BMJ Open

BMJ Open is committed to open peer review. As part of this commitment we make the peer review history of every article we publish publicly available.

When an article is published we post the peer reviewers' comments and the authors' responses online. We also post the versions of the paper that were used during peer review. These are the versions that the peer review comments apply to.

The versions of the paper that follow are the versions that were submitted during the peer review process. They are not the versions of record or the final published versions. They should not be cited or distributed as the published version of this manuscript.

BMJ Open is an open access journal and the full, final, typeset and author-corrected version of record of the manuscript is available on our site with no access controls, subscription charges or pay-per-view fees (http://bmjopen.bmj.com).

If you have any questions on BMJ Open's open peer review process please email info.bmjopen@bmj.com

BMJ Open

Latent profile analysis of nurses' perceived professional benefits: a cross-sectional study

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2023-078051
Article Type:	Original research
Date Submitted by the Author:	22-Jul-2023
Complete List of Authors:	Sun, Changli; Third Affiliated Hospital of Zunyi Medical University Jiang, Hu; Affiliated Hospital of Zunyi Medical University Yao, Qingfang; The Third Affiliated Hospital of Zunyi Medical University Wang, Xianwei; The Third Affiliated Hospital of Zunyi Medical University Wen, Xueke; Third Affiliated Hospital of Zunyi Medical University Liu, Hanmei; Zunyi Medical University
Keywords:	Burnout, Professional, Burnout, China

SCHOLARONE™
Manuscripts

I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our licence.

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which Creative Commons licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

For peer review only

Latent profile analysis of nurses' perceived professional benefits: a cross-sectional study

Running Head: LPA of nurses' perceived professional benefits

Changli Sun[1], Hu Jiang[1]*, Qingfang Yao[2], Xianwei Wang[2], Xueke Wen[1] and Hanmei Liu[2],

[1] The Third Affiliated Hospital of Zunyi Medical University (The First People's Hospital of Zunyi), Zunyi, Guizhou, China

[2] Zunyi Medical University, Zunyi, Guizhou, China

*Correspondence: jianghuchn@163.com, Nursing Department, The Third Affiliated Hospital of Zunyi Medical University (The First People's Hospital of Zunyi), Zunyi, Guizhou, China

For peer review only

Latent profile analysis of nurses' perceived professional benefits: a cross-sectional study

ABSTRACT

Aim: To identify profiles of nurses' perceived professional benefits as well as their predictors.

Design: Cross-sectional descriptive study.

Methods: From July 6 and July 27, 2022, a total of 1,309 registered nurses participated in the survey by convenient sampling. We collected the Nurses' Perceived Professional Benefits Questionnaire (NPPBQ) and demographic data. Using latent profile analysis (LPA), subgroups of nurses' perceived professional benefits were identified. Moreover, univariate and multinomial logistic regression analysis were conducted to find the factors that were linked with the profiles.

Results: The survey was validly completed by 1309 nurses. The findings of the LPA demonstrated three unique profiles: low perceived professional benefits (11.8%), moderate perceived professional benefits (57.1%), and high perceived professional benefits (31.1%). There was a correlation between marital status, the number of night shifts performed each month, and job title.

No Patient or Public Contribution.

Keywords: nurse, perceived professional benefits, latent profile analysis, cross-sectional study

For peer review only

1 INTRODUCTION

It is estimated that 69% of the global health workforce consists of nurses [1]. Yet, the present physical and mental health of nurses is not encouraging, as they confront high levels of stress, burnout, turnover, and their own ageing [2-4]. Nursing is no longer a desirable and appealing profession [5], which makes nurse shortages a widespread worldwide concern [6]. These issues have a direct bearing on the sustainability and continued growth of the nursing workforce. In recent years, nursing in China has experienced remarkable growth, and the most recent statistics indicate that China has more than 5 million registered nurses [7]. Chinese nurses are extremely susceptible to burnout, and a high desire to leave is a serious concern [8 9]. However, there is a dearth of comprehensive study and viable remedies.

The mental health of nurses is receiving increasing attention from managers and researchers in the context of positive psychology. It is beginning to be recognized that nurses' own positive psychology promotes job satisfaction and professional identity, lessens burnout, and hence reduces turnover rates [10 11]. Moreover, despite the fact that nursing is a high-risk, high-stress profession, nurses are able to achieve benefit findings [12-14]. In recent years, the concept of nurses' perceived professional benefits arises naturally, and has gradually attracted the attention of researchers.

1.1 Background

Regarding nurses' perceptions of their professional perks, there is no universally agreed definition. Nurses' perceived professional benefits (NPPB) refer to nurses' perceptions of the gains and benefits they receive in their profession during the hiring process, as well as their belief that working in nursing can promote their overall growth and development [15 16]. Essentially, perceived professional benefits can be classified as an emotional experience and cognitive evaluation, which has two aspects: actual benefits and spiritual benefits [15].

