Personality traits and decision-making styles among Swedish obstetricians and gynecologists managing obstetric emergencies

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Abstract

Background: The management of an obstetric emergency is a complex phenomenon during which the team's resilience and success will also be dependent on the diversity of individuals and the variation of their responses. Such differences can be explained through personality traits. The objectives of this study are I) to compare the personality traits of obstetricians and gynecologists with those of the general population and II) to examine the relationship between obstetricians' and gynecologists' personality traits, cognitive ability, clinical experience, sex and three decision-making styles (*Individual*, *Team* and *Flow*) during obstetric emergencies.

Methods: Obstetricians and gynecologists, members of the Swedish Society for Obstetrics and Gynecology (n = 472) responded to an online questionnaire that included a simplified version of the Five Factor Model questionnaire (IPIP-NEO-30), a spatial ability test (ICAR) and 15 general questions about decision-making during obstetric emergencies relating to three decision-making styles (*Individual*, *Team* and *Flow*). A control cohort (N = 1943) from the general Swedish population was used. The data was analyzed using Pearson's correlation analysis and multiple linear regression.

Results: Swedish obstetricians and gynecologists scored ($P < 0.001$) lower on neuroticism (d = – 1.08) and higher on extraversion (d = 0.80), agreeableness (d = 1.00) and conscientiousness (d = 0.95) compared to the general population. Both *Individual* and *Team* decision-making styles correlated with work experience (r = 0.30 / – 0.23), and neuroticism (r = – 0.28 / 0.15) while *Flow* correlated with openness (r = 0.11). Multiple linear regression showed personality traits, cognitive ability, clinical experience, sex, and age had a cumulative effect on decision-making ($F(9,419) = 10.20$, $P < 0.001$, $R^2 = 0.18$).

Conclusions: Swedish obstetricians and gynecologists have a specific personality profile. Personality traits affect decision-making during obstetric emergencies. The assessment of medical errors in obstetric emergencies and their prevention through individualized training should take account of these findings.

Key Message

Management of obstetric emergencies focuses on teamwork with little attention to variations of individuals' responses. Nevertheless, personality, sex and work experience of Swedish obstetricians and gynecologists affect decision making during obstetric emergencies.

Introduction

Giving birth is relatively safe in the wealthiest parts of the world [1]. However, there are puzzling variations in delivery outcomes and intervention rates between different high-income countries, and between maternity units within the same country despite universal coverage and standardized care [2, 3]. Indeed, most of health care, including obstetrics, can be seen as a complex system [4–6]. Such complex systems behave non-linearly and are, because of the multitude of relationships between various elements of the system, intrinsically difficult to predict [5]. During obstetric emergencies, decisions are made by interactions among practitioners in relation to patients that are continuously assessed based on various risk factors and new informational inputs [4, 5]. As impulses to action often emerge from a range of informal, sometimes less visible, conversational exchanges, it is frequently difficult to determine who actually made the decisions [7, 8]. From this perspective, an increasing interest in teams and teamwork has naturally developed within obstetrics [9–11]. Yet, it is often forgotten that the resilience and success of a team will be dependent on the individuals' competence, diversity, and adaptability [5, 6, 12]. This diversity among individuals and the resulting variations in their responses to a similar situation can partly be seen as the result of personality traits [13, 14]. Scientifically, personality traits can be organized according to the Five Factor Model (FFM) containing the dimensions of neuroticism (eg, emotional instability, anxiety and pessimism), extraversion (eg, sociability and assertiveness), openness (eg, creativity, curiosity and imaginativeness), agreeableness (eg, expression of compassion, respect, and trust) and conscientiousness (eg, being responsible, trustworthy, orderly and hardworking) [15, 16]. The reliable and replicable framework of the FFM has led to a substantial research literature linking personality to various individual, interpersonal, and social-institutional outcomes [13, 14, 16, 17]. For physicians working in obstetric care, only a few studies have discussed the impact of personality on the choice of this specialty, on physicians' responses to stress, on teamwork, and obstetrical outcomes [18–22]. To the best of our knowledge no previous research has explored the personality of obstetricians and gynecologists according to the FFM in relationship to a background population and to decision-making during obstetric emergencies. The aims of this study are I) to compare the personality traits of obstetricians and gynecologists with those of the general population and II) to examine the relationship between obstetricians and gynecologists' personality traits, cognitive ability, clinical experience, sex and three decision-making styles (*Individual*, *Team* and *Flow*) during obstetric emergencies.

