		
5	<b>0.91</b>		
6	<b>0.83</b>		
Sexual violence			
1	<b>0.69</b>		0.43
2	<b>0.97</b>		
3	<b>0.94</b>		
Accumulated variance (%)	55.4	68.6	76.0
Eigenvalues	7.2	1.7	1.0

\*Loadings>0.30 are shown and highest loadings are boldfaced. List-wise deletion was used.

**Table 3** Cronbach's  $\alpha$  of the WHO's Violence Against Women instrument psychological, physical and sexual violence scales and total scale, life-time (N=399)

Scales	$\alpha$ if item deleted
Psychological violence	
1 Insulted me in a way that made me feel bad about myself	0.66
2 Belittled and humiliated me in front of other people	0.64
3 Tried to scare and intimidate me on purpose (eg, by the way he/she looked at you, by yelling or smashing things)	0.64
4 Threatened to hurt me or someone I care about	0.64
<b>Total</b>	<b>0.74</b>
Physical violence	
1 Pushed or shoved me	0.87
2 Thrown something at me that could have hurt me	0.82
3 Hit me with his/her fist or with some other object that could have hurt me	0.81
4 Kicked and dragged me and beat me up	0.82
5 Choked me or burnt me on purpose	0.83
6 Hurt me with a knife, a gun or some other weapon	0.85
<b>Total</b>	<b>0.86</b>
Sexual violence	
1 Demanded to have sex with me even though I did not want to (but did not use physical force)	0.92
2 Forced me to have sex against my will by using his/her physical strength (by hitting, holding me firmly or threatening me with a weapon)	0.71
3 Forced me to perform sexual acts that I experienced as degrading and/or humiliating	0.68
<b>Total</b>	<b>0.82</b>
<b>Violence scale, total</b>	<b>0.88</b>

conceptual model. In general, the VAWI model was not replicated by PCA in the three-component model and other constructs were found which reflected more the severity rather than the types (psychological, physical and sexual) of violence. Although the three-component structure obtained in the female sample (companion article) also reflected the severity of the acts of violence to a certain extent, the PCA structure in that sample conformed better to the VAWI conceptual model of psychological, physical and sexual violence. Another study that conducted exploratory factor analysis on a different instrument assessing psychological and physical IPV among high-school students, also found that the boundaries of psychological and physical IPV were indistinct for men whereas they were generally distinct for women.<sup>30</sup>

Our finding that the underlying constructs differ for women versus men needs to be investigated further.

**Table 4** Past-year and earlier-in-life exposure to intimate partner violence as assessed with the WHO's Violence Against Women instrument (N=399)

	Past year			Earlier in life		
	N	%*	95% CI	N	%*	95% CI
Psychological violence	92	24.0*	19.8 to 28.2	55	13.8	10.4 to 17.2
Physical violence	29	7.6	5.0 to 10.2	27	6.8	4.3 to 9.3
Sexual violence	9	2.3	0.8 to 3.8	10	2.5	1.0 to 4.0

\*Percentage is given in valid per cent.

Several researchers have hypothesised that men's experiences of partner violence are qualitatively different from those of women,<sup>12 31</sup> although few qualitative studies exist that would have investigated this in depth. Previous research has argued that violent acts are not as fearsome or injury inducing to men as they are to women, and it is indeed possible that men and women are both exposed to and experience IPV in different, gendered ways.<sup>31</sup> This could indicate that different conceptual models, and possibly different assessment instruments, are needed in order to accurately assess men's experiences of IPV in heterosexual relationships.<sup>19</sup> However, further studies, especially qualitative ones, are needed in order to explore this further.

#### Internal reliability

All three subscales showed acceptable internal reliability. The  $\alpha$  of the sexual violence scale would augment from 0.82 to 0.92 by deletion of the first item ('Demanded to

**Table 5** Life-time prevalence of exposure to IPV as assessed with the VAWI versus NorAQ (N=50)

	VAWI		NorAQ	
	N	%*	N	%*
Psychological violence	15	30.6	5	10.2
Physical violence	7	14.3	6	12.5
Sexual violence	4	8.2	3	6.1

\*Percentage is given in valid per cent.

IPV, intimate partner violence; VAWI, WHO's Violence Against Women instrument; NorAQ, NorVold Abuse Questionnaire.

have sex with me even though I did not want to (but did not use physical force)'). However, given that the current study is explorative and hypothesis generating, further studies are needed to assess whether the scale would need to be revised or not.