The profession of nursing can be beneficial to nurses in a number of ways. Previous studies [17 18] reported that nursing preceptorship offers many benefits, and nurses may find themselves being more committed to the position as a result. A

For peer review only

qualitative study [19] found that nurses who were involved in caring for dying patients got a great lot of experience and benefited considerably; they can create a personal philosophy on death and life, in addition to professional growth. Nurses who served as advanced practice nurse roles perceived numerous benefits, including improved patient care quality and safety, professionalism, personal development, career development, intrinsic satisfaction with the role, and impact on other professional groups [20]. A person's perception of professional benefit is an endogenous motivation for his or her development and has a positive effect on that person's career. According to prior study, improving the perceived professional benefit of nurses reduces burnout reduction and enables nurses to approach their work with a good attitude and obtain more favorable comments [21 22].

Measures created by researchers to evaluate the perceived professional benefits of nurses were still in little supply. The Preceptor's Perspective of Benefits and Rewards (PPBR) measure was designed by Dibert and Goldenberg [23]to evaluate the perceived benefits of clinical preceptor nurses, however, it is not relevant to general clinical nurses. A questionnaire entitled Nurses' Perceived Professional Benefits Questionnaire (NPPBQ) was developed to assess how Chinese nurses perceive the gains and benefits of their employment [16 24]. This questionnaire has been utilized in a lot of research to date. While we now have a better grasp of nurses' perceptions of professional benefits, but the heterogeneity of the population is still lack, screening strategies for future precision interventions cannot be developed for identifying low-benefit populations.

The use of latent profile analysis (LPA) is frequently used to determine the number of subpopulations in a given sample. LPA is a statistical method that use potential category variables to explain the link between exogenous continuous-type indicators, permitting the assessment of the correlation between exogenous indicators and the maintenance of local independence among exogenous indicators [25].

To our knowledge, no studies have been conducted using LPA-based analyses of the perceived professional benefits of nurses have been done. The current study was created to bridge that gap. This study's objective was to examine the characteristics

For peer review only

and determinants of nurses' perceived professional benefits as well as the predictors of these latent profiles.

2 THE STUDY

2.1 Study design

An online survey was used in this study to conduct a cross-sectional analysis. This study was designed and reported in accordance with the guidelines for Strengthening the Reporting of Observational Studies in Epidemiology (STROBE).

2.2. Sample size estimation

An examination of the latent profiles of perceived professional benefits among nurses was conducted in this study. LPA needs a sample size larger than 500 [25 26], therefore, the minimum sample size for this study was 500.

2.3 Participants

Participants in this study required to meet the inclusion criteria and be registered nurses. To be considered, candidates had to satisfy the following criteria to be considered: (1) having worked as a nurse in a medical facility for at least one year, and (2) being willing to participate in this study. The following were the exclusion criteria: having been diagnosed with a severe psychological or physical disorder.

2.4 Instruments

2.4.1 Demographic

This study gathered and evaluated demographic data including age, gender, greatest degree of education, marital status, and other participant characteristics.

2.4.2 Nurses' Perceived Professional Benefits Questionnaire (NPPBQ)

The questionnaire was designed by Hu and Liu [16] to investigate the gains and benefits that nurses perceived from their jobs. The authors then reduced it to 17 items by 2020 [24]. The questionnaire has five dimensions: personal growth, a good nurse-patient

For peer review only

relationship, recognition from family and friends, a positive occupational perception, and team belonging. Items are scored on a 5-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = not sure, 4 = agree, 5 = strongly agree). Cronbach's alphas for the questionnaires were 0.94, and the NPPBQ subquestionnaires' alphas were 0.84, 0.83, 0.74, 0.79, and 0.85.

2.5 Data collection

During the dates of July 6 and July 27, 2022, data was gathered. Wenjuanxing (www.wjx.cn) was used to develop a web-based questionnaire. Wechat was used to send the URL and QR code for the web questionnaire. The survey can be completed by clicking on the link or scanning the QR code.

2.6 Statistical analyses

Latent profile analysis was conducted using Mplus 7.4 software. Log likelihood (LL), Akaike information criterion (AIC), Akaike Information Criterion (BIC), Adjusted Bayesian Information Criteria (aBIC), Entropy, Lo-Mendell-Rubin (LMR), and the Bootstrapped Likelihood Ratio Test (BLRT) were used to assess model fit and determine the appropriate number of categories. In order to decide which model best fit the data, the models from each category's fitting results were combined with the aforementioned indicators. The data was examined using the SPSS 26.0 statistical program. We utilized frequency and composition ratios for categorical data, whereas mean and standard deviation were utilized for continuous variables. The chi-square test was performed to compare category variables across groups. ANOVA was used to compare continuous variables among multiple groups. A multivariate logistic regression model was employed to analyze the variations in demographic variables. A statistically significant difference was indicated by $p < 0.05$.