Methods

A questionnaire (Supplementary Material: Questionnaire S1) was constructed using the online tool *Google forms*. It consisted of six different parts: (I) demographic questions such as age, sex, work place and work experience, (II) questions regarding the preference for obstetrics or gynecology, (III) a simplified version of the FFM standardized psychometric test (IPIP-NEO-30) [23] and three cube rotations (ICAR spatial ability) [24], (IV) general questions about decision-making during obstetric emergencies (Table 1), (V) questions related to three different obstetric

Table 1. General questions related to different decision-making styles during obstetric emergencies

"During obstetric emergencies…	
- **Individual-centered style:**	· … the responsibility rests with me". · … I take in information, process and give directives". · … guidelines are important". · … structure creates a sense of safety". · … there are right and wrong decisions".
- **Team-based style:**	· … my focus is on the birthing woman and her partner". · … it's nice to have a sparring partner". · … we help each other out in the team". · … different team members' contributions are important". · … I think of the consequences for the birthing woman".
- **Flow-oriented style:**	· … I trust my intuition". · … I don't always know what's right". · … I sometimes need to improvise". · … the outcome is beyond my control but it's important". that everyone does her/his best. · … I trust the process/higher powers.

emergency scenarios and (VI) questions concerning the overall satisfaction with the questionnaire. The Likert scale was used for most questions, some others had a yes or no type of answer or multiple choice, and a few had a field for free text answering. The 15 general questions on decision-making during obstetric emergencies (item 23 in the questionnaire) as well as questions related to various scenarios (item 20, 21 and 22 in the questionnaire) were constructed based on results from an interview study [25]. The 15 questions were designed to reflect various aspects of three decision-making styles: an individual-centered, a team-based and a flow-oriented (Table 1). This was supported by the literature [21, 26-32]. In the present context – and according to the definition of the Oxford English dictionary – 'style' should be understood as "a particular procedure by which something is done; a manner or way", and can even be equated with 'strategy'. Here, the flow-oriented decision-making style demands particular commenting. 'Flow' refers to a relatively uncommon state of mind in which the person performing an activity is fully immersed in a feeling of energized focus and enjoyment in the process of that activity [30]. When in a state of flow, individuals appear to act more intuitively [31, 32]. 'Flow' is mostly accidental and occurs under circumstances of presumed "optimal stress" (eg, an obstetric emergency) [30]. However, in the previously mentioned interview study, physicians also described being able to volitionally enter a flow state. In this study, 'flow' was therefore assumed to be both a spontaneous state of mind and a distinct strategy the *Ob&Gyn* would be able to choose [33].

The questionnaire was sent out between October-November 2020 to all Swedish obstetricians and gynecologists that were members of the Swedish Society for Obstetrics and Gynecology – (*Svensk Förening för Obstetrik och Gynekologi, SFOG*). A reminder was sent after three weeks. According to *SFOG*'s 2019 annual report, the organization comprised of 2180 members, trainees and specialists in obstetrics and gynecology. A total of 480 retired physicians, some of which were still working part-time, were also among the members. Inclusion stopped at 513 responses, of which 472 were used for the analysis (ie, corresponding to a 22 % answering rate). Out of the initial 513 obstetricians and gynecologists *(Ob&Gyn)* respondents, two were excluded for working abroad and one for not answering the questionnaire. Thirty eight duplicates were also, eventually excluded. The inclusion of responses was stopped after a noticeable slowing down of incoming answers. The result estimates were deemed to be within power for the study design [34, 35](Sample Size Calculators. Available from: https://www.sample-size.net/). A sample from the general Swedish population (*the general population*) consisting of 1943 respondents was used as reference group [23].

