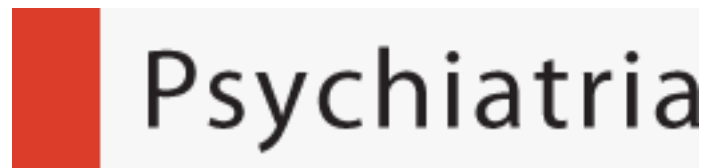


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## **Anxiety and depression screening among Polish adults in 2023: Depression levels are higher than in cancer patients**

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## ORIGINAL PAPER

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### **Anxiety and depression screening among Polish adults in 2023: Depression levels are higher than in cancer patients**

**Short title:** Anxiety and depression screening

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#### **Abstract**

**Introduction:** This study presents a brief report on the psychometrics of the WHO-Five Well-being Index (WHO-5) and a screening assessment of probable anxiety and depression disorders in a general community sample of Poles. The study aimed to (1) examine the factorial validity and measurement invariance of the Polish WHO-5 across age and gender groups, and (2) estimate the prevalence of probable anxiety and depression disorders using two screening questionnaires, i.e., the WHO-5 and the Patient Health Questionnaire-4 (PHQ-4).

**Material and methods:** The sample included 1115 Polish adults (661 females, 438 males, and 16 non-binary people) aged 18–72 recruited from the general population in July 2023. The Polish versions of the WHO-5 and the PHQ-4 were applied.

**Results:** The Polish WHO-5 had an intended 1-factor structure and was invariant across two age and two gender groups. Based on the recommended WHO-5 cut-off scores of  $\leq 12$ , more than 71% of respondents in all age-gender groups (aged 18–29 and older) were screened positively for depression. In the whole sample, 59.28% and 52.91% of the respondents were screened positively for anxiety and depression, respectively (based on the PHQ-4 cut-off scores of  $\geq 3$  for the anxiety and depression subscales). Females aged 18–29 and non-binary people were very high-risk groups for psychopathology.

**Conclusions:** Compared to previous Polish studies and other diverse cultural samples, the prevalence of probable anxiety and depression disorders in Polish adults in July 2023 was extremely high. Clinical interviews and a mixed methods approach are required to a more in-depth examination of this state of affairs.

**Keywords:** anxiety; depression; measurement invariance; Patient Health Questionnaire-4; prevalence; psychometric properties; psychopathology; questionnaire; screening; WHO-Five Well-being Index

## Introduction

This study presents a brief report on screening depression and anxiety disorders in a general community sample of Polish adults. Recent studies in Polish general community samples highlighted the high vulnerability of mental health status of adults and adolescents. For instance, the screening assessment of probable depression and anxiety disorders conducted from February 2022 to July 2022 in a large ( $n = 2557$ ) and diverse sample of Poles using the Patient Health Questionnaire-4 (PHQ-4) documented that more than half of respondents aged 18–59 were screened positively for anxiety and/or depression, and more than one-third of older respondents were also screened positively [1]. Recent research has shown that probable post-traumatic stress disorder had 18.8% Polish adults that was revealed in a representative sample of 1598 Polish adults studied between September 2022 and October 2022 using the Posttraumatic Diagnostic Scale for Diagnostic and Statistical Manual of Mental Disorders–Fifth Edition [2].

As for young adults and adolescents, the study conducted from November 2020 to January 2021 in a sample of 1500 respondents aged 18–23 years using the Kutcher Adolescents Depression Scale indicated that the prevalence of possible depression was 56.5% [3]. Another report revealed that 31% of Polish adolescents aged 15–19 had clinically significant alexithymia levels among 730 studied respondents (the study was conducted from September to November 2021 using the Toronto Alexithymia Scale-20) [4]. In general, the authors of the above-described studies indicated that the high prevalence of clinically meaningful symptoms of mental disorders and risk factors for psychopathology (*i.e.*, alexithymia), as measured by different questionnaires, is in many cases significantly higher compared to rates reported in other cultural samples across the world. Therefore, a screening assessment of psychopathology is important in order to provide mental health prevention in the general

population of Poles.

