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# **BMJ Open**

# Latent Profile Analysis of mindful self-care and associations with mental health among nurses in China

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Complete List of Authors:	Yang, Zhongfu; The Third Affiliated Hospital of Zunyi Medical University, The First People's Hospital of Zunyi, Emergency department Zhou, Yehong; The Third Affiliated Hospital of Zunyi Medical University, The First People's Hospital of Zunyi Wan, Weiwei; Fifth Affiliated Hospital of Zunyi Medical University Li, Mingdan; Affiliated Hospital of Zunyi Medical University Yan, Weiping; The Third Affiliated Hospital of Zunyi Medical University, The First People's Hospital of Zunyi Hospital of Zunyi Medical University, The First People's Hospital of Zunyi Jiang, Hu; The Third Affiliated Hospital of Zunyi Medical University, The First People's Hospital of Zunyi, Nursing departmen
Keywords:	Health Workforce, Nurses, Occupational Stress, Self Care





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2	Latent Profile Analysis of mindful self-care and associations with
3	mental health among nurses in China
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5	Zhongfu Yang <sup>1</sup> , Yehong Zhou <sup>1</sup> , Weiwei Wan <sup>2</sup> , Mingdan Li <sup>3</sup> , Weiping Yan <sup>1</sup> , Hu
6	Jiang <sup>1*</sup>
7	<sup>1</sup> The Third Affiliated Hospital of Zunyi Medical University, The First People's Hospital of
8	Zunyi, Zunyi, China.
9	<sup>2</sup> The Fifth Affiliated Hospital of Zunyi Medical University, Zhuhai, China.
10	<sup>3</sup> The Affiliated Hospital of Zunyi Medical University, Zunyi, China.
1	
2	*Correspondence: jianghuchn@163.com, Nursing Department, The Third Affiliated Hospital
13	of Zunyi Medical University, The First People's Hospital of Zunyi, Zunyi, China.
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# Latent Profile Analysis of mindful self-care and associations with mental health among nurses in China

18 Abstract

Background: Despite the crucial role of mindfulness and self-care in nurses' physical
and mental health, as well as their professional well-being, the majority of nurses still
exhibit low levels of self-care. Moreover, there remains a lack of understanding
regarding the diverse subgroups of mindful self-care among nurses.

Objectives: To delve into the diverse groups of mindful self-care among nurses and to
investigate the correlation between these groups and their mental health.

Methods: Convenience sampling was adopted to select nurses from Guizhou Province, China during August to September, 2023. The demographic characteristics questionnaire, Chinese version of the Brief Mindful Self-Care Scale, Patient Health Questionnaire-9 (PHQ-9), Generalized Anxiety Disorder-7 (GAD-7), Perceived Stress Scale (PSS) were used. A latent profile analysis (LPA) was performed on characteristics of nurses' mindful self-care, and the correlations among latent profiles, demographic characteristics, and mental wellbeing were identified by chi-square test, Spearman correlation analysis, and non-parametric test. 

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**33 Results:** A total of 1001 nurses were included, and they were divided into four

34 heterogeneous subgroups, namely Inconsistent Mindful Self-Care Group (4.4%),

35 Balanced Development Group (43.4%), Moderate Mindful Self-Care Group (39.4%),

36 High Mindful Self-Care Group (12.9%). Results of single factor analysis showed that

37 the nurses' department and the average monthly income were the factors influencing

- 38 the potential profiles. Mindful self-care was negatively correlated to anxiety and
- 39 depression, but not correlated to perceived stress. There were significant differences
- 40 of perceived stress, anxiety, and depression across different mindful self-care groups.
- **Conclusion:** This study employed latent profile analysis to identify four distinct

subgroups of hospital nurses based on their mindful self-care, revealing varying levels

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of anxiety, depression, and perceived stress across groups, emphasizing the need for
tailored mindful self-care strategies to promote nurses' well-being.
Keywords: nurse, mindfulness, self-care, latent profile analysis, cross-sectional study

# 47 Strengths and limitations of this study:

- The LPA approach was employed in this study to delve into the diverse subgroups
  of mindful self-care practices among Chinese nurses.
- While this study adopted a cross-sectional research design, it failed to explore the
   interaction mechanism between mental health and mindful self-care.
- The generalizability of our findings may be constrained due to the survey data
  being sourced from a single region, potentially limiting its wider applicability.

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54 Introduction

Nurses are recognized as a high-stress profession [1]. Sustained stress over a prolonged period has numerous detrimental impacts on nurses, healthcare organizations, and the patients they serve. Despite the fact that nurses worldwide belong to a highly stressed group, there are significant differences among regions. A systematic review and meta-analysis [2] revealed that the Asian region exhibited the lowest degrees of compassion satisfaction, contrasted with the highest rates of compassion fatigue symptoms. Among them, Chinese nurses face a very worrying situation [3, 4], nearly 43.83% Chinese nurses had depressive symptoms [5]. 

Nursing professionals can mitigate severe consequences such as burnout, compassion fatigue and depression by adopting a regime of self-care management that helps them attain psychophysical balance and spiritual wellness [6]. Self-care is essential for nurses to optimize their performance and ensure they are operating at their peak abilities [7]. Some authors have proposed that nurses' self-care is not only beneficial but also a moral and ethical responsibility from a professional perspective [7, 8]. However, nurses frequently neglect self-care and prioritize the wellbeing and care of their patients [9, 10]. Nurses encounter numerous barriers to self-care, such as shift work, hectic schedules, competing time demands, cost considerations, limited resource availability, and work-related stress [11].

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Self-care is crucial as it facilitates the maintenance of one's physical, emotional, mental, spiritual, and social well-being [12]. As Martínez et al [13] stated, self-care is the ability to care for oneself through awareness, self-control, and self-reliance in order to achieve, maintain, or promote optimal health and well-being. Self-care contains six domains: physical, professional, relational, emotional, psychological, and spiritual [14]. Given the paramount significance of self-care, devoting attention to nurses' self-care practices holds the key to safeguarding their professional well-being. It is thus imperative that we proactively address this issue and provide effective strategies to enhance nurses' self-care practices.

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Mindfulness enables nurses to concentrate more effectively on the functions of their bodies and minds [15]. A concept analysis [16] defined mindfulness as a transformative process, where one develops an increasing ability to experience being present with awareness, acceptance and attention. Mindfulness offers a promising strategy for managing chronic stress, holding significant implications for enhancing mind-body health and well-being, regardless of disease status [17]. Existed studies [18-20] have consistently demonstrated that mindfulness intervention is effective in alleviating stress and burnout among nurses, and simultaneously promoting their physical and mental well-being. Consequently, it is crucial for nurses to elevate their mindfulness to the utmost level [21].

Cook-Cottone et al [22] developed formulated the concept of mindful self-care by seamlessly integrating mindful awareness, active mindful practices, and mindful nurturing of every facet of oneself with traditional conceptions of self-care. Then mindful self-care was defined it as a continuous process that comprises two parts: a mindful awareness and assessment of one's internal needs and external demands, and a purposeful engagement in targeted self-care practices aimed at addressing these needs and demands in a way that fosters well-being and personal effectiveness [22, 23]. Mindfulness self-care can aid in identifying unrecognized self-care patterns and obstacles to implementing targeted self-care, while also guiding the development of intentional and focused self-care practices [12].

Previous studies [24, 25] have investigated the current status of mindful self-care and its influencing factors in the nurse population, and the results show that most nurses deal with low levels of mindful self-care. However, the present evidence could not reveal the heterogeneous subgroups of mindful self-care in the nurse population and their differences in different dimensions. Latent profile analysis (LPA) is a trustworthy statistical technique for classifying subgroups [26]. In addition, previous studies have lacked correlations between latent profiles of mindful self-care and mental health.

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2 3	110	Therefore the number of this study was to conduct a survey on the surrent status
4 5	110	Therefore, the purpose of this study was to conduct a survey on the current status
6 7	111	of mindfulness self-care among nurses and explore the heterogeneous groups and the
8	112	correlation between mental health.
9 10	113	
11 12	114	METHODS
13 14	115	Study design
15 16	116	In this study, a cross-sectional study was conducted through an online survey
17 18	117	utilizing convenient sampling method. The study was designed and reported in
19 20	118	alignment with the Strengthening the Reporting of Observational Studies in
21 22	119	Epidemiology (STROBE) guidelines [27].
23 24	120	
25	121	Sample size estimation
27	122	This study aimed to delve into the latent profiles of nurses' mindful self-care.
20 29 30	123	Given that latent profile analysis (LPA) requires a sample size exceeding 500 [26,
31 22	124	28], the minimum sample size for this investigation was set at 500.
33 34	125	
35 36	126	Participants
30 37	127	Participants in this study required to meet the following inclusion criteria.
38 39	128	Inclusion criteria: (1) working as a nurse in a medical facility, (2) registered nurses,
40 41	129	and (3) being willing to participate in this study. Exclusion criteria: nurses who were
42 43	130	taking sick leave, or suffering from serious physical and psychological illnesses.
44 45	131	
46 47	132	Measurements
48 49	133	The General Information Questionnaire
50 51	134	The general information questionnaire included demographic and sociological
52 53	135	information such as age, gender, marital status, professional title, highest degree,
54 55	136	department, job title, working years, number of night shifts per month, average
56 57	137	monthly income, and hospital grade.
58 59	138	
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# 139 Chinese version of the Brief Mindful Self-Care Scale

The scale was developed by Cook-Cottone et al [23] in 2018, then it was
translated into Chinese and applied to the nurse population by Yang et al [29] in 2021.
The scale has a total of 24 items and 6 dimensions, which are mindful relaxation,
physical care, self-compassion and purpose, supportive relationships, and supportive
structure, mindful awareness. A Likert 5-point scale is used with a total score of 24 to
120, with higher scores indicating higher levels of mindful self-care among nurses.
The Cronbach's a coefficient for this scale is 0.92.