Statistical analyses

Reliability analysis using Cronbach's alpha was performed to verify the results of IPIP-NEO-30 [23] for both *Ob&Gyn* and *the general population*. Furthermore, Cronbach's alpha was used when creating three new dependent variables reflecting the different decision-making styles: *Individual*, *Team* and *Flow*. The study being about human behavior, a Cronbach's alpha of 0.60 rounded at the second decimal was considered adequate [36]. If Levene's test was significant ($P < 0.05$), suggesting a violation of the assumption of equal variances, Welch's t-test instead of Student's t-test, was used for comparisons between two study groups (a) *Ob&Gyn* and *the general population* and (b) women and men. Omnibus ANOVA/ANCOVA was used for evaluating the impact of covariates. Linear regression analysis was performed as a descriptive, explanatory modeling for decision-making using *Individual*, *Team* and *Flow* as dependent variables. The different covariates taken into account were sex, age, work experience, neuroticism, extraversion, openness, agreeableness, conscientiousness, and cognitive ability. The Pearson correlation analysis was also performed between personality traits and the three decision-making styles. The following cut-off values were used to assess the strength of a correlation: $r \geq 0.30$ showed a strong correlation and $r \leq 0.20$ showed a weak correlation, values in-between showed a moderate correlation, and r below 0.10 was considered very weak [37]. A power calculation for a correlation analysis with $r > 0.1$ ($\alpha = 0.05$, $\beta = 0.20$) was performed prior, corresponding to an optimal sample size estimate of 783 responses, [38](Sample Size Calculators. Available from: https://www.sample-size.net/). All statistical analyses were performed using the open source program *Jamovi*.

Results

Cohorts

Most physicians in the *Ob&Gyn* study sample were women (79.5 %) who on the average were significantly ($P < 0.001$) younger and less experienced than the men (Table 2). The number of respondents from each of the six

Table 2. Study sample: Ob&Gyn[a]

n = 375 / 97	Mean (/)	Min. (/)	Max. (/)	Mean difference in years ($P < 0.001$)	95% CI in years	Effect size
Age	45 / 53	28 / 29	90 / 82	9	6 / 12	0.68
Work experience	13 / 22	< 1 year	46 / 50	8	5 / 11	0.61

a: Welch's t-test was used, Levene's test being significant ($P < 0.05$)

health care districts in Sweden was proportional to the number of its inhabitants and births (Supplementary Material: Figure S1). The number of women and men in *the general population* was approximately equal (48 % women and 52 % men), age followed a normal distribution with an average of 29,6 years (min. 19 years and max. 66 years) and there were no significant age differences between sexes.

Personality traits and cognitive ability

The reliability analysis showed an adequate Cronbach's alpha for all five personality traits in the *Ob&Gyn* sample: 0.82 for neuroticism, 0.77 for extraversion, 0.73 for openness, 0.62 for agreeableness and 0.73 for conscientiousness. On average, women scored significantly higher than men for: neuroticism (d = 0.45, $P < 0.001$), agreeableness (d = 0.55, $P < 0.001$) and conscientiousness (d = 0.31, $P < 0.01$). No significant differences were found between sexes in scores for: extraversion (d = 0.18), openness (d = – 0.06) and cognitive ability (d = 0.12). The personality trait scores for *the general population* sample, based on the same 30 items used in the simplified version of the FFM for *Ob&Gyn* (ie, IPIP-NEO-30), were also found reliable: 0.84 for neuroticism, 0.86 for extraversion, 0.68 for openness, 0.79 for agreeableness and 0.82 for conscientiousness. Furthermore, convergence validity (r = 0.86, $P < 0.001$) was found between scores based on the full 120 items (ie, IPIP-NEO-120) and the IPIP-NEO-30 scores for *the general population*. On average, women scored significantly higher than men for: neuroticism (d = 0.44, $P < 0.001$), extraversion (d = 0.18, $P < 0.001$), openness (d = 0.13, $P = 0.005$), agreeableness (d = 0.65, $P < 0.001$) and conscientiousness (d = 0.18, $P < 0.001$). The data set for *the general population* did not contain information about cognitive ability.

Differences between *Ob&Gyn* and *the general population*

The initial comparison of personality traits scores between *Ob&Gyn* and *the general population* showed significant differences ($P < 0.001$). On average, *Ob&Gyn* was found to score lower on neuroticism (d = − 1.08) and to score higher on extraversion (d = 0.80), agreeableness (d = 1.00) and conscientiousness (d = 0.95) compared to *the general population*. No significant difference was found for openness. However, when adjusting for sex and age, new differences between the study groups appeared for openness, while remained for the other traits (Table 3, and Supplementary Material: Figure S2).

Table 3. Effect of various factors on personality traits (B = Estimate, SE = Standard Error, β = standardized estimate).