In this study, the screening assessment of depression and anxiety disorders was conducted in July 2023 (one year later than the previous screening [1]) with the 4-item PHQ-4 [5] and the 5-item WHO-Five Well-being Index (WHO-5) [6, 7]. The PHQ-4 is an ultra-brief self-report questionnaire for screening depression (two items) and anxiety (two items), whereas the WHO-5 is a 5-item questionnaire for measuring well-being, which can also be used as a screening tool for depression. Previous studies, systematic reviews and meta-analyses indicated that the WHO-5 and PHQ-4 are suitable for use in primary care for screening depression and anxiety disorders, being psychometrically sound questionnaires with good screening properties [5, 8–10]. The strong psychometric properties and measurement invariance across different age and gender groups of the PHQ-4 were empirically supported in Polish adults [1]. While Cichoń et al. [11] examined the psychometric properties of the Polish WHO-5 in adults with diabetes, supporting its good convergent validity, internal consistency reliability and screening characteristics, there are presently no data on the psychometrics of the WHO-5 in a general community sample of Poles. Moreover, in order to compare latent means between demographics backgrounds meaningfully [12], there is a need to examine measurement invariance of the Polish WHO-5. In this paper, it was examined between females and males, and two age groups (younger people vs older people).

The aims of the study were (1) a more in-depth examination of the WHO-5's factorial validity and its measurement invariance for different age and gender groups in a general community of Polish adults, and (2) an estimation of the prevalence of probable anxiety and depression disorders using the WHO-5 and the PHQ-4 screening questionnaires.

## Material and methods

### *Participants and procedure*

The sample consisted of 1115 Polish-speaking adults (661 females, 438 males, and 16 non-binary) with ages ranging from 18 to 72 years from the general population. Detailed sociodemographic characteristics of the sample are presented in Table 1.

**Table 1.** Sociodemographic characteristics of the study sample

Sociodemographic characteristics		n	%
Age	Mean = 27.81, standard deviation = 10.90, median = 24, min. = 18, max. = 72	1115	100

Gender	Females	661	59.28
	Males	438	39.28
	Non-binary	16	1.43
Residence	Large cities (above 100000 inhabitants)	472	42.33
	Towns (from 20000 to 100000)	244	21.88
	Small towns (up to 20000)	117	10.49
	Villages	282	25.29
Education	Higher	395	35.43
	Secondary	601	53.90
	Vocational	60	5.38
	Primary	59	5.29
Marital status	Single	559	50.13
	In relationships	556	49.87

The current data on the WHO-5 and PHQ-4 were derived from the author's unpublished but ongoing research project. The scope of that short project was alexithymia, where the WHO-5 and PHQ-4 were used as correlates of alexithymia. In that project, the participants were recruited in July 2023 via Facebook and Instagram, where there was a link to an online anonymous survey by a Google Forms platform with an appended consent form. All respondents had provided their written informed consent digitally before they completing the survey. That research project was conducted in accordance with the Declaration of Helsinki Ethical Principles and was approved by the Kazimierz Wielki University Ethics Committee (No. 1/13.06.2022, later revision 27.06.2023). For the current study, the data on the WHO-5 and PHQ-4 from that project were reanalyzed to provide a screening assessment of anxiety and depression disorders.

## *Measures*

### ***The WHO-Five Well-being Index (WHO-5)***

The WHO-5 is a 5-item self-report questionnaire for measuring positive well-being [6, 7]. Items (e.g., I feel cheerful and in good spirits) are scored on a 6-point scale ranging from 0 (*at no time*) to 5 (*all the time*), with higher scores indicating a higher level of well-being. The raw WHO-5 score (ranging from 0 to 25) is multiplied by 4 to give the final score from 0 (indicating the worst imaginable well-being) to 100 (indicating the best imaginable well-

being). A final WHO-5 cut-off score of  $\leq 50$  is recommended for clinical depression screening. Therefore, a raw WHO-5 score of  $\leq 12$  indicates a positive result on depression screening. A more restrictive WHO-5 cut-off score of  $\leq 28$  and its corresponding raw score of  $\leq 7$  can also be used [6, 7].