147

### 148 Perceived Stress Scale (PSS)

The scale was developed by Cohen et al. in 1983 [30]. The scale was translated into Chinese by Yang et al [31] in 2003. The scale consists of 10 items and is scored on a 5-point scale from "never" to "always", with a total score of 0-40, and higher scores indicate greater stress. The Cronbach's  $\alpha$  coefficient of the Chinese version of the PSS-10 is 0.76-0.83, which has good reliability and validity [32].

154

# 155 Patient Health Questionnaire-9 (PHQ-9)

The questionnaire was developed by Kroenke et al [33] in 2001, then it was introduced into China in 2009 [34]. The questionnaire comprises nine items, each rated on a scale ranging from 0 (not at all) to 3 (almost every day). The total score ranges from 0 to 27, with the following classifications: 0 to 5 indicating no depression, 6 to 9 indicating mild depression, 10 to 14 indicating moderate depression, 15 to 19 indicating severe depression, and 20 to 27 indicating extremely severe depression. The internal consistency coefficient of PHQ-9 is 0.857.

163

# 164 Generalized Anxiety Disorder-7 (GAD-7)

The scale was developed by Spitzer et al [35] in 2006 to reflect an individual's
psychosomatic activity in the past two weeks, and the Chinese version was translated
by He et al [36] in 2010, with a Cronbach's alpha coefficient of 0.898. The GAD-7

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3 4	168	(Chinese version) scale is used to screen and assess generalized anxiety symptoms,
5 6	169	with 7 items, using a scale of 0 (not at all) to 3 (almost every day) scale, with a total
7 8	170	score range of 0 to 21, of which 0 to 5 is no anxiety, 6 to 9 is mild, 10 to 14 is
9 10	171	moderate, and 15 to 21 is severe.
11 12	172	
13 14	173	Data collection
15 16	174	The data collection was conducted during the period spanning from August 26,
17 18	175	2023 to September 18, 2023. The survey mainly collected data through a Chinese
19 20	176	questionnaire survey network platform. The entire testing process followed the
21	177	principles of anonymity and voluntariness. Before the test, the participants could read
23	178	the instructions and precautions, and submitted questionnaire after completion. The
25	179	link of questionnaire was directly distributed to nurses by WeChat.
20	180	
20 29 20	181	Statistical analyses
30 31	182	The Mplus 7.4 program was employed to delineate distinct subgroups of mindful
32 33	183	self-care. To assess model adequacy and establish the optimal number of categories,
34 35	184	indicators such as Log likelihood (LL), Akaike information criterion (AIC), Bayesian
36 37	185	information criterion (BIC), and Adjusted Bayesian Information Criteria (aBIC),
38 39	186	Entropy, Lo-Mendell-Rubin (LMR) test and the Bootstrapped Likelihood Ratio Test
40 41	187	(BLRT) were used. By pooling these indicators across all model fitting results in each
42 43	188	category, we were able to select the model that best suited the data. For data analysis,
44 45	189	the statistical software SPSS 26.0 was utilized. Categorical variables were
46 47	190	characterized by assessing frequency and composition ratios, continuous variables
48 49	191	were described using mean and standard deviation. If the variables do not meet the
50 51	192	normality test, they should be represented using the median and quartiles. To compare
52 53	193	categorical variables across different groups, the chi-square test was employed. For
54 55	194	comparing variables among groups, non-parametric test, chi-square test and Fisher's
56 57	195	exact probability method were utilized. Differences between the two groups were
58 59 60	196	compared using post hoc tests. Statistical significance was defined as a p-value less

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197	than 0.05.
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199	Ethical Considerations
200	The Ethics Council of The Third Affiliated Hospital of Zunyi Medical
201	University, also known as The First People's Hospital of Zunyi, granted approval for
202	this study (2023-1-J02). All participants consented to the collection of data with full
203	knowledge and understanding. Prior to commencing the survey, participants were
204	informed about the study's primary objectives and rationale, enabling them to provide
205	informed consent. If any participant declined to participate, the questionnaire
206	collection process was promptly terminated. Furthermore, participants were assured
207	that the study results would be presented in aggregated form, ensuring their individual
208	anonymity.
209	
210	Patient and public involvement
211	Patients and/or the public were not involved in the design, or conduct, or
212	reporting, or dissemination plans of this research.
213	
214	Results
215	Participant characteristics
216	The study participants were collected from Guizhou Province, China. A total of
217	1020 questionnaires were received, with 1001 being valid, resulting in an effective

216 total of 217 fective recovery rate of 98.1%. Among them, 48 were males (4.8%) and 953 were females 218 219 (95.2%). The average age was 32.6 years old, ranging from 22 to 54. 31 people (3.1%) 220 were from first-level hospitals, 701 people (70.0%) were from second-level hospitals, 221 and 269 people (26.9%) were from third-level hospitals.

222

223 Latent class identification

224 The results of latent profile analysis showed that both the LMR P value and BLRT *P* value of Class 2, Class 3, and Class 4 were statistically significant (P < 0.05). 225

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Compared to Class 2 and Class 3, Class 4 had the highest Entropy value. Therefore, we
ultimately determined that Class 4 was the optimal profile analysis model, indicating
that classifying nurses' mindful self-care into four profiles was the best approach. The
results are shown in Table 1.

Based on the results of latent profile analysis, a score distribution chart of different
profiles across different dimensions was drawn. The results are presented in Figure 1.
Based on the trend of the profile distribution in the chart, we named Class 1 as
Inconsistent Mindful Self-Care Group (n=44, 4.4%), Class 2 as Balanced Development
Group (n=434, 43.4%), Class 3 as Moderate Mindful Self-Care Group (n=394, 39.4%),
Class 4 as High Mindful Self-Care Group (n=129, 12.9%).

# 237 Single-factor analysis of the latent profiles of nurses' mindful self-care

The distribution and characteristics of the basic information of the different potential profiles are shown in Table 2. The results illustrated that the nurses' department and the average monthly income were the factors influencing the potential profiles (P < 0.05), and there was no statistically significant difference in the other factors. Enseignement Superieur (ABES) Protected by copyright, including for uses related to text and data mining, AI training, and similar technologies