	Neuroticism (R^2 = 0.21)***			Extraversion (R^2 = 0.10)***			Openness (R^2 = 0.02)***		
	B	SE	β	B	SE	β	B	SE	β
The general population – Ob&Gyn	0.41***	0.05	0.47***	− 0.49***	0.04	− 0.74***	0.09**	0.03	0.17**
Woman – Man	0.25***	0.03	0.38***	0.09***	0.04	0.14***	0.11***	0.02	0.21***
Age	− 0.01***	0.00	− 0.19***	− 0.00	0.00	− 0.01	0.00***	0.00	0.09***

	Agreeableness (R^2 = 0.21)***			Conscientiousness (R^2 = 0.15)***		
	B	SE	β	B	SE	β
The general population – Ob&Gyn	− 0.31***	0.03	− 0.55***	− 0.37***	0.04	− 0.62***
Woman – Man	0.29***	0.02	0.51***	0.08***	0.02	0.14***
Age	0.01***	0.00	0.16***	0.01***	0.00	0.16***

***: $P < 0.001$, **: $P < 0.01$, *: $P < 0.05$

Correlations between *Ob&Gyn* personality traits and decision-making styles

The reliability analysis for each of the decision-making styles was found adequate: 0.70 for *Individual* (using items 23.1 to 23.4), 0.62 for *Team* (using items 23.7 to 23.9) and 0.60 for *Flow* (using items 23.11 to 23.15). The calculated Cronbach's alpha of *Flow* was 0.590. Items 23.5, 23.6 and 23.10 were excluded to increase reliability. The significant results from the correlation analysis are presented in table 4. The correlation factor of work experience and age being close to one

Table 4. Correlation matrix between personality traits and decision-making styles

	Work experience	Neuroticism	Extraversion	Openness	Agreeableness	Conscientiousness	Individual	Team
Neuroticism	− 0.34***							
Extraversion		− 0.26***						
Openness	0.11*		0.18***					
Agreeableness			0.23***	0.18***				
Conscientiousness		− 0.30***	0.23***		0.22***			
Cognitive ability	− 0.14**		− 0.15***					
Individual	0.30***	− 0.28***	0.14**	0.17***	0.20***	0.17***		
Team	− 0.23***	0.15**	0.13**	0.16***	0.18***		0.09*	
Flow				0.11*			0.12**	0.15**

***: $P < 0.001$, **: $P < 0.01$, *: $P < 0.05$

(r = 0.94, $P < 0.001$), we only chose to use work experience in the table. To control for all five personality traits as well as covariates, results from multiple linear regression analysis (Table 5) for

Table 5. Regression models: the effects of personality traits on the decision-making styles (B = Estimate, SE = Standard Error, β = standardized estimate).

	Individual (R^2 = 0.18)***			Team (R^2 = 0.15)***			Flow (R^2 = 0.05)*		
	B	SE	β	B	SE	β	B	SE	β
Sex	0.02	0.06	0.05	0.13*	0.06	0.26*	0.10	0.08	0.16
Age	0.00	0.01	0.02	0.01*	0.01	0.31*	− 0.00	0.01	− 0.03
Work experience	0.01	0.01	0.22	− 0.02***	0.01	− 0.46***	0.01	0.01	0.10
Neuroticism	− 0.13***	0.04	− 0.17***	0.10*	0.04	0.12*	0.07	0.06	0.07
Extraversion	0.00	0.03	0.00	0.08*	0.04	0.10*	− 0.06	0.05	− 0.06
Openness	0.06	0.03	0.09	0.12***	0.03	0.16***	0.11*	0.04	0.11*
Agreeableness	0.14**	0.05	0.15**	0.12*	0.05	0.11*	0.09	0.07	0.07
Conscientiousness	0.06	0.04	0.07	0.02	0.05	0.02	− 0.09	0.06	− 0.08
Cognitive ability	− 0.00	0.02	− 0.01	0.02	0.02	0.04	− 0.04	0.03	− 0.08