2.7 Ethical considerations

For peer review only

The Ethics Committee of the First People's Hospital of Zunyi (2022-016) approved the study, and participants gave permission for data collection. Before to completing the survey, participants will be informed of the major substance of the study and the objective of the investigation, and they will have the option to provide informed consent. In addition, participants were also informed that the study's findings would be given in aggregate form and that no participant could be identified. If a person declined to complete the questionnaire, the collection was immediately ended.

3 RESULTS

3.1 Participant characteristics

A total of 1409 nurses completed the questionnaire, while 58 nurses denied participation, for a total number of 1351 questionnaires received. 42 surveys were considered invalid due to insufficient or inaccurate information. 92.9 percent of the final 1309 surveys were correctly returned. The ages of the participants varied from 18 to 59 years old, with a mean age of 32.25 (SD: 6.18) years old. The bulk of participants were female (86.7%), whereas the minority were male (3.2%).

3.2 Characteristics of the different classes

On the basis of the NPPBQ's five dimensions, it was established that a model with three latent classes provided the greatest match. Table 1 provides the results. While the AIC and BIC in class 4 were lower in class 4 than in class 3, the entropy was greater; nonetheless, the lowest category probability in class 4 was 1.4%, which is unsatisfactory. As a consequence, we decided that the best-fitting model is class 3. Using a three-class model, Figure 1 illustrates the mean scores for each category within the NPPBQ's dimensions. The percentages increase from class 1 to class 3 as follows: 11.8% (155 nurses), 57.1% (747 nurses), and 31.1% (407 nurses). For the sake of brevity, based on the profile scores, we named class 1 as the low perceived professional benefits, class 2 as the moderate perceived professional benefits, and class 3 as the high perceived professional benefits.

For peer review only

3.3 The scale and dimension scores of different profiles

The findings of a one-way ANOVA indicated statistically significant differences in the scale and dimension scores of different profiles (both $p<0.001$). The results were shown in Figure 2 demonstrates the outcomes.

3.4 Demographic and related characteristics of each profile

The ANOVA and chi-square tests indicated statistically significant differences between the three profiles differed statistically in terms of age, marital status, children, professional title, job title, working years, and number of night shifts per month. Table 2 is a summary of the results.

A multivariate logistic regression model was constructed using the variables with statistically significant differences as determined by ANOVA and chi-square tests. Of the three profiles, the class 3 was chosen as a reference to find the predictors linked with NPPBQ. As shown in Table 3, nurses who were single/divorced/widowed were more likely to belonged to low perceived professional benefits (*OR*: 1.984, 95%*CI*:1.028-3.828). The number of night shifts worked per month was associated with low perceived professional benefits (*OR*: 0.633, 95% *CI*: 0.405-0.988), compared to those with more than five night shifts, those without night shifts tended to fall into the high perceived professional benefits. Nurses without a job title were more likely to be in the moderate perceived professional benefits *(OR*: 1.489, 95% *CI*: 1.028-2.157). Other variables were not statistically significant in the multivariate logistic regression.

For peer review only

4 DISCUSSION

The purpose of this research was to identify distinct profiles of nurses' perceived professional benefits. Furthermore, the current study employed multinomial logistic regression to investigate predictors of these profiles.

In this study, we investigated 1309 nurses who validly completed the questionnaire. As a result, three latent profiles were identified: low perceived professional benefits, moderate perceived professional benefits, and high perceived professional benefits. Our research revealed that the majority of nurses had a moderate or higher levels of perceived professional benefits, with just 11.8% of nurses belonging to the category of nurses with low perceived professional benefits. Most studies reported nurses had an upper-moderate level of perceived professional benefits [27 28], and our findings are consistent with those of previous studies.

In the last three years, nurses have been a key part of the fight against the COVID-19 outbreak. Despite heavy job pressure, nurses have had a feeling of professional calling and value [29], which has effectively enhanced their sense of professional benefit [12]. At the same time, the critical role of nurses in defending people's lives and health has earned the society's respect and recognition, as well as a positive social image [30 31], which can further enhance nurses' sense of professional benefit. Our survey was conducted during the COVID-19 epidemic, and nurses' perceptions of professional benefit may be elevated.

Another finding of our study revealed that the membership of profiles can be predicted by some characteristics such as the number of night shifts, job title, and marriage status. Nursing is a continuous, 24-hour profession, and nurse's work normally takes the form of night shifts. It is widely proven that night shifts negatively impact the physical and emotional health of nurses [32-35]. Nurses working rotating night shifts were normally younger, and they had the lower scores of job satisfaction, quality of sleep, and quantity of sleep [36], these factors resulted in a low perceived professional benefits. Consistent with past research, our findings indicate that the greater the frequency of night shifts, the lower the perceived professional benefit [28].

For peer review only

The majority of nurses in the moderate perceived professional benefits group lacked a work title, while the majority of nurses in the highly perceived professional benefits group held a job title. This has been validated by other research, and our work provides more support for this notion [28]. Holding a managerial position at a hospital is a means of advancing one's career, and nurses highly value this opportunity.