### ***The Patient Health Questionnaire-4 (PHQ-4)***

The PHQ-4 is a 4-item self-report questionnaire for measuring anxiety and depression symptoms over the previous two weeks [5, 9]. The PHQ-4 has two subscales: anxiety (two items, e.g., *Feeling nervous, anxious, or on edge*) and depression (two items, e.g., *Feeling down, depressed, or hopeless*). A total score can be also calculated as an overall marker of psychological distress. Items are scored on a 4-point scale from 0 (*not at all*) to 3 (*nearly every day*). Higher scores indicate higher levels of symptoms. In this study, the Polish version of the PHQ-4 was used [1].

### ***Analytic strategy***

Statistical analyses were carried out using Statistica 13.3 and R 4.3.0 with the *lavaan* and *psych* statistical packages. McDonald's omega values ( $\omega$ ) and Cronbach's alpha coefficients ( $\alpha$ ) with 95% confidence intervals (95% CI) were calculated. For these coefficients, values  $\geq 0.70$  were judged as acceptable,  $\geq 0.80$  as good, and  $\geq 0.90$  as excellent [13].

Pearson correlations between age and WHO-5, and PHQ-4 scores were calculated. Student's *t*-test was used to compare WHO-5 scores between two gender groups (females vs males). For this test, Cohen's *d* effect size (with the following interpretation:  $< 0.20$  very small,  $0.20$ – $0.49$  small,  $0.50$ – $0.79$  moderate, and  $\geq 0.80$  large) [14] was calculated using the Psychometrica calculator [15].

Confirmatory factor analysis with maximum likelihood estimation with robust standard errors and the Satorra–Bentler scaled test statistic was used. A theoretically informed 1-factor model of the WHO-5, where all five items were specified to load on a general well-being factor, was tested. Goodness-of-fit was judged based on the following fit index values: root mean square error of approximation (RMSEA) with 90% CI, standardized root mean square residual (SRMR), comparative fit index (CFI), and Tucker–Lewis index (TLI). RMSEA and SRMR values  $\leq 0.08$  indicate acceptable fit and values  $\leq 0.06$  excellent fit. CFI and TLI values  $\geq 0.90$  indicate acceptable fit and values  $\geq 0.95$  excellent fit [16].

The measurement invariance of the WHO-5 across two gender and two age groups separately was examined. First, the goodness-of-fit was evaluated separately for each group. Second, the

configural, metric and scalar invariance models were tested. Models were compared in terms of the CFI, when an absolute difference in CFI ( $\Delta$ CFI) of less than 0.01 indicates full invariance [17].

## Results

### Descriptive statistics

Descriptive statistics for the WHO-5 and PHQ-4 scores were presented in Table 2. The WHO-5 and PHQ-4 showed acceptable internal consistency reliability ( $\omega$  and  $\alpha \geq 0.74$ ).

**Table 2.** Descriptive statistics for the WHO-5 and PHQ-4 scores

Scale/subscale	Total sample (n = 1115)				Females (n = 661)		Males (n = 438)		Non-binary (n = 16)	
	$\omega$ (95% CI)	$\alpha$ (95% CI)	M	SD	M	SD	M	SD	M	SD
WHO-5 Total score	0.85 (0.84; 0.87)	0.85 (0.84; 0.87)	8.55	4.93	8.21	4.85	9.13	5.03	6.69	3.52
PHQ-4 Anxiety	0.74 (0.70; 0.77)	0.74 (0.70; 0.76)	3.34	1.84	3.49	1.83	3.06	1.83	4.75	1.34
PHQ-4 Depression	0.77 (0.74; 0.80)	0.77 (0.74; 0.80)	2.90	1.94	2.96	1.94	2.78	1.93	3.94	1.81
PHQ-4 Total score	0.85 (0.83; 0.86)	0.84 (0.82; 0.85)	6.24	3.47	6.45	3.45	5.84	3.46	8.69	2.87