***: $P < 0.001$, **: $P < 0.01$, *: $P < 0.05$

Individual decision-making style indicated that there was a significant model effect from sex, age, work experience, personality traits and cognitive ability, (F (9,419) = 10.20, $P < 0.001$, $R^2 = 0.18$). Each individual predictor was examined further and indicated that neuroticism (β = – 0.17, $P < 0.001$) and agreeableness (β = 0.15, $P = 0.002$) were significant predictors in the model. Results from multiple linear regression analysis for *Team* decision-making style indicated that there was a collective significant effect between the sex, age, work experience, personality traits and cognitive ability (F (9,421) = 7.93, $P < 0.001$, $R^2 = 0.15$). Each individual predictor was examined further and indicated that sex (ie, being a woman) (β = 0.26, $P = 0.032$), age (β = 0.31, $P = 0.019$), work experience (β = – 0.46, $P = 0.001$), neuroticism (β = 0.12, $P = 0.025$), extraversion (β = 0.10, $P = 0.041$), openness (β = 0.16, $P < 0.001$) and agreeableness (β = 0.11, $P = 0.021$) were significant predictors in the model. Results from multiple linear regression analysis for *Flow* decision-making style indicated that there was a collective significant effect between the sex, age, work experience, personality traits and cognitive ability (F (9,417) = 2.20, $P = 0.021$, $R^2 = 0.05$). Each individual predictor was examined further and indicated that openness (β = 0.11, $P = 0.021$) was a significant predictor in the model. The cognitive ability was not related to the decision-making styles.

Discussion

Swedish obstetricians and gynecologists have a personality trait profile that is different from the general Swedish population. This is similar to other studies linking personality to occupational choices [17] and to choices of academic discipline (ie, Humanities, Arts, Psychology, Political Science, etc.) [39]. More specifically, although Swedish medical students get exposed to different specialties during their clinical rotations, they would eventually choose what best suits their temperament and personality. Indeed, this is suggested by another study that adapted other personality test results to the FFM, demonstrating that medical students that chose obstetrics and gynecology as a specialty were highly conscientious and had lower scores for openness and agreeableness, compared to those choosing other specialties [18]. Although one should be cautious of generalizations, obstetric emergencies are potentially high stake situations that can quickly escalate from non-normal to crisis [8]. It is in this setting that physicians need to act swiftly and calmly under time pressure [25]. A lower level of neuroticism would evidently be an advantage for dealing with stress and uncertainty in such moments [40, 41]. Similarly, a higher level of extraversion as the expression of being comfortable in taking center stage, and being able to have a clear and open communication in a moment of information overload would also be an advantage [40]. Low levels of openness are synonymous with risk avoidance, predictability, focus, pragmatism and trusting data more than feelings, which could be desirable during an emergency [42]. Higher levels of conscientiousness would coincide with wanting to do “the right thing”, and being able to maintain a mental effort over time in situations that deal with the lives of a mother and a child during birth [40]. A high level of agreeableness, especially combined with a high level of conscientiousness would be favorable in situations that naturally involve a need for cooperative interactions between team members, such as childbirth, and particularly during emergencies [43]. Further research into what motivates physicians to choose the specialty of obstetrics and gynecology would be valuable.

In each of the three regression models, personality traits in combination with sex, age, work experience, and cognitive ability strongly predicted the *Individual* and *Team* styles, and moderately predicted the *Flow* style of decision-making [37](Effect Size Converter. Available from: https://www.escal.site). However, different factors were significant for each style. Emotional stability was most important for the *Individual* style. A lack of experience was most important for the *Team* style. Openness to experience was most important for the *Flow* style. Considering the correlation analysis, an inverse relationship was found for the *Individual* and *Team* styles with neuroticism and work experience. These combined findings suggest that the less experienced physicians are, the more they turn to a team-based style for decision-making. Notably, anxiety (ie, a facet trait of neuroticism) has been shown as essential for efficient functioning in situations that require caution, self-discipline and the general anticipation of threat, such as an obstetric emergency [44]. This would possibly explain why dialogue and peer support, as a strategy, could compensate for a greater emotional insecurity [45]. Women are also known to take fewer risks than men [46] possibly explaining the significance of female sex on the *Team* style. Also, neuroticism is well known to diminish with age [14]. Thus, as *Ob&Gyn* get older and develop their skills they naturally become more self-sufficient. Today there is a consensus that teamwork is not only an essential normal part of daily work, but also the key to solving many complex clinical problems [10, 28, 29, 47, 48]. That *Ob&Gyn* become more and more individual-centered in their decision-making as they progress professionally is difficult to reconcile with the idea that teamwork is inherently better, at least within emergency obstetric care. A more critical appraisal of teams and teamwork has more recently been voiced [49]. In summary and to paraphrase Neuhaus et al.: “medicine has currently settled for a reductionist and simplistic approach towards teamwork in the management of health care’s associated complexities, creating confusion for practitioners, and in disregard of their needs for sophisticated professional standards” [49].