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								1-2024-08 vright, in	
243 244				Table 1	Table 1 Potenti	al profile analys	sis indicators (N=10	cluding for 001) for	
	Model	LL	AIC	BIC	aBIC	Entropy	LMR P value	BLRT	Category probability (%)
	Class 1	-15893.553	31811.106	31870.011	31830.898	_		2024. ¢igner relåte	_
	Class 2	-14886.130	29810.259	29903.526	29843.180	0.865	< 0.001	d top < 000000000000000000000000000000000000	47.35/52.65
	Class 3	-14500.995	29053.990	29181.618	29099.041	0.896	0.001	oaded fr upe <del>de</del> ur < 0 da <	5.20/49.15/45.65
	Class 4	-14131.351	28328.702	28490.691	28385.881	0.922	< 0.001	(ABE (ABE < 0min	4.40/43.36/39.36/12.89
	Class 5	-14070.715	28221.431	28417.781	28290.739	0.917	0.496	10001	4.40/37.56/4.30/39.96/13.79
246 247 248 249 250 251 252	AIC Akaike i Ratio Test, BI	nformation crit	terion, BIC Ba	yesian informati Ratio Test. <i>Insert Figur</i>	on criterion, aB	IC Sample adju 1 Latent profi	isted bayesian info	rmation difference I and similar technologies.	LMR Lo-Mendell-Rubin Likel
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Page	e 13 of 28				BMJ Open		bmjopen-202 1 by copyrigh		
2 3 4 5	253		Table 2 D	emographic and ch	aracteristics by lat	ent profile (N=10	14-087005 or		
6 7		Variables	Category	Class 1	Class 2	Class 3	of saClass 4	$X^2/H$	Р
7 8 9		Age, median (P25, P75)		31.5 (28.0, 37.0)	32.0 (29.0, 36.0)	31.5 (28.0, 35.0)	uses rel 15 15 15 15 15 15 15 16 10 10 10 10 10 10 10 10 10 10 10 10 10	2.067	0.559
10		Gender	Female	43 (97.7%)	407 (93.8%)	380 (96.4%)	ate of 123 (95.3%)	3.407	0.317
12			Male	1 (2.3%)	27 (6.2%)	14 (3.6%)	to nent % (4.7%)		
13		Marital status	Single	10 (22.7%)	70 (16.1%)	74 (18.8%)		6.463	0.373
14 15			Married	34 (77.3%)	354 (81.6%)	312 (79.2%)	an de la 3 (79.8%)		
16			Others	0 (0%)	10 (2.3%)	8 (2.0%)	$dat = \frac{1}{16} (4.7\%)$		
17 18		Professional title	Junior level	24 (54.5%)	257 (59.2%)	241 (61.2%)	BB (62.1%)	2.587ª	0.860
19			Intermediate level	19 (43.2%)	154 (35.5%)	137 (34.8%)	ing · 45 (34.9%)		
20 21			Senior level	1 (2.3%)	23 (5.3%)	16 (4.1%)	≥ 34 (3.1%)		
22		Highest Degree	Junior College and below	7 (15.9%)	61 (14.1%)	62 (15.7%)	<b>Tair 125</b> (19.4%)	9.701	0.138
23			Undergraduate and above	37 (84.1%)	373 (85.9%)	332 (84.3%)	<b>1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 </b>		
24 25		Department	Internal Medicine	12 (27.3%)	90 (20.7%)	129 (32.7%)	a 🙀 (18.6%)	50.627 <sup>a</sup>	0.001
26			Surgery	10 (22.7%)	94 (21.7%)	67 (17.0%)	si <b>3</b> 0 (23.3%)		
27			Obstetrics and Gynecology	11 (25.0%)	38 (8.8%)	33 (8.4%)	mila 7 (5.4%)		
28 29			Pediatrics	2 (4.5%)	32 (7.4%)	31 (7.9%)	<b>Te b</b> (12.4%)		
30			Emergency/ICU	0 (0%)	57 (13.1%)	47 (11.9%)	<b>B</b> (14.7%)		
31			Operating Room	2 (4.5%)	25 (5.8%)	10 (2.5%)	<b>b b</b> (5.4%)		
32 33			Functional Assistance	1 (2.3%)	20 (4.6%)	16 (4.1%)	<b>Ties a</b> <sub>5</sub> (3.9%)		
34			Departments				Age		
35			Administrative and Logistics	0 (0%)	17 (3.9%)	7 (1.8%)	<b>6</b> 4 (3.1%)		
36 37			Departments				Bii		
38			Others	6 (13.6%)	61 (14.1%)	54 (13.7%)	<del>ق</del> ر (13.2%)		
39							grap		
40 ∡1					12		shiq		
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43			For peer n	eview only - http://bm	iopen.bmi.com/site/a	bout/auidelines.xht	ml <b>–</b>		

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						1-2024-087 yright, incl			
	Job title	No	37 (84,1%)	348 (80.2%)	322 (81.7%)	uding 1997 (82,9%)	0.858	0.839	
		Yes	7 (15.9%)	86 (19.8%)	72 (18.3%)	of <u>82</u> (17.1%)			
	Working years (years)	< 5	7 (15.9%)	77 (17.7%)	76 (19.3%)	uses reij reij 20	5.204	0.518	
		5~10	23 (52.3%)	209 (48.2%)	193 (49.0%)	sianeer teren			
		> 10	14 (31.8%)	148 (34.1%)	125 (31.7%)	d nent Si (41.1%)			
	Number of night	0	17 (38.6%)	154 (35.3%)	133 (33.8%)	ar e <b>4</b> 7 (36.4%)	7.512	0.276	
	shifts per month	1~4	4 (9.1%)	75 (17.3%)	57 (14.5%)	id ie 28 (21.7%)			
		≥5	23 (52.3%)	205 (47.2%)	204 (51.8%)	at 2 34 (41.9%)			
	Average monthly income (yuan)	≤3000	16 (36.4%)	47 (10.8%)	68 (17.3%)	nining. (14.0%)	24.460	< 0.001	
	<b>Q</b> <i>y</i>	3001~6000	23 (52.3%)	299 (68.9%)	256 (65.0%)	A (69.8%)			
		> 6000	5 (11.4%)	88 (20.3%)	70 (17.8%)	raining 21 (16.3%)			
	Hospital grade	Primary level	1 (2.3%)	16 (3.7%)	12 (3.0%)	an <b>6</b> 2 (1.6%)	3.396	0.749	
		Secondary level	35 (79.5%)	298 (68.7%)	278 (70.6%)	a <b>5</b> 0 (69.8%)			
		Tertiary level	8 (18.2%)	120 (27.6%)	104 (26.4%)	mila $\frac{1}{2}$ (28.7%)			
254	<sup>a</sup> Fisher's exact probal	bility test	0 (10.270)	120 (27.076)	104 (20.478)	ar technologies.			
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255 Correlation analysis between mindful self-care and mental health

Spearman's correlation was used to analyze the relationship between mindful selfcare, perceived stress, anxiety, and depression, the results showed that mindful selfcare was negatively correlated to anxiety and depression (P < 0.05). However, there was no correlation between mindful self-care and perceived stress (P > 0.05). There were positively correlation among perceived stress, anxiety, and depression (P < 0.05). There The results were shown in Table 3.

Table 3 Correlation between mindful self-care and mental health

_						
		Median (P25, P75)	1	2	3	4
	1 Mindful self-care	80.00 (69.00, 91.00)	1			
	2 PHQ-9	7.00 (3.00, 11.00)	-0.333**	1		
	3 GAD-7	6.00 (1.00, 8.00)	-0.295**	0.826**	1	
_	4 PSS	20.00 (16.00, 22.00)	-0.030	0.498**	0.496**	1
-	4155	20.00 (10.00, 22.00)	-0.030	0.470	0.470	1

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\*\* *P* < 0.01

Using the grouping of mindful self-care as the dependent variable and the scores of perceived stress, anxiety, and depression as the independent variables, a non-parametric test was conducted. The results are showed in Table 4. There were significant differences in nurses' scores of perceived stress, anxiety, and depression across different groups. There were differences in depression scores among different groups. When comparing multiple groups, it was revealed that Inconsistent Mindful Self-Care Group and Moderate Mindful Self-Care Group had higher level of depression than Balanced Development Group and High Mindful Self-Care Group, but there was no difference between Inconsistent Mindful Self-Care Group and Moderate Mindful Self-Care Group. The results of anxiety were similar to depression. Perceived stress was statistically different among the groups, and further two-by-two comparisons showed that, Balanced Development Group and Moderate Mindful Self-Care Group had a higher level than High Mindful Self-Care Group and Inconsistent Mindful Self-Care Group, and Inconsistent Mindful Self-Care Group had a highest level of perceived 

1 2								
3 4	280	stress.						
5 6	281							
7 8	282	Та	ble 4 Comparative	analysis of mental h	ealth between different	ent groups		
9 10 11 12		1 Inconsistent Mindful Self- Care Group	2 Balanced Development Group	3 Moderate Mindful Self- Care Group	4 High Mindful Self-Care Group	Н	Р	Post hoc
13 14	PHQ-9	9.0 (4.5, 16.0)	6.0 (2.0, 10.0)	9.0 (6.0, 13.0)	3.0 (0, 7.0)	107.327	< 0.001	3≈1 > 2 > 4
15 16 17	GAD-7	7.0 (0, 13.0)	4.0 (0, 7.0)	4.0 (0, 7.0)	7.0 (3.0, 10.0)	90.593	< 0.001	3≈1 > 2 > 4
18 19 20	PSS	17.0 (10.0, 16.0)	20.0 (16.0, 22.0)	20.0 (17.0, 22.0)	18.0 (13.0, 22.0)	11.585	0.009	3≈2 > 4 > 1
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# 283 Discussion

In this study, we employed LPA to investigate the diverse group of mindful selfcare practices among nurses in hospitals. Based on cross-sectional data, we discovered four distinct subgroups: the Inconsistent Mindful Self-Care Group, the Balanced Development Group, the Moderate Mindful Self-Care Group, and the High Mindful Self-Care Group. To the best of our knowledge, this is the first study to explore the heterogeneous group of mindful self-care using the LPA method. We further used correlation analysis to confirm that there was a significant correlation among four subgroups, anxiety, depression, and perceived stress.

LPA results revealed nearly half of the nurses have a mindful self-care level below the average, and 39.4% of the nurses have a moderate level. A survey of oncology nurses in China showed an average mindful self-care score of 59.30 [37]. In another survey of emergency nurses, using the 36-item mindful self-care scale in the study, it was found that scores averaged 89.74, which was low overall [24]. In our findings, nurses' mindful self-care score of 80.00, which was higher than previous studies. The LPA results similarly revealed characteristic differences between groups. The two groups with high levels of LPA scored significantly higher on the dimensions of supportive relationships and supportive structures than on the other dimensions, and may have a stronger external self from the perspective of Attuned Representational Models of Self [23]. The natural development group scored more consistently on all dimensions. However, the inconsistent group scored significantly higher on physical care and self-compassion and purpose, which means a stronger internal self. This suggests that in future studies, priority should be given to considering the characteristics of the population and implementing effective interventions.