M — mean; SD — standard deviation,  $\alpha$  — Cronbach's alpha;  $\omega$  — McDonald's omega; CI — confidence interval

### Factor structure and measurement invariance

In the total sample, the intended 1-factor model was a poor fit [CFI = 0.937; TLI = 0.874; RMSEA = 0.165 (90% CI: 0.140; 0.191); SRMR = 0.045]. The modification indices were analyzed, and the correlated error term between item 1 and item 2 was added. Its addition improved fit index values [CFI = 0.990; TLI = 0.976; RMSEA = 0.072 (0.045; 0.102); SRMR = 0.016]. Therefore, the 1-factor model with the error term was the best fitting model in this data-set. All WHO-5 items loaded well (factor loadings  $\geq 0.695$ , all  $ps < 0.001$ ) on its intended factor (Tab. 3). The fit index values were also good for two gender groups and two age groups.

**Table 3.** Descriptive statistics of the WHO-5 statements and standardized factor loadings from confirmatory factor analysis of the 1-factor model with the error term between item 1 and item 2 (n = 1115)

WHO-5 statements	<i>M</i>	<i>SD</i>	Skewnes s	Kurtosis	Factor loadings
1. I have felt cheerful and in good spirits	2.19	1.13	0.21	-0.87	0.711
2. I have felt calm and relaxed	1.76	1.22	0.43	-0.55	0.695
3. I have felt active and vigorous	1.72	1.23	0.53	-0.30	0.774
4. I woke up feeling fresh and rested	1.09	1.22	1.14	0.68	0.715
5. My daily life has been filled with things that interest me	1.79	1.39	0.60	-0.50	0.713

*M* = mean; *SD* = standard deviation. All factor loadings are statistically significant ( $ps < 0.001$ )

**Table 4.** Factor structure and measurement invariance for the WHO-5 across two gender and two age groups

Samples	$\chi^2$ (df)	CFI	TLI	RMSEA (90% CI)	SRMR	$\Delta$ CFI
1-factor model						
Total sample (n = 1115)	117.806 (5)	0.937	0.874	0.165 (0.140; 0.191)	0.045	–
1-factor model with the error term between item 1 and item 2						
Total sample (n = 1115)	22.740 (4)	0.990	0.976	0.072 (0.045; 0.102)	0.016	–
Females (n = 661)	18.081 (4)	0.988	0.970	0.081 (0.046; 0.121)	0.020	–
Males (n = 438)	9.991 (4)	0.992	0.981	0.064 (0.012; 0.115)	0.017	–
Younger people aged 18–29 (n = 776)	10.085 (4)	0.995	0.987	0.050 (0.010; 0.090)	0.014	–
Older people aged 30–72 (n = 339)	18.719 (4)	0.981	0.953	0.108 (0.062; 0.160)	0.022	–
Gender invariance (females vs males)						
Configural	28.189 (8)	0.990	0.974	0.075 (0.046; 0.102)	0.017	–



				0.105)		
Metric	37.384 (12)	0.987	0.979	0.068 (0.044; 0.094)	0.033	-0.003
Scalar	51.931 (16)	0.983	0.978	0.069 (0.048; 0.090)	0.036	-0.004
Age invariance (younger people aged 18–29 vs older people aged 30–72)						
Configural	28.028 (8)	0.990	0.975	0.073 (0.045; 0.103)	0.014	–
Metric	33.405 (12)	0.990	0.983	0.061 (0.037; 0.086)	0.023	0
Scalar	58.509 (16)	0.981	0.976	0.073 (0.053; 0.093)	0.032	-0.009

$\chi^2$  — chi-square statistic; df — degrees of freedom; CFI — comparative fit index; TLI — Tucker–Lewis index; RMSEA — root mean square error of approximation; CI — confidence intervals; SRMR — standardized root mean square residual

Then, the configural, metric and scalar invariance across gender and age separately was tested (Tab.4). The  $\Delta$ CFI indicated full metric and scalar invariance for gender and age ( $\Delta$ CFI from -0.009 to 0). The full scalar invariance indicates that the latent structure of the well-being construct, as measured by the WHO-5, is similarly construed by females and males, as well as younger people and older people. This implicates that latent means, i.e., WHO-5 total scores, can be compared across these groups meaningfully [12].