Our study found that nurses who were single/divorced/widowed were more likely to belonged to low perceived professional benefits, which is consistent with earlier findings [28]. This may be because, unlike single/divorced/widowed nurses, married nurses receive more social support from their spouses and other family members.

Unfortunately, our research failed to demonstrate that the profiles can be predicted by other factors in the model variables. Our findings in the univariate analysis results were consistent with earlier research. Nevertheless, because the bulk of prior research did not employ multi-factor models, it was impossible to compare our findings could not be compared to those of others. In addition, certain putative contributing elements were not adequately proven, and further research is required to confirm them in the future.

Professional benefit for nurses is a psychological process that is dynamic and impacted by a number of elements. According to our results, 57.1% of nurses perceived professional benefits as moderate. However, they may perceive low professional benefits as a result of personal, organizational, environmental or social reasons. Although many studies have been conducted to investigate the relationship between professional benefits, professional identity, and burnout, they only make spectacular observations without delving into the mechanisms and theories. As Willetts and Clarke [37] argued, using social identity theory as a research framework may assist in clarifying and describing nurses' professional identities. In order to better understand how nurses perceive the benefits of having a career, it is necessary to develop additional theoretical models.

For peer review only

Our research has theoretical and practical implications for the future study of nurses' perceived professional benefits. In this survey, we presented a unique perspective and a basis for future research on the perceived career benefits of nurses. Additionally, our research has identified subgroups of registered nurses based on their perceptions of professional benefits and offers treatments based on these findings. It is important to realize that there are many interventions available for addressing job satisfaction [38] and burnout [39]. In the future, further assistance programs targeting perceived professional benefits should be implemented.

4.1 Limitations

The research was limited in some ways. First, this was a web-based survey, and the sample process and self-reporting strategy may have resulted in some bias. Second, we only polled nurses in mainland China, and our sample only reflected the current situation in a single nation. Lastly, the constraints of the study's design prohibited an in-depth assessment of the psychological factors behind nurses' perceptions of their professional benefit. As a result, more rigorously designed studies will be required in the future to investigate this issue in depth.

5 CONCLUSION

Our study identified three professional benefits profiles among nurses. The results of our study indicated that nurses enjoy a high level of professional benefits. Notwithstanding the study's limitations of the study and the present condition of nursing, it is vital that we engage on several levels to encourage a stable nursing workforce, including policy, organisation, financial income, and career development, so that nurses experience a sense of professional gain.

For peer review only

Acknowledgements

None.

CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

AUTHOR CONTRIBUTIONS

Jiang Hu and Sun Changli were responsible for the conception and study design. Yao Qiangfang, Wang Xianwei and Liu Hanmei performed the data collection. Yao Qiangfang, Wang Xianwei and Wen Xueke contributed to the analysis of the data. Sun Changli and Jiang Hu were involved in drafting the manuscript and revising it. All authors have read and approved the final manuscript.

FUNDING

This study was funded by the Science and Technology Fund Project of Guizhou Provincial Health and Health Commission (gzwjkj2019-1-030).

For peer review only

REFFERENCES

1. Malone B. A Perspective on the State of the World's Nursing Report. *Nurs Adm Q* 2021;**45**(1):6-12.
2. Ivziku D, de Maria M, Ferramosca FMP, et al. What determines physical, mental and emotional workloads on nurses? A cross-sectional study. *J Nurs Manag* 2022;**30**(8):4387-97.
3. Morgan B, Jordan L, Rivera LA. Considerations for an aging nurse anesthetists workforce. *Geriatr Nurs* 2020;**41**(6):1017-19.
4. Tamata AT, Mohammadnezhad M. A systematic review study on the factors affecting shortage of nursing workforce in the hospitals. *Nurs Open* 2023;**10**(3):1247-57.
5. van der Cingel M, Brouwer J. What makes a nurse today? A debate on the nursing professional identity and its need for change. *Nurs Philos* 2021;**22**(2):e12343.
6. Udod S. A Call for Urgent Action: Innovations for Nurse Retention in Addressing the Nursing Shortage. *Nurs Rep* 2023;**13**(1):145-47.
7. National Bureau of Statistics of China. China Statistical Yearbook. Secondary China Statistical Yearbook 2022. http://www.stats.gov.cn/sj/ndsj/2022/indexch.htm.
8. Zeng LN, Zhang JW, Zong QQ, et al. Prevalence of burnout in mental health nurses in China: A meta-analysis of observational studies. *Arch Psychiatr Nurs* 2020;**34**(3):141-48.
9. Chen JP, Dai YM, Qin Y, et al. Factors influencing turnover intention among male nurses in China: A large-scale descriptive correlational study. *Int Nurs Rev* 2023.
10. Yu JF, Ding YM, Jia RY, et al. Professional identity and emotional labour affect the relationship between perceived organisational justice and job performance among Chinese hospital nurses. *J Nurs Manag* 2022;**30**(5):1252-62.