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307 Our study also found that some characteristics of different profiles. More 308 specifically, department and average monthly income were influencing factors of 309 different groups. Workloads, atmospheres, and incomes can vary from unit to unit, 310 which can greatly influence the level of mindful self-care among nurses. Previous study 311 [37] have proved that educational level and health status are predictors of mindful self-

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312 care, but our investigation failed to verify it, this may be related to the inclusion of the 313 study population. In addition, another study [25] showed that gender is also an 314 influencing factor for mindful self-care, but the large gap between the male and female 315 ratios in this study also failed to validate this difference. This elevates the need to 316 actively focus on key populations in future research to explore the factors influencing 317 the population of nurses with low mindful self-care and provide targeted interventions.

Our study further proved the correlation between mindful and mental health. Anxiety and depression scores showed weak negative correlations with mindful self-care scores. Mental health literacy is positively correlated with mindful self-care [37]. However, perceived stress was not correlated with mindful self-care scores. This is inconsistent with previous studies. A study [38] has revealed that mindfulness can function as a protective factor, mitigating or even eliminating the negative impact of perceived stress among Chinese intensive care nurses. After careful analysis, we hypothesize that the observed phenomenon might stem from a direct correlation between the nurses' anxiety and depression levels and their mindful self-care practices. However, it's noteworthy that the nurses' perception of stress and their mindful selfcare levels might interact and dynamically modulate the stress levels. The underlying mechanisms governing this interaction remain elusive and require further exploration through more rigorous research. 

This study revealed that there is still much room for improvement in mindful self-care for nurses. Most importantly, nurses' awareness of self-care should be raised and mindfulness should be integrated into their daily work and life [12]. There have been many mindful self-care related interventions, such as mindfulness workshops [39], mindful self-compassion training [40], and mindfulness-based self-care and resiliency intervention [41], but these interventions have failed to use mindful self-care as a valid outcome indicator. In addition, some personalized and convenient interventions, such as digital health App [42] and fragmented interventions, should be provided according to the special characteristics of the nurses' group work. 

#### Limitations

This research encountered several notable limitations. Firstly, the methodology employed was a cross-sectional survey, and despite the substantial size of the sample, data collection relied on convenience sampling instead of random sampling. Secondly, the sample was exclusively drawn from Guizhou Province in China, resulting in a potential selection bias that hinders a comprehensive portrayal of the current state of mindfulness self-care among nurses throughout the country. Thirdly, since the present research was conducted exclusively with Chinese nurses, it remains uncertain whether the findings can be generalized to other cultural contexts. Therefore, there is a pressing need for further research with a larger, higher-quality sample size, and meticulously designed investigations. 

#### Conclusion

This study used LPA to investigate mindful self-care practices among hospital nurses, revealing four distinct subgroups: the Inconsistent Mindful Self-Care Group, the Balanced Development Group, the Moderate Mindful Self-Care Group, and the High Mindful Self-Care Group. The four groups showed different levels of anxiety, depression, and perceived stress scores, highlight the importance of mindful self-care for nurses' mental well-being. In future studies, nursing managers and researchers should prioritize enhancing nurses' awareness of mindful self-care and develop some concise, accessible, and feasible intervention programs. 

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365	
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372	
373	Authors' contribution
374	YZF, ZYH participated in writing and revising the manuscript. WWW, LMD and
375	YWP collected and analyzed the data. Jiang Hu designed the study, and participated
376	in revising the manuscript. All authors have read and approved the manuscript.
377	
378	CONFLICT OF INTEREST
379	The authors have no conflicts of interest to declare.
380	
381	Data availability statement
382	Data are available upon reasonable request. Data are available from the corresponding
383	author and the first author on reasonable request.
384	

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**BMJ** Open

Taylor H, Cavanagh K, Field AP, Strauss C: Health Care Workers' Need for Headspace:

Findings From a Multisite Definitive Randomized Controlled Trial of an Unguided Digital

Mindfulness-Based Self-help App to Reduce Healthcare Worker Stress. JMIR Mhealth

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Uhealth 2022, 10(8):e31744.

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STROBE Statement—Checklist of items that should be included in reports of <i>cross-sectional studies</i>	
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	Item No	Recommendation	Page No
Title and abstract	1	( <i>a</i> ) Indicate the study's design with a commonly used term in the title or the abstract	2
		( <i>b</i> ) Provide in the abstract an informative and balanced summary of what was done and what was found	2-3
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4-5
Objectives	3	State specific objectives, including any prespecified hypotheses	6
Methods			
Study design	4	Present key elements of study design early in the paper	6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	6
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	NA
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	6-8
Bias	9	Describe any efforts to address potential sources of bias	6-8
Study size	10	Explain how the study size was arrived at	6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6-8
Statistical methods	12	( <i>a</i> ) Describe all statistical methods, including those used to control for confounding	8-9
		(b) Describe any methods used to examine subgroups and interactions	NA
		(c) Explain how missing data were addressed	NA
		( <i>d</i> ) If applicable, describe analytical methods taking account of sampling strategy	NA
		( <u>e</u> ) Describe any sensitivity analyses	NA
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	9
		(b) Give reasons for non-participation at each stage	9
		(c) Consider use of a flow diagram	NA
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	9
		(b) Indicate number of participants with missing data for each variable of interest	NA
Outcome data	15*	Report numbers of outcome events or summary measures	9-14
Main results	16	( <i>a</i> ) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	NA

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	(b) Report category boundaries when continuous variables were						
		categorized					
		(c) If relevant, consider translating estimates of relative risk into absolute	NA				
		risk for a meaningful time period					
Other analyses	17	Report other analyses done-eg analyses of subgroups and interactions,	NA				
	and sensitivity analyses						
Discussion							
Key results	18	Summarise key results with reference to study objectives	16-				
			17				
Limitations	19	Discuss limitations of the study, taking into account sources of potential	18				
		bias or imprecision. Discuss both direction and magnitude of any potential					
		bias					
Interpretation	20	Give a cautious overall interpretation of results considering objectives,	18				
		limitations, multiplicity of analyses, results from similar studies, and other					
		relevant evidence					
Generalisability	21	Discuss the generalisability (external validity) of the study results	18				
Other information							
Funding	22	Give the source of funding and the role of the funders for the present study	19				
		and, if applicable, for the original study on which the present article is					
		based					

\*Give information separately for exposed and unexposed groups.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

# **BMJ Open**

# Latent profile analysis of mindful self-care and associations with mental health among nurses in China

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<b>Primary Subject Heading</b> :	Nursing
Secondary Subject Heading:	Nursing
Keywords:	Health Workforce, Nurses, Occupational Stress, Self Care





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2	Latent profile analysis of mindful self-care and associations with
3	mental health among nurses in China
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5	Zhongfu Yang <sup>1</sup> , Yehong Zhou <sup>1</sup> , Weiwei Wan <sup>2</sup> , Mingdan Li <sup>3</sup> , Weiping Yan <sup>1</sup> , Hu
6	Jiang <sup>1*</sup>
7	<sup>1</sup> The Third Affiliated Hospital of Zunyi Medical University, The First People's Hospital of
8	Zunyi, Zunyi, China.
9	<sup>2</sup> The Fifth Affiliated Hospital of Zunyi Medical University, Zhuhai, China.
10	<sup>3</sup> The Affiliated Hospital of Zunyi Medical University, Zunyi, China.
11	
12	*Correspondence: jianghuchn@163.com, Nursing Department, The Third Affiliated Hospital
13	of Zunyi Medical University, The First People's Hospital of Zunyi, Zunyi, China.
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# Latent profile analysis of mindful self-care and associations with mental health among nurses in China

18 Abstract

Background: Despite the crucial role of mindfulness and self-care in nurses' physical and mental health, as well as their professional well-being, most nurses exhibit low levels of self-care. Moreover, there is a lack of understanding of the diverse subgroups of mindful self-care among nurses.

Objectives: The present study delved into the diverse groups of mindful self-care among nurses and investigated the correlation between these groups and their mental health.

Methods: Convenience sampling was used to select nurses from Guizhou Province, China, from August to September 2023. A total of 1020 nurses were investigated, and 1001 questionnaires were included, for an effective return rate of 98.1%. The demographic characteristics questionnaire, Chinese version of the Brief Mindful Self-Care Scale, Patient Health Questionnaire-9 (PHQ-9), Generalized Anxiety Disorder-7 (GAD-7), and Perceived Stress Scale (PSS) were used. Latent profile analysis (LPA) was performed on the characteristics of nurses' mindful self-care, and the correlations between the latent profiles, demographic characteristics, and mental wellbeing were identified using chi-squared tests, Spearman correlation analyses, and nonparametric tests.