### *Demographic differences*

A series of Student's *t*-test revealed statistically significant differences between females and males in well-being ( $t = -3.03$ ,  $df = 1097$ ,  $p = 0.002$ , Cohen's  $d = -0.19$ , indicating a very small effect size), anxiety symptoms ( $t = 3.77$ ,  $df = 1097$ ,  $p < 0.001$ , Cohen's  $d = 0.23$ , indicating a small effect size), and PHQ-4 total scores ( $t = 2.84$ ,  $df = 1097$ ,  $p = 0.005$ , Cohen's  $d = 0.175$ , indicating a very small effect size). There were no statistically significant differences between females and males in depression symptoms ( $t = 1.49$ ,  $df = 1097$ ,  $p = 0.135$ , Cohen's  $d = 0.09$ , indicating a very small effect size). The results indicated that females tended to have lower levels of well-being and higher levels of anxiety symptoms and in general psychopathology symptoms than males. In contrast, females and males had similar levels of depression symptoms.

Pearson correlations between age and well-being were statistically significant and positive for the female sample ( $r = 0.20$ ,  $p < 0.001$ ) and the total sample ( $r = 0.12$ ,  $p < 0.001$ ), whereas insignificant for the male sample ( $r = 0.00$ ,  $p > 0.05$ ; see Tab. 5).

**Table 5.** Pearson correlations between age, WHO-5, and PHQ-4 scores

Variables	WHO-5 Total score	PHQ-4 Anxiety	PHQ-4 Depression	PHQ-4 Total score
Age (females, n = 661)	0.20***	-0.20***	-0.22***	-0.23***
Age (males, n = 438)	0.00	-0.10*	-0.03	-0.07
Age (total sample, n = 1115)	0.12***	-0.15***	-0.15***	-0.16***
WHO-5 Total score (total sample, n = 1115)	—	-0.57***	-0.66***	-0.67***
PHQ-4 Anxiety (total sample, n = 1115)	-0.57***	—	0.68***	0.91***
PHQ-4 Depression (total sample, n = 1115)	-0.66***	0.68***	—	0.92***
PHQ-4 Total score (total sample, n = 1115)	-0.67***	0.91***	0.92***	—

\* $p < 0.05$ ; \*\*\* $p < 0.001$

Pearson correlations between age and psychopathology symptoms were also statistically significant, but negative and small for the female sample ( $r$  from  $-0.20$  to  $-0.23$ , all  $ps < 0.001$ ) and the total sample ( $r$  from  $-0.15$  to  $-0.16$ , all  $ps < 0.001$ ). In contrast, in the male sample, age was not statistically significantly associated with psychopathology symptoms (all  $ps > 0.05$ ), except a negative and very small correlation between age and anxiety symptoms ( $r = -0.10$ ,  $p < 0.05$ ). This indicated that younger females tended to have lower levels of well-being and higher levels of psychopathology symptoms (compared to older females), whereas males appeared to have relatively stable levels of well-being and psychopathology symptoms across life-span.

### *Screening results on anxiety and depression*

Table 6 presents descriptive statistics for the WHO-5 and PHQ-4 scores as well as the prevalence of positively screened participants in four age-gender groups.