For peer review only

11. Lin L, Liu X, He G. Mindfulness and Job Satisfaction Among Hospital Nurses: The Mediating Roles of Positive Affect and Resilience. *J Psychosoc Nurs Ment Health Serv* 2020;**58**(6):46-55.

12. Wang X, Chen F, Dai P, et al. Perceived professional benefits and associated factors among nurses during the COVID-19 pandemic: A cross-sectional study. *Nurs Open* 2023;**10**(3):1461-70.

13. Jiang H, Huang N, Tian W, et al. Factors Associated With Post-traumatic Stress Disorder Among Nurses During COVID-19. *Front Psychol* 2022;**13**:745158.

14. Liu S, Duan X, Han P, et al. Occupational benefit perception of acute and critical care nurses: A qualitative meta-synthesis. *Front Public Health* 2022;**10**:976146.

15. Zhou H, Zhu Y, Zhang X, et al. Psychological Capital and Perceived Professional Benefits: Testing the Mediating Role of Perceived Nursing Work Environment Among Chinese Nurses. *J Psychosoc Nurs Ment Health Serv* 2018;**56**(4):38-47.

16. Hu J, Liu X. The preparation of nurses' occupational benefit questionnaire and its reliability and validity test [J]. *J Chin People's Liberation Army* 2013;**30**(22):1-5.

17. Macey A, Green C, Jarden RJ. ICU nurse preceptors' perceptions of benefits, rewards, supports and commitment to the preceptor role: A mixed-methods study. *Nurse Educ Pract* 2021;**51**:102995.

18. Natan MB, Qeadan H, Egbaria W. The commitment of Israeli nursing preceptors to the role of preceptor. *Nurse Educ Today* 2014;**34**(12):1425-9.

19. Zheng RS, Guo QH, Dong FQ, et al. Chinese oncology nurses' experience on caring for dying patients who are on their final days: a qualitative study. *Int J Nurs Stud*

For peer review only

2015;**52**(1):288-96.

20. Christiansen A, Vernon V, Jinks A. Perceptions of the benefits and challenges of the role of advanced practice nurses in nurse-led out-of-hours care in Hong Kong: a questionnaire study. *J Clin Nurs* 2013;**22**(7-8):1173-81.

21. Wu B, Zhao Y, Xu D, et al. Factors associated with nurses' willingness to participate in care of patients with COVID-19: A survey in China. *J Nurs Manag* 2020;**28**(7):1704-12.

22. Liu X, Ju X, Liu X. The relationship between resilience and intent to stay among Chinese nurses to support Wuhan in managing COVID-19: The serial mediation effect of post-traumatic growth and perceived professional benefits. *Nurs Open* 2021;**8**(5):2866-76.

23. Dibert C, Goldenberg D. Preceptors' perceptions of benefits, rewards, supports and commitment to the preceptor role. *J Adv Nurs* 1995;**21**(6):1144-51.

24. Hu Y, Hu J, Li L, et al. Development and preliminary validation of a brief nurses' perceived professional benefit questionnaire (NPPBQ). *BMC Med Res Methodol* 2020;**20**(1):18.

25. Spurk D, Hirschi A, Wang M, et al. Latent profile analysis: A review and “how to” guide of its application within vocational behavior research. *Journal of vocational behavior* 2020;**120**:103445.

26. Nylund KL, Asparouhov T, Muthén BO. Deciding on the number of classes in latent class analysis and growth mixture modeling: A Monte Carlo simulation study. *Structural equation modeling: A multidisciplinary Journal* 2007;**14**(4):535-69.

27. Ma HW, Dan X, Xu SH, et al. [Current status of nurses' perceived professional benefits and influencing factors in 3A-level hospitals in Tianjin]. *Zhonghua Lao Dong Wei Sheng Zhi Ye Bing Za Zhi* 2017;**35**(6):443-47.

For peer review only

28. Zhan T, Li H, Ding X. Can social support enhance sense of coherence and perceived professional benefits among Chinese registered nurses? A mediation model. *J Nurs Manag* 2020;**28**(3):488-94.

29. Savitsky B, Radomislensky I, Hendel T. Nurses' occupational satisfaction during Covid-19 pandemic. *Appl Nurs Res* 2021;**59**:151416.

30. Mohammed S, Peter E, Killackey T, et al. The "nurse as hero" discourse in the COVID-19 pandemic: A poststructural discourse analysis. *Int J Nurs Stud* 2021;**117**:103887.

31. Begnini D, Cicolella DA, Freitas KR, et al. Heroines in Covid-19 times: visibility of nursing in the pandemic. *Rev Gaucha Enferm* 2021;**42**(spe):e20200373.

32. James L, Elkins-Brown N, Wilson M, et al. The effects of three consecutive 12-hour shifts on cognition, sleepiness, and domains of nursing performance in day and night shift nurses: A quasi-experimental study. *Int J Nurs Stud* 2021;**123**:104041.