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Results: A total of 1001 nurses were included, and they were divided into four
heterogeneous subgroups: the Inconsistent Mindful Self-Care Group (4.40%),

38 Balanced Development Group (43.36%), Moderate Mindful Self-Care Group

39 (39.36%), High Mindful Self-Care Group (12.89%). Results of single factor analysis

- 40 showed that the nurses' department and average monthly income were the factors
- 41 influencing the potential profiles. Mindful self-care negatively correlated with anxiety

42 and depression but was not correlated with perceived stress. There were significant

43 differences in perceived stress, anxiety, and depression between different mindful

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44 self-care groups.
45 Conclusion: The present study used latent profile analysis to identify four distinct
46 subgroups of hospital nurses based on their mindful self-care and revealed varying
47 levels of anxiety, depression, and perceived stress between groups. These results

48 emphasize the need for tailored mindful self-care strategies to promote nurses' well49 being.

50 Keywords: nurse, mindfulness, self-care, latent profile analysis, cross-sectional study

# 52 Strengths and limitations of this study:

- The LPA approach was sed in this study to delve into the diverse subgroups of
   mindful self-care practices among Chinese nurses.
- This study used confirmatory factor analysis (CFA) to ensure the validity of the
   measurement tools.
- This study provided evidence of the relationships between mindful self-care and
   anxiety, depression, and perceived stress.
- 59 This study was limited by its cross-sectional research design.
- The generalizability of our findings may be limited due to the survey data being
   sourced from a single region, which may limit its wider applicability.

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62	Introduction
63	Nurses occupy an important position in the healthcare field and are the largest
64	group within the health care system. They often perform a variety of work roles,
65	which leads to diverse job demands, such as work overload, lack of formal rewards,
66	and work-life interference [1]. Due to the influence of multiple factors, including
67	individual, educational, organizational, managerial, and policy-making factors, the
68	shortage of nurses has become a continuous global challenge [2, 3]. It is estimated
69	that the demand for nursing will reach 12.9 million worldwide by 2035 [4]. Therefore,
70	paying attention to the physical and mental health of nurses and enhancing their
71	coping abilities is an important task in nursing management.
72	Nursing is recognized as a high-stress profession [5]. Prolonged sustained stress
73	has numerous detrimental impacts on nurses, health care organizations, and the
74	patients they serve. Although nurses are one of the occupations with the highest levels
75	of stress, there are significant differences between regions. A systematic review and
76	meta-analysis [6] revealed that the Asian region exhibited the lowest degree of
77	compassion satisfaction and the highest rates of compassion fatigue symptoms.
78	Chinese nurses face a very worrying situation [7, 8], and approximately 43.83% of
79	Chinese nurses experience depressive symptoms [9].
80	Nursing professionals can mitigate severe consequences, such as burnout,
81	compassion fatigue and depression, by adopting a regime of self-care management
82	that helps them attain psychophysical balance and spiritual wellness [10]. Self-care is
83	essential for nurses to optimize their performance and ensure that they are operating at
84	their peak abilities [11]. Some authors proposed that nurses' self-care is not only
85	beneficial but also a moral and ethical responsibility from a professional perspective
86	[11, 12]. Nurses frequently neglect self-care and prioritize the wellbeing and care of
87	their patients [13, 14]. A cross-sectional study revealed that more than half of nurses
88	did not engage in health-promoting self-care [15]. Nurses encounter numerous
89	barriers to self-care, such as shift work, hectic schedules, competing time demands,
90	cost considerations, limited resource availability, and work-related stress [16].

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91 Self-care is crucial because it facilitates the maintenance of one's physical, emotional, mental, spiritual, and social well-being [17]. Martínez et al. [18] stated that 92 self-care is the ability to care for oneself through awareness, self-control, and self-93 reliance to achieve, maintain, or promote optimal health and well-being. Self-care 94 contains six domains: physical, professional, relational, emotional, psychological, and 95 96 spiritual [19]. Given the paramount significance of self-care, devoting attention to nurses' self-care practices is key safeguarding their professional well-being. 97 98 Therefore, it is imperative to proactively address this issue and provide effective 99 strategies to enhance nurses' self-care practices.

Mindfulness enables nurses to concentrate more effectively on the functions of 100 their bodies and minds [20]. A concept analysis [21] defined mindfulness as a 101 transformative process in which one develops an increasing ability to experience 102 being present with awareness, acceptance and attention. Mindfulness offers a 103 promising strategy for managing chronic stress, with significant implications for 104 enhancing mind-body health and well-being, regardless of disease status [22]. 105 106 Existing studies [23-25] have consistently demonstrated that mindfulness interventions effectively alleviated stress and burnout in nurses and simultaneously 107 promoted their physical and mental well-being. Therefore, it is crucial for nurses to 108 elevate their mindfulness to the utmost level [26]. 109

110 Cook-Cottone et al. [27] conceptualized mindful self-care by skillfully integrating mindful awareness, active mindful practices, and mindful nurturing of 111 112 every facet of oneself with traditional conceptions of self-care. Mindful self-care was defined as a continuous process comprised of two parts: mindful awareness and 113 114 assessment of one's internal needs and external demands and purposeful engagement in targeted self-care practices aimed at addressing these needs and demands in a way 115 that fosters well-being and personal effectiveness [27, 28]. Mindfulness self-care can 116 aid in the identification of unrecognized self-care patterns and obstacles and the 117 implementation of targeted self-care while guiding the development of intentional and 118 119 focused self-care practices [17].

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3 4	120	Previous studies [29, 30] investigated the current status of mindful self-care and
5 6	121	its influencing factors in the nurse population, and the results showed that most nurses
7 8	122	engaged in low levels of mindful self-care. However, the current evidence could not
9 10	123	reveal the heterogeneous subgroups of mindful self-care in the nurse population or
11 12	124	their differences in different dimensions.
13 14	125	Latent profile analysis (LPA) is a reliable statistical technique for the
15 16	126	classification of subgroups [31]. LPA is a "person-centered" analysis method that is
17 18	127	frequently used in current research. This method is based on the classification of
19 20	128	mixture models that views the population distribution as a mixture of several
21 22	129	homogeneous populations with the same distribution and uses maximum likelihood
23	130	estimation to estimate the probabilities of latent classes and the parameters of the
24 25 26	131	population distribution within the class. Considering the uncertainty of classification,
20 27 20	132	this method ultimately assigns observations to the category with the maximum
28 29	133	posterior probability. Previous studies lacked correlations between latent profiles of
30 31	134	mindful self-care and mental health.
32 33	135	Therefore, the present study performed a survey of the current status of
34 35	136	mindfulness self-care among nurses and explored the heterogeneity of groups and the
36 37	137	correlation between anxiety, depression and perceived stress.
38 39	138	
40 41	139	METHODS
42 43	140	Study design
44 45	141	A cross-sectional study was performed via an online survey using a convenient
46 47	142	sampling method. The study was designed and reported in compliance with the
48 49	143	Strengthening the Reporting of Observational Studies in Epidemiology (STROBE)
50 51	144	guidelines [32].
52 53	145	
54 55	146	Sample size estimation
56 57	147	This study investigated the latent profiles of nurses' mindful self-care. Because
58 59	148	the LPA requires a sample size that exceeds 500 [31, 33], the minimum sample size
60	149	for this investigation was set at 500.
		6

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150	
151	Participants
152	Participants were included in this study based on the following eligibility
153	criteria: (1) working as a nurse in a medical facility, (2) registered as a nurse, and (3)
154	willing to participate in this study. The exclusion criteria were nurses taking sick
155	leave or who self-reported suffering from serious physical or psychological illnesses
156	using the questionnaire.
157	
158	Measurements
159	The general information questionnaire
160	The general information questionnaire included demographic and sociological
161	information, such as age, gender, marital status, professional title, highest degree,
162	department, job title, working years, number of night shifts per month, average
163	monthly income, and hospital grade.
164	
165	The Chinese version of the Brief Mindful Self-Care Scale
166	This scale was developed by Cook-Cottone et al. [28] in 2018. It was translated
167	into Chinese and applied to the nurse population by Yang et al. [34] in 2021. The
168	scale has a total of 24 items and 6 dimensions, which are mindful relaxation, physical
169	care, self-compassion and purpose, supportive relationships, supportive structure, and
170	mindful awareness. A 5-point Likert scale is used with a total score ranging from 24
171	to 120. Higher scores indicate higher levels of mindful self-care among nurses. The
172	Cronbach's alpha coefficient for this scale is 0.92.
173	
174	Perceived Stress Scale (PSS)
175	This scale was developed by Cohen et al. in 1983 [35]. Yang et al. [36] translated
176	this scale into Chinese in 2003. The scale consists of 10 items that are scored on a 5-
177	point scale from "never" to "always". The total score ranges from 0 to 40, and higher
178	scores indicate greater stress. The Cronbach's $\alpha$ coefficient for the Chinese version of
179	the PSS-10 is 0.76-0.83, which indicates good reliability and validity [37].