**Table 6.** Descriptive statistics and screening results on anxiety and depression in different age-gender groups

Groups	Females aged 18–29 (n = 428)				Females aged 30–71 (n = 233)				Males aged 18–29 (n = 333)				Males aged 30–72 (n = 105)			
	W	A	D	T	W	A	D	T	W	A	D	T	W	A	D	T
M	7.71	3.72	3.23	6.96	9.14	3.06	2.45	5.51	9.11	3.14	2.77	5.91	9.20	2.80	2.82	5.62
SD	4.62	1.75	1.90	3.30	5.13	1.89	1.92	3.53	4.97	1.85	1.91	3.47	5.26	1.76	2.01	3.47
Skewness	0.69	-0.18	-0.01	-0.08	0.54	0.24	0.37	0.34	0.49	0.20	0.26	0.29	0.41	0.50	0.22	0.33
Kurtosis	-0.09	-1.16	-1.24	-1.18	-0.48	-1.16	-1.05	-1.08	-0.42	-1.23	-1.05	-1.07	-0.48	-0.89	-1.21	-1.04
Minimum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maximum	23	6	6	12	23	6	6	12	23	6	6	12	22	6	6	12
Positively screened (%)	81.78 <sup>a;</sup> 54.44 <sup>b</sup>	69.39	59.11	63.55	72.96 <sup>a;</sup> 45.49 <sup>b</sup>	51.93	42.92	46.35	74.47 <sup>a;</sup> 42.64 <sup>b</sup>	54.35	51.35	49.55	71.43 <sup>a;</sup> 44.76 <sup>b</sup>	44.76	50.48	44.76

% of positively screened respondents presents the percentage of respondents with a raw WHO-5 score of  $\leq 12^a$  and  $\leq 7^b$ , a PHQ-4 score of  $\geq 3$  for anxiety and depression subscales as well as  $\geq 6$  for a PHQ-4 Total score

W — WHO-5 Total score; A — PHQ-4 Anxiety score; D — PHQ-4 Depression score; T — PHQ-4 Total score

Based on the recommended WHO-5 cut-off score of  $\leq 12$  for screening depression, 76.95% of the respondents in the whole sample (n = 1115) and about 82% of females aged 18–29 were screened positively, whereas approximately from 71 to 74% of respondents in the other groups were screened positively. Based on the more restrictive cut-off score of  $\leq 7$ , 48.16% of the respondents in the whole sample and approximately from 43% to 54% of the respondents in the four groups were screened positively for depression.

In the whole sample and based on the PHQ-4 cut-off scores of  $\geq 3$  for the anxiety and depression subscales, 59.28% of the respondents were screened positively for anxiety, and 52.91% were screened positively for depression. In different age-gender groups, about 69% of females aged 18–29 and about 52% of females aged 30–71 were screened positively for anxiety disorders, whereas about 59% of younger females and about 43% of older females were screened positively for depression disorders. In the male sample, the prevalence of positively screened respondents was slightly lower, *i.e.*, about 54% for anxiety and about 51% for depression in younger males, and about 45% for anxiety and about 50% for depression in

older males.

In the non-binary group (n = 16), 93.75% of respondents were screened positively for anxiety (PHQ-4 Anxiety score), 81.25% for depression (PHQ-4 Depression score), 87.5% for total psychopathology symptoms (PHQ-4 Total score), and 93.75% (with a raw WHO cut-off score of  $\leq 12$ ) or 56.25% (with a raw WHO cut-off score of  $\leq 7$ ) for depression. In this non-binary group, the max. raw WHO-5 score was 13, indicating very low levels of well-being.

In general, females aged 18–29 had the worst mental health among the four analyzed groups, as about 64% of younger females were screened positively for anxiety and/or depressive disorders, whereas less than 50% of respondents were screened positively in other analyzed groups (based on the cut-off score of  $\geq 6$  for PHQ-4 Total score).

## Discussion

The aims of the study were to examine the WHO-5's factorial validity and its measurement invariance for different age and gender groups, and to estimate the prevalence of probable anxiety and depression disorders using the WHO-5 and the PHQ-4 in a general community of Polish adults. Overall, the 1-factor structure of the Polish WHO-5 was supported empirically, which is in line with the past works [18–20]. The scalar invariance across females and males, and across younger people aged 18–29 and older people aged 30–72 was also supported, indicating that levels of well-being, as measured by the total WHO-5 scores, can be compared across these groups meaningfully.