33. Weaver SH, de Cordova PB, Vitale TR, et al. Experiences and perceptions of nurses working night shift: a qualitative systematic review. *JBI Evid Synth* 2023;**21**(1):33-97.

34. Borroni E, Frigerio G, Polledri E, et al. Metabolomic profiles in night shift workers: A cross-sectional study on hospital female nurses. *Front Public Health* 2023;**11**:1082074.

35. Jørgensen JT, Rozing MP, Westendorp RGJ, et al. Shift work and incidence of psychiatric disorders: The Danish Nurse Cohort study. *J Psychiatr Res* 2021;**139**:132-38.

36. Ferri P, Guadi M, Marcheselli L, et al. The impact of shift work on the psychological and physical health of nurses in a general hospital: a comparison between rotating night shifts and day shifts. *Risk Manag Healthc Policy* 2016;**9**:203-11.

37. Willetts G, Clarke D. Constructing nurses' professional identity through social identity theory.

For peer review only

Int J Nurs Pract 2014;**20**(2):164-69.

38. Niskala J, Kanste O, Tomietto M, et al. Interventions to improve nurses' job satisfaction: A systematic review and meta-analysis. *J Adv Nurs* 2020;**76**(7):1498-508.

39. Lee HF, Kuo CC, Chien TW, et al. A Meta-Analysis of the Effects of Coping Strategies on Reducing Nurse Burnout. *Appl Nurs Res* 2016;**31**:100-10.

For peer review only

Table 1 Potential profile analysis indicators (N=1309)

Model	LL[a]	AIC[b]	BIC[c]	aBIC[d]	Entropy	LMR[e] *p*-value	BLRT[f] *p*-value	Category probability
Class 1	-14709.353	29438.706	29490.476	29458.711	-	-	-	-
Class 2	-13420.425	26872.850	26955.682	26904.857	0.905	< 0.001	< 0.001	0.654/0.346
Class 3	-12583.629	25211.257	25325.152	25255.268	0.936	0.007	< 0.001	0.118/0.571/0.311
Class 4	-12307.807	24671.613	24816.570	24727.627	0.940	0.036	< 0.001	0.151/0.014/0.530/0.306

a Akaike information criterion, b Bayesian information criterion, c Sample adjusted bayesian information criterion, d Lo-Mendell-Rubin Likelihood Ratio Test, f Bootstrapped Likelihood Ratio Test.

For peer review only

Table 2 Demographic and characteristics by latent profile (*N*=1309)

Variables	Class 1	Class 2	Class 3	χ^2/F	*p*
Age (SD)	30.94 (5.37)	31.76 (5.91)	33.64 (6.71)	16.545	< 0.001
Gender				0.600	0.741
Male	6 (3.9)	25 (3.3)	11 (2.7)		
Female	149 (96.1)	722 (96.7)	396 (97.3)		
Highest Degree				1.602	0.449
Junior college and below	29 (18.7)	111 (14.9)	60 (14.7)		
Bachelor's and above	126 (81.3)	636 (85.1)	347 (85.3)		
Marital status				25.768	< 0.001
Single/divorced/widowed	62 (40.0)	218 (29.2)	80 (19.7)		
Married	93 (60.0)	529 (70.8)	327 (80.3)		
Children				26.943	< 0.001
Yes	87 (56.1)	481 (64.4)	311 (76.4)		
No	68 (43.9)	266 (35.6)	96 (23.6)		

For peer review only

Professional title				23.589	< 0.001
Junior Level	102 (65.8)	448 (60.0)	207 (50.9)		
Intermediate level	50 (32.3)	280 (37.5)	172 (42.3)		
Senior level	3 (1.9)	19 (2.5)	28 (6.9)		
Job title				17.086	< 0.001
Yes	18 (11.6)	86 (11.5)	82 (20.1)		
No	137 (88.4)	661 (88.5)	325 (79.9)		
Working years (years)				32.903	< 0.001
≤5	52 (33.5)	217 (29.0)	79 (19.4)		
6–15	91 (58.7)	438 (58.6)	241 (59.2)		
≥16	12 (7.7)	92 (12.3)	87 (21.4)		
Average monthly income (yuan)				7.990	0.239
≤3000	23 (14.8)	75 (10.0)	43 (10.6)		
3001~6000	93 (60.0)	415 (55.6)	217 (53.3)		
6001~9000	27 (17.4)	179 (24.0)	105 (25.8)		

For peer review only

≥9001	12 (7.7)	78 (10.4)	42 (10.3)		
Number of night shifts per month				17.797	0.001
0	42 (27.1)	233 (31.2)	164 (40.3)		
1–4	22 (14.2)	143 (19.1)	73 (17.9)		
≥5	91 (58.7)	371 (49.7)	170 (41.8)		