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3	180	
5 6	181	Patient Health Questionnaire-9 (PHQ-9)
7 8	182	The questionnaire was developed by Kroenke et al. [38] in 2001 and
9 10	183	subsequently introduced to China in 2009 [39]. The questionnaire is comprised of
11 12	184	nine items, each rated on a scale from 0 (not at all) to 3 (almost every day). The total
13 14	185	scores range from 0 to 27, with the following classifications: 0 to 5 indicating no
15 16	186	depression, 6 to 9 indicating mild depression, 10 to 14 indicating moderate
17 18	187	depression, 15 to 19 indicating severe depression, and 20 to 27 indicating extremely
19 20	188	severe depression. The internal consistency coefficient of the PHQ-9 is 0.857.
21 22	189	
23 24	190	Generalized Anxiety Disorder-7 (GAD-7) Scale
25 26	191	The scale was developed by Spitzer et al. [40] in 2006 to reflect an individual's
27 28	192	psychosomatic activity in the past two weeks, and the Chinese version was translated
29 30	193	by He et al. [41] in 2010. This scale has a Cronbach's alpha coefficient of 0.898. The
31 32	194	GAD-7 (Chinese version) is used to screen and assess generalized anxiety symptoms
33 34	195	using 7 items. The scale ranges from 0 (not at all) to 3 (almost every day). The total
35 36	196	score ranges from 0 to 21, with 0 to 5 indicating no anxiety, 6 to 9 indicating mild
30 37	197	anxiety, 10 to 14 indicating moderate anxiety, and 15 to 21 indicating severe anxiety.
38 39	198	
40 41	199	Data collection
42 43	200	Data collection was performed from August 26, 2023 to September 18, 2023.
44 45	201	The survey collected data mainly using a Chinese questionnaire survey network
46 47	202	platform. The entire testing process followed the principles of anonymity and
48 49	203	voluntariness. Before the test, the participants read the instructions and precautions
50 51	204	and completed the questionnaire. The questionnaire was directly distributed to nurses
52 53	205	via WeChat.
54 55	206	
56 57	207	Statistical analyses
58 59	208	The omega coefficient was used to measure the internal consistency reliability of
60	209	the scale. Omega coefficients greater than 0.7 indicate that the scale has a high level $\frac{8}{8}$

210	of internal consistency reliability. The validity of the scale must be comprehensively
211	assessed in combination with the fit indices. (1) Smaller $\chi^2$ test values indicate smaller
212	degrees of deviation and a greater fit of the measurement model. (2) Degrees of
213	freedom ( <i>df</i> ). (3) $\chi^2 / df$ , smaller $\chi^2 / df$ values indicate a greater fit of the model, and a
214	value between 1 and 5 indicates good model fit. (4) Root mean square error of
215	approximation (RMSEA): an RMSEA less than 0.05 indicates a good model fit, and
216	an RMSEA less than 0.08 indicates an acceptable model fit. (5) The comparative fit
217	index (CFI), which ranges between 0 and 1; generally, a CFI greater than 0.9 indicates
218	a good model fit. (6) For the Tucker–Lewis index (TLI), a TLI greater than 0.9
219	indicates an acceptable model, and a TLI greater than 0.95 indicates a better model fit.
220	(7) The standardized root mean square residual (SRMR), which reflects the
221	standardized overall residual of the assumed model, is used to determine whether the
222	model parameter setting is ideal via residual analysis, and an SRMR between 0 and 1
223	and less than 0.08 indicates a good model fit. The Mplus 7.4 program was used to
224	delineate distinct subgroups of mindful self-care. To assess model adequacy and
225	establish the optimal number of categories, various indicators were used, such as the
226	log likelihood (LL), Akaike information criterion (AIC), Bayesian information
227	criterion (BIC), adjusted Bayesian information criterion (aBIC), entropy, Lo-Mendell-
228	Rubin (LMR) test and bootstrapped likelihood ratio test (BLRT). By pooling these
229	indicators across all model fitting results in each category, we selected the model that
230	best suited the data. For data analysis, the statistical software SPSS 26.0 was used.
231	Categorical variables were characterized by assessing frequency and composition
232	ratios, and continuous variables were described using means and standard deviations.
233	If the variables did not meet the normality test, they were represented using the
234	median and quartiles. To compare categorical variables between different groups, the
235	chi-squared test was used. For comparing variables between groups, nonparametric
236	tests, chi-squared tests and Fisher's exact probability tests were used. Differences
237	between the two groups were compared using post hoc tests. Cramér's V and Epsilon-
238	squared ( $\epsilon^2$ ) were used to determine the effect size. Statistical significance was
239	defined as a p value less than 0.05.
	9

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3 4	240	
5 6	241	Ethical considerations
7 8	242	The Ethics Council of The Third Affiliated Hospital of Zunyi Medical
9 10	243	University, also known as The First People's Hospital of Zunyi, granted approval for
11 12	244	this study (2023-1-J02). All participants consented to the collection of data with full
13 14	245	knowledge and understanding. Prior to commencing the survey, participants were
15 16	246	informed about the study's primary objectives and rationale, which enabled them to
17 18	247	provide informed consent. If any nurse declined to participate, the questionnaire
19 20	248	collection process was promptly terminated. The instructions clearly assured
21 22	249	participants that there would be no consequences for refusing to participate in the
23 24	250	survey. Furthermore, participants were assured that the study results would be
25 26	251	presented in aggregated form to ensure their individual anonymity.
27	252	
29	253	Patient and public involvement
31 32	254	Patients and/or the public were not involved in the design, conduct, reporting, or
33	255	dissemination of this research.
34 35	256	
36 37	257	Results
38	258	Participant characteristics
40 41	259	The study participants were recruited from Guizhou Province, China. A total of
41 42	260	1020 questionnaires were returned, and 1001 questionnaires were valid, which resulted
45 44	261	in an effective recovery rate of 98.1%. Among the 19 invalid questionnaires, 9
45 46	262	contained logical errors in basic information, and 10 had missing data. Among the
47 48	263	included participants, 48 were males (4.8%), and 953 were females (95.2%). The
49 50	264	average age was 32.6 years, and the range was 22 to 54 years. Thirty-one people (3.1%)
51	265	were from first-level hospitals, 701 people (70.0%) were from second-level hospitals,
53 54	266	and 269 people (26.9%) were from third-level hospitals.
55 56	267	
57 58	268	Reliability and validity analysis
59 60	269	The omega coefficients of the scales ranged from 0.723 to 0.954, which indicated that

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the scales were reliable. The fit indices of all scales were within the ideal range, which

suggested that the scales had good validity. The results are presented in Table 1.

Table 1 Reliability and validity analysis of the scales

Variables	$\chi^2$	df	$\chi^2/df$	RMSEA	CFI	TLI	SRMR	omega
Mindful self-care	1143.558	232	4.929	0.063	0.946	0.936	0.038	0.946
PHQ-9	85.956	19	4.524	0.059	0.988	0.977	0.021	0.919
GAD-7	30.132	10	3.013	0.045	0.997	0.994	0.008	0.954
PSS	119.957	26	4.614	0.060	0.985	0.973	0.032	0.777

# 

# 275 Latent class identification

The results of latent profile analysis showed that the LMR *P* value and BLRT *P* value of Class 2, Class 3, and Class 4 were statistically significant (P<0.05). Compared to Class 2 and Class 3, Class 4 had the highest entropy value. Therefore, we ultimately determined that Class 4 was the optimal profile analysis model, and it indicated that classifying nurses' mindful self-care into four profiles was the best approach. The results are shown in Table 2.

Based on the results of the latent profile analysis, a score distribution chart of different profiles between different dimensions was drawn. These results are presented in Figure 1. Based on the trend of the profile distribution in the chart, we named Class 1 the Inconsistent Mindful Self-Care Group (n=44, 4.40%), Class 2 the Balanced Development Group (n=434, 43.36%), Class 3 the Moderate Mindful Self-Care Group (n=394, 39.36%), and Class 4 the High Mindful Self-Care Group (n=129, 12.89%).

### 289 Single-factor analysis of the latent profiles of nurses' mindful self-care

The distribution and characteristics of the basic information of the different potential profiles are shown in Table 3. The results showed that the nurses' department and average monthly income were the factors influencing the potential profiles (P<0.05), and there was no statistically significant difference between the other factors. The results of the effect size analysis showed that the effect size was moderate or small.