The *Flow* style being moderately explained by the combined effect of the predictors confirms the assumption that part of the flow state is tied to individual factors and is a worthwhile strategy during decision-making [33, 50]. Previous research has in fact suggested that there are positive relationships between flow and the personality traits of openness, extraversion, and conscientiousness (Hager PL. Flow and the Five-Factor Model of personality characteristics [Dissertation]. Kansas City: University of Missouri; 2015). Results from that thesis somewhat contrast with ours, but can be explained by the fact that a standardized scale was used to measure flow (ie, the Dispositional Flow Scale – 2). Nevertheless, openness being the significant predictor in our model is of particular interest since some of its facet traits have been shown to either facilitate or impede the experience of flow, as also shown by Hager. In fact, some attributes of flow and openness are shared, such as being cognitively and emotionally more open and flexible while others are in direct opposition, such as being alert and having focused attention [30, 42]. The mixed aspects of openness, combined with the facts that it is a notoriously difficult trait to measure [42], and that *Ob&Gyn* scored significantly lower than *the general population*, could explain why

openness had a weak effect. In addition, actively working to get into a flow state goes contrary to modern day principles of safety in obstetric (ie, following guidelines and standard algorithms) [4, 9, 11]. A further exploration of the flow dimension of decision-making among obstetricians and gynecologists would be of interest.

There are two main limitations to our study. Firstly, we were only able to compare the personality traits scores of our *Ob&Gyn* sample set with *the general population*, and not with other physicians, health care professionals or academics. However, a British study assessing surgeons' personalities found that they scored significantly higher for neuroticism, openness, agreeableness, and conscientiousness compared to the background population. Furthermore, surgeons developed more neuroticism with experience and female surgeons scored higher in openness and extraversion [51], which differs from our study. Differences in personality are known to be greater within a country than between countries [13]. Hence, the differences between surgeons and obstetricians and gynecologists are either likely true or affected by instrument incompatibilities (ie, the British study used 50 unspecified questions from the FFM whereas this study used the standardized IPIP-NEO-30). Secondly, decision-making during obstetric emergencies in real time is a complex phenomenon and conceptualization into styles, as attempted for the purpose of this study, will always be limiting [5, 7, 8]. Nevertheless, the construction of styles was based on results from an interview study [25], and further supported by the literature [21, 26-32]. Reliability analysis was sufficient, giving the defined styles further credibility. A further exploration of decision-making styles during obstetric emergencies is warranted, possibly through ethnographic observations.

Conclusions

Swedish obstetricians and gynecologists have a characteristic personality trait profile. They score significantly higher on extraversion and conscientiousness, and significantly lower on neuroticism and openness. During decision-making in obstetric emergencies, respondents tend to prefer an individual-centered style as they gain more experience. Women prefer working in teams. The results on personality regarding a more intuitive type of decision-making in obstetric emergencies warrant further research. The findings presented herein should be taken into consideration during recruitment and education of trainees and proficient physicians alike. They also invite for a higher level of nuancing in the assessment and prevention of medical errors in obstetric emergencies.

Abbreviations

IPIP-NEO-30: is the acronym for 'International Personality Item Pool – Neuroticism, Extraversion & Openness' and is a personality questionnaire that assesses people on the Five Factor Model with 30 items.

FFM: stands for the Five Factor Model. The model represents five broad trait dimensions of the personality.

Declarations

Ethics approval and consent to participate

The study was approved by the regional ethics review board (Lund University, permit number LU 2018/198). **Informed consent** was obtained from the study participants. Participation could be terminated at any time. All methods were carried out in accordance with relevant guidelines and regulations.

Consent for publication

Not applicable.

Availability of data and materials

The dataset generated and analyzed during the current study is available upon request to The Swedish National Data Service, and for research purposes only, https://snd.gu.se/en/catalogue/study/2022-57

Competing interests

GMR, PK and SRH declare that they have no relevant financial or non-financial competing interests to report.

Author contributions

GMR and SRH conceived the presented idea. PK and GMR developed the theory and questionnaire and GMR performed the computations. PK provided additional reference group data. PK verified the analytical methods and results. All authors discussed the results. GMR wrote the manuscript with support from PK and SRH. All authors contributed to the final version of the manuscript. PK and SRH supervised the project.

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