### External validity

#### Comparison of prevalence rates to other studies

Comparisons of our prevalence rates with those from previous studies are hampered by the fact that there exist few Nordic, population-based studies focusing on men's self-reported exposure to IPV. A recent population-based study conducted in Finland (n=1119), which used similar definitions to the VAWI found lower prevalence for physical (4.4% vs 7.6%) and sexual (0.3% vs 2.3%) IPV experienced during the past year.<sup>1</sup> For earlier in life (n=1423), the same study found a higher prevalence for physical IPV (19.5% vs 6.8%) than the current study, but a lower prevalence for sexual IPV (1.6% vs 2.5%). The study did not measure psychological violence.

Although it was expected that IPV reported for the past year would be less than for earlier in life, similar levels of physical and sexual violence were reported for both periods in the current study. Furthermore, psychological violence was also reported to a considerably lesser extent for earlier in life than for the past year. These results are likely due to a pattern observed in other studies where men report significantly lower prevalence for IPV experienced earlier in life when compared with women.<sup>1 5 10</sup> One possibility is that if men experience less severe and threatening violence, it may not be salient enough for them to recall later in life. However, the results may also be due to an oversight in the questionnaire layout, where the box for ticking violence experienced earlier in life was somewhat unclearly placed. Moreover, the discrepancies may be due to differences in the definitions of violent acts. For example, the high estimates of sexual IPV found in the current study are most likely attributable to the first and relatively less severe violence item 'Demanded to have sex with me even though I did not want to (but did not use physical force)'. However, if this item were excluded and only the following two and relatively more severe VAWI items were counted, then our rate would be more similar to that in the Finnish study. Finally, the observed differences may reflect actual differences between the two countries.

#### VAWI and NorAQ

The items comprising the VAWI seem to capture a broader spectrum of violent acts, especially psychological violence, than the more systematic types of abuse reflected in the NorAQ. Given the small sample used in this analysis, we cannot draw any conclusions as to which questionnaire is more useful for assessing IPV; however, since they tap a different range of such experiences, the

choice of instrument should be made in accordance with the researcher's aim.

### Methodological considerations

The overall non-response rate was high (54.6%) and response rates were lower among young men, unmarried men, men with a lower annual income and men born outside Sweden, which compromises the generalisability of our results. Given that previous studies have found some of these groups to be associated with higher levels of IPV among men, our study may have underreported exposure to IPV.<sup>32 33</sup> Also, the earlier-in-life estimates may have been underestimated due to a minor detail on the questionnaire layout. Furthermore, the subsample of respondents who answered both the VAWI and the NorAQ is small, which limits our ability to draw conclusions or generalise to the target population.

Little is known about men's response patterns in surveys on violence exposure perpetrated by their intimate partners. A recent review of gender differences in self-reported IPV cites some studies in which men underreport their experiences of IPV,<sup>6</sup> whereas another review found studies pointing to the contrary.<sup>7</sup> Future research investigating men's patterns and reasons for responding or not responding to a postal survey on IPV, especially in a Nordic context, would shed more light on these matters.

Studies on validity assess the extent to which an instrument measures what it is intended to measure.<sup>34</sup> Future research should consider concerns raised by researchers as to the validity of instruments assessing IPV among men in view of the lack of a common definition for what constitutes male victimisation of partner violence in intimate heterosexual relationships.<sup>19</sup> Although there exist official and widely used definitions of violence against women by their intimate partners, such as the United Nation's definition of violence against women,<sup>35</sup> there is little consensus about what constitutes violence against men in an intimate relationship.<sup>31 36</sup> Even when the same act of violence is assessed, the experiences of these acts can be different due to various cultural definitions of femininity and masculinity and to how they are informed by gender hierarchy and power.<sup>7</sup> Definitions need to be clarified so that they adequately capture men's experiences of being abused in an intimate relationship.<sup>36</sup>

### CONCLUSION

The VAWI conceptual model was only partially replicated and boundaries between psychological, physical and sexual acts of violence were indistinct among men exposed to IPV. This finding suggests that research instruments assessing intimate partner violence need to be validated separately in male and female samples in order to ensure their suitability for the respective groups. However, more and larger studies with better response rates are needed in order to verify the results. Furthermore, theoretical frameworks for understanding men's exposure to intimate

partner violence need to be advanced and should serve to guide in the development and evaluation of gender-specific IPV assessment instruments.

**Contributors** LN conducted all analyses, wrote the first draft of the manuscript and rewrote new drafts based on input from coauthors. CT planned the analyses and gave input on manuscript drafts. GK designed the project, planned the analyses and gave input on manuscript drafts. All authors read and approved the final manuscript.

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