13 of 29						BMJ Open		bmjopen-20 I by copyrig	
295 296				Tab	le 2 Potential pro	ofile analysis in	ndicators (N=1001)	124-087005 on 31 ht, including for	
	Model	LL	AIC	BIC	aBIC	Entropy	LMR <i>P</i> value	BLRT &	e Category probability (%)
	Class 1	-15893.553	31811.106	31870.011	31830.898	_		2024. eigne relate	_
	Class 2	-14886.130	29810.259	29903.526	29843.180	0.865	< 0.001		47.35/52.65
	Class 3	-14500.995	29053.990	29181.618	29099.041	0.896	0.001	<0 e s a lo a a lo a lo a lo a lo a lo a lo a a lo a lo a lo a lo a lo a lo a lo a lo a lo a lo a lo a lo a lo a lo a a a a a a a a lo a a a a a a a	5.20/49.15/45.65
	Class 4	-14131.351	28328.702	28490.691	28385.881	0.922	< 0.001	ed freed	4.40/43.36/39.36/12.89
	Class 5	-14070.715	28221.431	28417.781	28290.739	0.917	0.496		4.40/37.56/4.30/39.96/13.7
<ul><li>301</li><li>302</li><li>303</li></ul>				Insert Figur	e 1 here Figure i	1 Latent prof	iles of mindful so	and similar tec	
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1 2 3 4				BMJ Open		bmjopen-2024-087005 I by copyright, includi			Ρας
5 30:	5	Table	e 3 Demographics a	and characteristics	by latent profile (N	N=1003) g	2.		
7	Variables	Category	Class 1	Class 2	Class 3	Elas 4	$X^2/H$	Р	$V/\epsilon^2$
8	Age, median		31.5 (28.0, 37.0)	32.0 (29.0, 36.0)	31.5 (28.0, 35.0)	33.0%25, 36.0)	2.067	0.559	0.001
9 10	(P25, P75)	- ·				2022 rela	<b>•</b> • • • <b>-</b>		
11	Gender	Female	43 (97.7%)	407 (93.8%)	380 (96.4%)	12 <b>8 (9</b> 5.3%)	3.407	0.317	0.062
12		Male	1 (2.3%)	27 (6.2%)	14 (3.6%)				
13 14	Marital status	Single	10 (22.7%)	70 (16.1%)	74 (18.8%)	20%(£555%)	6.463	0.373	0.055
15		Married	34 (77.3%)	354 (81.6%)	312 (79.2%)	10 <b>3 678</b> 8%)			
16		Others	0 (0%)	10 (2.3%)	8 (2.0%)	(H. 7%)			
17 18	Professional title	Junior level	24 (54.5%)	257 (59.2%)	241 (61.2%)	8 <b>()</b>	2.587ª	0.860	0.039
19		Intermediate level	19 (43.2%)	154 (35.5%)	137 (34.8%)	4 <b>8</b> (34 <b>9</b> %)			
20		Senior level	1 (2.3%)	23 (5.3%)	16 (4.1%)	<b>4≥</b> (3. <b>2</b> %)			
21 22	Highest Degree	Junior College and below	7 (15.9%)	61 (14.1%)	62 (15.7%)	2 2 2 4 (19 4 %)	9.701	0.138	0.047
23		Undergraduate and above	37 (84.1%)	373 (85.9%)	332 (84.3%)				
24	Department	Internal Medicine	12 (27.3%)	90 (20.7%)	129 (32.7%)	242(186%)	50.627 a	0.001	0.133
25 26	-	Surgery	10 (22.7%)	94 (21.7%)	67 (17.0%)	36(233%)			
27		Obstetrics and Gynecology	11 (25.0%)	38 (8.8%)	33 (8.4%)	<b>1</b> <b>1</b> <b>1</b> <b>1</b> <b>1</b> <b>1</b> <b>1</b> <b>1</b> <b>1</b> <b>1</b>			
28		Pediatrics	2 (4.5%)	32 (7.4%)	31 (7.9%)				
29 30		Emergency/ICU	0 (0%)	57 (13.1%)	47 (11.9%)	193(14.57%)			
31		Operating Room	2 (4.5%)	25 (5.8%)	10 (2.5%)				
32		Functional Assistance	1 (2.3%)	20 (4.6%)	16 (4.1%)	gięs(3.9%)			
33 34		Departments				. Ag			
35		Administrative and Logistics	0 (0%)	17 (3.9%)	7 (1.8%)	4 (3. <b>8</b> %)			
36		Departments				e B			
37 38		Others	6 (13.6%)	61 (14.1%)	54 (13.7%)	17 (13 <b>5</b> 2%)			
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1 2 3 4						2024-087005 ight, includ			
5 Jo	ob title	No	37 (84.1%)	348 (80.2%)	322 (81.7%)	102 (83.9%)	0.858	0.839	0.029
6 7		Yes	7 (15.9%)	86 (19.8%)	72 (18.3%)	22g(1741%)			
/ W 8 (y 9 (y	Working years years)	<5	7 (15.9%)	77 (17.7%)	76 (19.3%)	2\$\$5 ED5 Seic 2 \$ 2 \$ 20 2 5 20	5.204	0.518	0.051
10		5~10	23 (52.3%)	209 (48.2%)	193 (49.0%)	5 <b>a</b> (a) (2) (3) (3) (3) (3) (3) (3) (3) (3) (3) (3			
11 12		>10	14 (31.8%)	148 (34.1%)	125 (31.7%)	5 <b>35(9919</b> 1%)			
13 N	Number of night	0	17 (38.6%)	154 (35.3%)	133 (33.8%)	4 <b>18</b>	7.512	0.276	0.061
14 sł	hifts per month	1~4	4 (9.1%)	75 (17.3%)	57 (14.5%)	28 ( <u>e</u> 167%)			
15		≥5	23 (52.3%)	205 (47.2%)	204 (51.8%)	54 <b>a</b> (≝1 <b>≍</b> 9%)			
17 A	Average monthly	≤3000	16 (36.4%)	47 (10.8%)	68 (17.3%)	18 ( A F 0%)	24.460	< 0.001	0.111
18 ir	ncome (yuan)	3001~6000	23 (52.3%)	299 (68.9%)	256 (65.0%)	9 <b>Ē.6</b> 8%)			
19 20		>6000	5 (11.4%)	88 (20.3%)	70 (17.8%)	24(12)			
21 H	Hospital grade	Primary level	1 (2.3%)	16 (3.7%)	12 (3.0%)	2 (1. <mark>8</mark> %)	3.396	0.749	0.044
22		Secondary level	35 (79.5%)	298 (68.7%)	278 (70.6%)	9( <b><u>5</u>)</b> (69 <mark>)</mark> 8%)			
23 24		Tertiary level	8 (18.2%)	120 (27.6%)	104 (26.4%)	39 (287%)			
25 306 27 28 29 30 31 32 33 34 35 36	<sup>a</sup> Fisher's exact p	probability test			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	tom/ on June 12, 2025 at Agence E and similar technologies.			

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307 Correlation analysis between mindful self-care and mental health

Spearman's correlation was used to analyze the relationships between mindful selfcare, perceived stress, anxiety, and depression. The results showed that mindful selfcare negatively correlated with anxiety and depression (P < 0.05). However, there was no correlation between mindful self-care and perceived stress (P > 0.05). There were positive correlations between perceived stress, anxiety, and depression (P < 0.05). The results are shown in Table 4.

Table 4 Correlations between mindful self-care and mental health

	Median (P25, P75)	1	2	3	4
1 Mindful self-care	80.00 (69.00, 91.00)	1			
2 PHQ-9	7.00 (3.00, 11.00)	-0.333**	1		
3 GAD-7	6.00 (1.00, 8.00)	-0.295**	0.826**	1	
4 PSS	20.00 (16.00, 22.00)	-0.030	0.498**	0.496**	1
** <i>P</i> <0.01					

Using the grouping of mindful self-care as the dependent variable and the scores of perceived stress, anxiety, and depression as the independent variables, a nonparametric test was performed. The results are shown in Table 5. There were significant differences in nurses' scores for perceived stress, anxiety, and depression between the different groups. There were differences in depression scores between the different groups. Comparison of multiple groups revealed that the Inconsistent Mindful Self-Care Group and Moderate Mindful Self-Care Group had higher levels of depression than the Balanced Development Group and High Mindful Self-Care Group, but there was no difference between the Inconsistent Mindful Self-Care Group and Moderate Mindful Self-Care Group. The results for anxiety were similar to depression. Perceived stress was statistically different between the groups, and further two-by-two comparisons showed that the Balanced Development Group and Moderate Mindful Self-Care Group had higher levels than the High Mindful Self-Care Group and Inconsistent Mindful Self-Care Group. The Inconsistent Mindful Self-Care Group had the highest level of perceived stress. The results of the effect size analysis showed that the comparison of anxiety and depression between the different groups revealed a 

1 Inconsistent

Mindful Self-

Care Group

9.0 (4.5, 16.0)

7.0 (0, 13.0)

17.0 (10.0, 16.0)

16HQ-9

1GAD-7

	Table 5 Compara	ative analysis of me	ntal health between o	different gro	oups		
nsistent ul Self- Group	2 Balanced Development Group	3 Moderate Mindful Self- Care Group	4 High Mindful Self-Care Group	Н	Р	Post hoc	€ <sup>2</sup>
5, 16.0)	6.0 (2.0, 10.0)	9.0 (6.0, 13.0)	3.0 (0, 7.0)	107.327	< 0.001	3≈1>2>4	0.10
, 13.0)	4.0 (0, 7.0)	4.0 (0, 7.0)	7.0 (3.0, 10.0)	90.593	< 0.001	3≈1>2>4	0.08
).0, 16.0)	20.0 (16.0, 22.0)	20.0 (17.0, 22.0)	18.0 (13.0, 22.0)	11.585	0.009	3≈2>4>1	ع 0.00
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### 338 Discussion

The present study used LPA to investigate diverse groups of mindful self-care practices among nurses in hospitals. Based on cross-sectional data, we identified four distinct subgroups: the Inconsistent Mindful Self-Care Group, the Balanced Development Group, the Moderate Mindful Self-Care Group, and the High Mindful Self-Care Group. To the best of our knowledge, this study is the first study to explore heterogeneous groups of mindful self-care using the LPA method. Compared to traditional person-centered analysis methods, such as cluster analysis, LPA is a more flexible and model-based classification method. Notably, LPA provides a variety of adaptability indices to determine the number of profiles more scientifically with a lower bias. We further used correlation analysis to confirm a significant correlation between four subgroups, anxiety, depression, and perceived stress.