### *Age and gender differences in well-being, anxiety, and depression*

It was revealed that younger females tended to have lower levels of well-being and higher levels of psychopathology symptoms. In males, only the levels of anxiety decreased with age, whereas age was not statistically significantly associated with well-being and depression symptoms. It seems that males appeared to have relatively stable levels of psychopathology symptoms and well-being across life-span. As this study was cross-sectional, this conclusion is tentative, and longitudinal research is required to examine these patterns. Notwithstanding, it should be highlighted that similar age-gender specific patterns within emotional variables were shown in other studies. For instance, the recent Polish studies on emotional reactivity [21, 22] have shown changes towards a more favorable emotional status in females with age. This suggests that the female emotional life is more prone to change with age than the male emotional life. In Polish samples, specific age-gender relationships with somatic symptoms were also observed [23]. Based on these studies, and in order to provide relevant conclusions

on the role of age in psychosomatic variables, it is recommended calculating correlations between age and these variables separately for females and males.

It was shown that females tended to have lower levels of well-being, and higher levels of anxiety symptoms and psychopathology symptoms in general (total PHQ-4 score) than males. No statistically significant differences in depression symptoms were noted between females and males. In general, these results are in line with the previous Polish studies on mental health status of Poles [1].

### *Screening results on anxiety and depression*

The screening assessment with the WHO-5 and the PHQ-4 was conducted in the four age-gender specific groups: (1) females aged 18–29, (2) females aged 30–71, (3) males aged 18–29, and (4) males aged 30–72. Based on the recommended WHO-5 cut-off score of  $\leq 12$  for screening depression, about 82% of females aged 18–29 were screened positively. In other groups, approximately from 71 to 74% of respondents were screened positively.

Based on the PHQ-4 cut-off scores of  $\geq 3$  for the anxiety and depression subscales, about 69% and 59% of females aged 18–29 were screened positively for anxiety and depression disorders, respectively. In contrast, about 52% and 43% of females aged 30–71 were screened positively for anxiety and depression disorders, respectively. In the male sample, the prevalence of positively screened respondents was slightly lower, *i.e.*, about 54% for anxiety and about 51% for depression in younger males, and about 45% for anxiety and about 50% for depression in older males. All things considered, females aged 18–29 had the worst mental health among the four analyzed groups. Based on the screening results with both the WHO-5 and the PHQ-4, more than half respondents in each group were screened positively for anxiety and/or depression.

As gender identity is an understudied factor of mental health [24], this issue was examined in this paper. The non-binary group characterized by a low sample size ( $n = 16$ ) was also analyzed, and practically all non-binary people were screened positively. The prevalence of probable anxiety and depressive disorders in all gender and age groups is extremely high (July 2023). Chiefly, females aged 18–29 and non-binary people are very high-risk groups for psychopathology and low well-being, which is in line with the previous reports [1]. The results indicated that research on mental health in non-binary people is important for providing them with a high level of well-being.

When comparing the results on screening depression with the WHO-5 and PHQ-4, more respondents were screened positively for depression with the WHO-5, as the percentage of

positively screened respondents was approximately 21 to 30% higher compared to the PHQ-4 screening results. When using the more restrictive WHO-5 cut-off score of  $\leq 7$ , similar results to depression screening with the PHQ-4 were documented.

### *Comparative analysis of screening results with other Polish studies*

Low well-being WHO-5 scores were compared descriptively with the previous Polish studies. In this paper, the current WHO-5 score for the total sample ( $n = 1115$ , mean = 8.55, standard deviation = 4.93) was almost two times lower as compared to the score obtained in Polish patients with diabetes in 2014–2015 ( $n = 216$ , mean = 15.97, standard deviation = 6.48) [11], and in a general community sample of Poles in 2020 ( $n = 1758$ , mean = 13.72, standard deviation = 5.72) [25]. In this study, the levels of well-being were lower than in Polish cancer patients ( $n = 1000$ ; mean = 12.40, standard deviation = 0.92) studied at the beginning of the COVID-19 pandemic in Poland (March–October 2020) [26]. The current results suggested that more than two thirds of the respondents were screened positively (a raw WHO cut-off score  $\leq 12$ ) in each age-gender group. The results are alarming, as the levels of well-being in a general community sample of Poles were significantly lower than in cancer patients in 2020. The obtained anxiety and depression levels (PHQ-4 scores) in this data-set were significantly higher than scores reported in the study conducted in 2020 [27]. Moreover, the prevalence of probable anxiety and/or depression in this data-set (52.91% had probable depression, and 59.28% had probable anxiety) was about 2–3 times higher than the prevalence of these disorders in adults of seven European countries (Germany, United Kingdom, Denmark, Netherlands, France, Portugal and Italy), *i.e.*, 23.8% for probable depression and 22.1% for probable anxiety (April 2021) [28].