For peer review only

Table 3 Predictors of latent profile membership

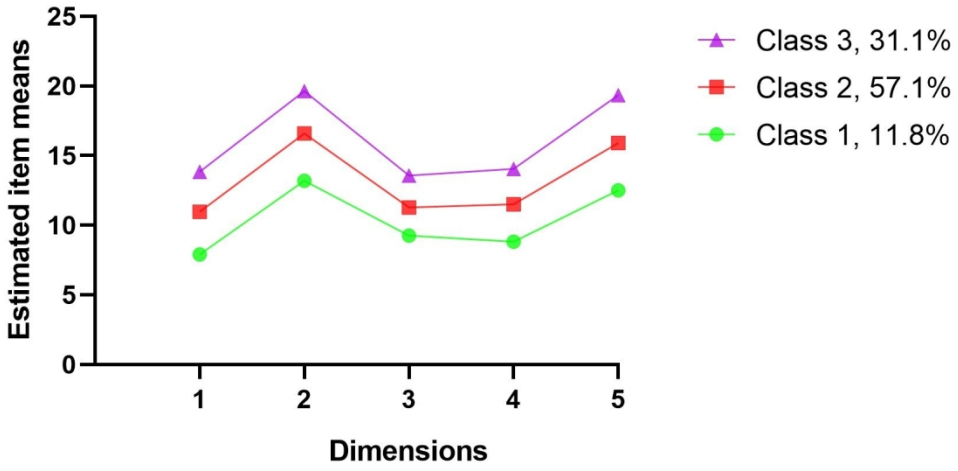
Variables	Class 1 VS Class 3			Class 2 VS Class 3		
	β	***OR***	***95%CI***	***β***	***OR***	***95%CI***
Age (SD)	0.004	1.004	0.941-1.070	-0.005	0.995	0.957-1.034
Marital status						
Single/divorced/widowed	0.685	1.984*	1.028-3.828	0.115	1.122	0.716-1.760
Married (Ref)						
Children						
No	0.177	1.194	0.622-2.293	0.240	1.272	0.822-1.967
Yes (Ref)						
Professional title						
Junior Level	0.368	1.444	0.334-6.241	0.359	1.433	0.661-3.105
Intermediate level	0.378	1.460	0.370-5.766	0.429	1.535	0.764-3.085
Senior level (Ref)						
Job title						
No	0.139	1.984	1.028-3.828	0.398	1.489*	1.028-2.157

For peer review only

Yes (Ref)						
Working years (years)						
≤5	0.781	2.184	0.666-7.161	0.411	1.508	0.748-3.042
6–15	0.721	2.057	0.847-5.000	0.228	1.256	0.773-2.039
≥16 (Ref)						
Number of night shifts per month						
0	-0.458	0.633*	0.405-0.988	-0.223	0.800	0.601-1.064
1–4	-0.354	0.702	0.400-1.231	0.089	1.094	0.768-1.558
≥5 (Ref)						

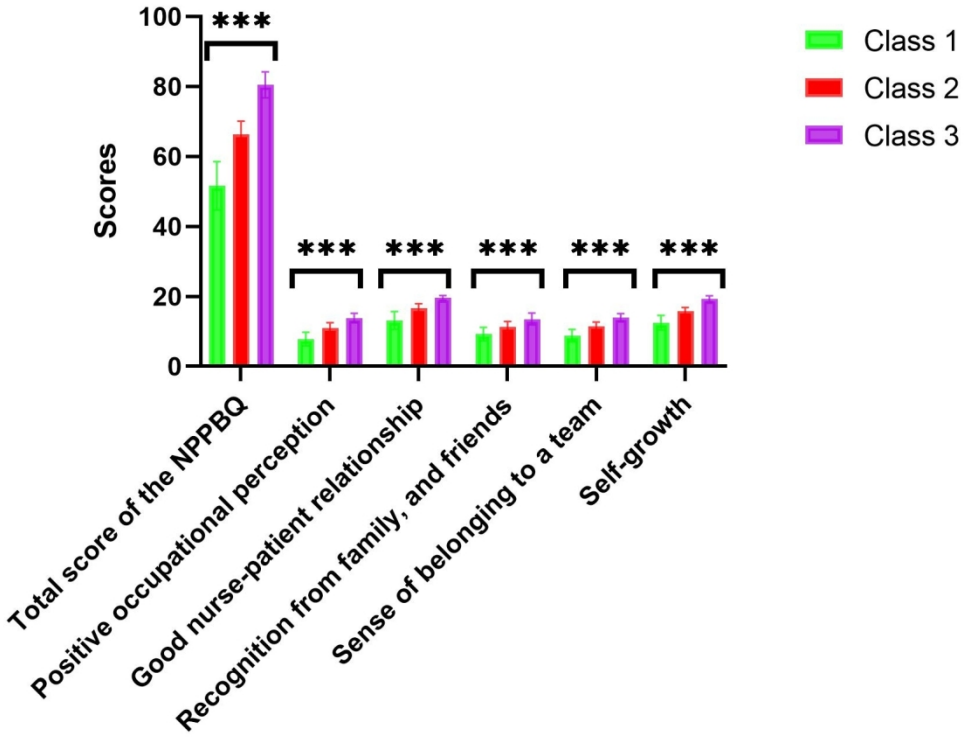
*p < 0.05; *OR*, Odds ratio; 95% *CI*, 95% Confidence Interval; Ref, Reference.