The LPA results revealed that nearly half (43.36%) of the nurses had a relatively lower level of mindful self-care, and 39.36% of the nurses had a moderate level of mindful self-care. A survey of oncology nurses in China reported an average mindful self-care score of 59.30 [42]. In another survey of emergency nurses used the 36-item mindful self-care scale and found that scores averaged 89.74, which was low overall [29]. According to our findings, nurses' mindful self-care score was 80.00, which was higher than previous studies. Similarly, the LPA results revealed characteristic differences between the groups. The two groups with high LPA values scored significantly higher on the dimensions of supportive relationships and supportive structures than the other dimensions and may have a stronger external self from the perspective of Attuned Representational Models of Self [28]. The Natural Development Group scored more consistently on all dimensions. However, the Inconsistent Group scored significantly higher on physical care, self-compassion and purpose, which indicates a stronger internal self. These results suggest that future studies should prioritize the characteristics of the population and the implementation of effective interventions.

366 Our study also revealed several different profile characteristics. Specifically,
367 department and average monthly income were influencing factors in different groups.

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The results showed that a larger proportion of nurses in the internal medicine department belonged to the medium- and high-scoring groups, which indicated that internal medicine nurses more frequently adopted mindful self-care practices. Potential reasons may be that nurses in internal medicine departments have relatively low workloads, and working in such an environment, where some chronic diseases are often caused by unhealthy lifestyles, may promote nurses' self-care behaviors. The present study included full-time nurses because there are no part-time nurses in China. There is a significant income disparity between different hospitals and departments, which is also one of the factors affecting mindful self-care. Nurses' capacity for health-promoting self-care is significantly influenced by a confluence of factors, including time constraints, excessive workloads, scarcity of resources and facilities, the draining effects of fatigue, and the demands of external commitments [15, 43]. A previous study [42] demonstrated that educational level and health status were predictors of mindful self-care, but our investigation did not support this finding, which may be related to the inclusion of the study population. Another study [30] showed that gender was also an influencing factor for mindful self-care, but the large gap between the male and female ratios in this study failed to validate this difference. Future research should actively focus on key populations to explore the factors influencing the population of nurses with low levels of mindful self-care to provide targeted interventions. 

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Our study further confirmed the correlation between mindfulness and mental health. Anxiety and depression scores showed weak negative correlations with mindful self-care scores. Although perceived stress was not correlated with the mindful selfcare score, the perceived stress score differed between the four groups. Zhang et al. [42] showed that mental health literacy positively correlated with mindful self-care. Mindfulness can function as a protective factor to mitigate or even eliminate the negative impact of perceived stress [44]. This relationship may further explain the potential stress-buffering effects of mindful self-care. More research is needed to further validate the relationships between the variables related to mental health and mindful self-care. 

The present study revealed that there is much room for improvement in mindful

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self-care for nurses. Notably, nurses' awareness of self-care should increase, and mindfulness should be integrated into their daily work and life [17]. There have been many mindful self-care-related interventions, such as mindfulness workshops [45], mindful self-compassion training [46], and mindfulness-based self-care and resiliency interventions [47], but these interventions did not use mindful self-care as a valid outcome indicator. Some personalized and convenient interventions, such as digital health apps [48] and fragmented interventions, should be provided according to the special characteristics of the nurses.

#### 407 Limitations

This research has several notable limitations. First, the methodology was a cross-sectional survey, and despite the substantial size of the sample, data collection relied on convenience sampling instead of random sampling. Second, the sample was exclusively drawn from Guizhou Province in China, which resulted in a potential selection bias that hindered a comprehensive portraval of the current state of mindfulness self-care among nurses throughout the country. Third, because the present research was performed exclusively with Chinese nurses, whether the findings can be generalized to other cultural contexts is not certain. Therefore, there is a pressing need for further research with a larger and higher-quality sample size. 

# 418 Conclusion

This study used LPA to investigate mindful self-care practices among hospital nurses and revealed four distinct subgroups: the Inconsistent Mindful Self-Care Group, the Balanced Development Group, the Moderate Mindful Self-Care Group, and the High Mindful Self-Care Group. The four groups showed different levels of anxiety, depression, and perceived stress, which highlights the importance of mindful self-care for nurses' mental well-being. Nursing managers and researchers should prioritize the enhancement of nurses' awareness of mindful self-care and the development of concise, accessible, and feasible intervention programs. 

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2 3 4	428	Acknowledgments
5 6	429	None.
7 8	430	
9 10	431	CONFLICT OF INTEREST
11 12	432	The authors have no conflicts of interest to declare.
13 14	433	
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19	436	Science and Technology Bureau (2023-73).
20	437	
22 23	438	Ethical considerations
24 25	439	The Ethics Committee of The Third Affiliated Hospital of Zunyi Medical University
26 27	440	(The First People's Hospital of Zunyi) approved this study (2023-1-J02). Informed
28 29	441	consent was obtained from all study participants prior to initiating the survey.
30 31	442	
32	443	Authors' contributions
33 34	444	YZF and ZYH participated in writing and revising the manuscript. WWW, LMD and
35 36	445	YWP collected and analyzed the data. JH designed the study and participated in
37 38	446	revising the manuscript. All authors have read and approved the manuscript. JH acted
39 40	447	as guarantor.
41 42	448	
43 44	449	Data availability statement
45 46	450	The data are available upon reasonable request. The data are available from the
47	451	corresponding author and the first author upon reasonable request.
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	T.	Sheekiist of items that should be meraded in reports of cross sectional shares		
	Item No	Recommendation		
Title and abstract	1	( <i>a</i> ) Indicate the study's design with a commonly used term in the title or the abstract	2	
		(b) Provide in the abstract an informative and balanced summary of what	2-	
		was done and what was found		
Introduction				
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4-:	
Objectives	3	State specific objectives, including any prespecified hypotheses	6	
Methods			1	
Study design	4	Present key elements of study design early in the paper	6	
Setting	5	Describe the setting, locations, and relevant dates, including periods of	6	
		recruitment, exposure, follow-up, and data collection		
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	6	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders,	NA	
		and effect modifiers. Give diagnostic criteria, if applicable		
Data sources/	8*	For each variable of interest, give sources of data and details of methods	6-8	
measurement		of assessment (measurement). Describe comparability of assessment		
		methods if there is more than one group		
Bias	9	Describe any efforts to address potential sources of bias	6-8	
Study size	10	Explain how the study size was arrived at	6	
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6-8	
Statistical methods	12	( <i>a</i> ) Describe all statistical methods, including those used to control for confounding	8-9	
		(b) Describe any methods used to examine subgroups and interactions	NA	
		(c) Explain how missing data were addressed	NA	
		( <i>d</i> ) If applicable, describe analytical methods taking account of sampling strategy	NA	
		(e) Describe any sensitivity analyses	NA	
Recults				
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	9	
		(b) Give reasons for non-participation at each stage	9	
		(c) Consider use of a flow diagram	NA	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	9	
		(b) Indicate number of participants with missing data for each variable of interest	NA	
Outcome data	15*	Report numbers of outcome events or summary measures	9-	
Main results	16	( <i>a</i> ) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear	NA	

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		(b) Report category boundaries when continuous variables were	10
		categorized	
		(c) If relevant, consider translating estimates of relative risk into absolute	NA
		risk for a meaningful time period	
Other analyses	17	Report other analyses done-eg analyses of subgroups and interactions,	NA
		and sensitivity analyses	
Discussion			
Key results	18	Summarise key results with reference to study objectives	16-
			17
Limitations	19	Discuss limitations of the study, taking into account sources of potential	18
		bias or imprecision. Discuss both direction and magnitude of any potential	
		bias	
Interpretation	20	Give a cautious overall interpretation of results considering objectives,	18
		limitations, multiplicity of analyses, results from similar studies, and other	
		relevant evidence	
Generalisability	21	Discuss the generalisability (external validity) of the study results	18
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study	19
		and, if applicable, for the original study on which the present article is	
		based	

\*Give information separately for exposed and unexposed groups.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.