All things considered, the current prevalence rate for probable depression and probable anxiety in Polish respondents in July 2023 was extremely high. In this data-set, intriguingly high levels of anxiety and depressive symptoms, as measured by the PHQ-4, were noted. Compared to the PHQ-4 screening results obtained from February to November 2022 [1], the prevalence of possible anxiety and depression disorders in July 2023 was a few percent lower, indicating a positive trend. Despite this fact, their prevalence still remains extremely high. This paper encourages researchers to conduct population-based studies for further mental health monitoring for understanding an extremely high prevalence of anxiety and depression symptoms.

### *Limitations of the study, and future directions*

This study was cross-sectional; therefore, no conclusions can be drawn regarding the temporal order of age, anxiety, depression and well-being. Due to a small sample size of non-binary group in this data-set, it was impossible to examine measurement invariance between this group and females, and males. This study was based on self-report measures, which were not designed for clinical diagnosis of anxiety or depression disorders. There is a need to examine current cut-off scores for both the questionnaires, i.e., the WHO-5 and the PHQ-4, in order to be sure that these screening tools are adapted to a general community sample of Poles. Therefore, examining their sensitivity and specificity as well as negative and positive predictive values of specific cut-off scores for identifying clinical depression and anxiety among Polish adults is required.

## **Conclusions**

The Polish version of the WHO-5 has a strong factorial validity in a general community sample, and it is invariant across females and males, and between younger people and older people, indicating that WHO-5 scores can be compared across these groups meaningfully. Being a very short and freely available screening tool [29], this questionnaire along with a free and psychometrically sound Polish version of the PHQ-4 [1] may be applied in population-based studies for further mental health monitoring.

Based on the screening results on both the WHO-5 and the PHQ-4, the prevalence of probable anxiety and depression disorders in July 2023 is extremely high, as more than half respondents in each age-gender group were screened positively for anxiety and/or depression. The current prevalence of these possible disorders was about 2–3 times higher than in other European countries in 2021, and only slightly lower than in Polish adults studied in February–November 2022. This study encourages researchers, chiefly psychiatrist, for a more in-depth examination of the prevalence of anxiety and depression disorders using clinical interviews and multimethodology research.

## **Article information**

### *Data availability statement*

The data that support the findings of this study are available from the author upon reasonable request. This data-set was derived from an unpublished (in preparation) and very short research project on alexithymia (with no more than 20 questions), where the WHO-5 and the PHQ-4 were used as correlates of an alexithymia questionnaire. For this study, the data were reanalyzed to provide a screening assessment of anxiety and depression disorders.

### *Ethics statement*

The current data on the WHO-5 and PHQ-4 were derived from the author's unpublished but ongoing research project. The scope of that short project was alexithymia, where the WHO-5 and PHQ-4 were used as correlates of alexithymia. In that project, the participants were recruited in July 2023 via Facebook and Instagram, where there was a link to an online anonymous survey by a Google Forms platform with an appended consent form. All respondents had provided their written informed consent digitally before they completing the survey. That research project was conducted in accordance with the Declaration of Helsinki Ethical Principles and was approved by the Kazimierz Wielki University Ethics Committee (No. 1/13.06.2022, later revision 27.06.2023). For the current study, the data on the WHO-5 and PHQ-4 from that project were reanalyzed to provide a screening assessment of anxiety and depression disorders.

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Paweł Larionow — 100%.

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### *Conflict of interest*

The author declares no conflict of interest.

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