For peer review only



Latent profiles of NPPBQ

145x76mm (300 x 300 DPI)



The scale and dimension scores of different profiles

145x114mm (300 x 300 DPI)

STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) 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 was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3-4
Objectives	3	State specific objectives, including any prespecified hypotheses	4-5
Methods			
Study design	4	Present key elements of study design early in the paper	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	5
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5-6
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	5-6
Bias	9	Describe any efforts to address potential sources of bias	6
Study size	10	Explain how the study size was arrived at	5
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	5-6
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	6
		(*b*) Describe any methods used to examine subgroups and interactions	NA
		(*c*) Explain how missing data were addressed	NA
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	NA
		(*e*) 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	7
		(b) Give reasons for non-participation at each stage	7
		(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	7
		(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	8
Main results	16	(*a*) 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

For peer review only

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

		(*b*) Report category boundaries when continuous variables were categorized	8
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	NA
Discussion			
Key results	18	Summarise key results with reference to study objectives	9-11
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	11
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	11
Generalisability	21	Discuss the generalisability (external validity) of the study results	11
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	12

*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.

For peer review only

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

BMJ Open

Latent profile analysis of nurses' perceived professional benefits in China: a cross-sectional study

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2023-078051.R1
Article Type:	Original research
Date Submitted by the Author:	04-Oct-2023
Complete List of Authors:	Sun, Changli; Third Affiliated Hospital of Zunyi Medical University Jiang, Hu; Zunyi Medical University Yao, Qingfang; The Third Affiliated Hospital of Zunyi Medical University Wang, Xianwei; The Third Affiliated Hospital of Zunyi Medical University Wen, Xueke; Third Affiliated Hospital of Zunyi Medical University Liu, Hanmei; Zunyi Medical University
Primary Subject Heading:	Occupational and environmental medicine
Secondary Subject Heading:	Nursing, Occupational and environmental medicine
Keywords:	Burnout, Professional, Burnout, China

SCHOLARONE™
Manuscripts

I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our licence.

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which Creative Commons licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

For peer review only

Latent profile analysis of nurses' perceived professional benefits in China: a cross-sectional study

Running Head: LPA of nurses' perceived professional benefits

Changli Sun[1], Hu Jiang[1]*, Qingfang Yao[2], Xianwei Wang[2], Xueke Wen[1] and Hanmei Liu[2],

[1] The Third Affiliated Hospital of Zunyi Medical University (The First People's Hospital of Zunyi), Zunyi, Guizhou, China

[2] Zunyi Medical University, Zunyi, Guizhou, China

*Correspondence: jianghuchn@163.com, Nursing Department, The Third Affiliated Hospital of Zunyi Medical University (The First People's Hospital of Zunyi), Zunyi, Guizhou, China

For peer review only

Latent profile analysis of nurses' perceived professional benefits in China: a cross-sectional study

ABSTRACT

Objective: To identify profiles of nurses' perceived professional benefits as well as their predictors.

Design: Cross-sectional study.

Setting: The study was carried out online in China.

Methods: From July 6 and July 27, 2022, a total of 1,309 registered nurses participated in the survey by convenient sampling. We collected the Nurses' Perceived Professional Benefits Questionnaire (NPPBQ) and demographic data. Using latent profile analysis (LPA), subgroups of nurses' perceived professional benefits were identified. Moreover, univariate and multinomial logistic regression analysis were conducted to find the factors that were linked with the profiles.

Results: The survey was validly completed by 1309 nurses, with a 92.9% effective return rate. The findings of the LPA demonstrated three unique profiles: low perceived professional benefits (11.8%), moderate perceived professional benefits (57.1%), and high perceived professional benefits (31.1%). There was a correlation between marital status, the number of night shifts per month, and leadership role.

Conclusions: According to our research, registered nurses have three unique professional benefit profiles. In order to sustain the nursing workforce, despite the fact that nurses get a high level of professional benefits, interventions are necessary to increase nurses' perception of their professional value.

Keywords: nurse, perceived professional benefits, latent profile analysis, cross-sectional study

Strengths and limitations of this study:

- A total of 1,309 registered nurses participated in the survey across the country.
- Three unique professional benefit profiles and influencing factors were found

For peer review only

among nurses.

- The generalization of this study was limited by the web-based cross-sectional design and convenient sampling method.

For peer review only

INTRODUCTION

Despite the fact that nursing is a high-risk, high-stress profession, nurses are able to achieve benefit findings [1-3]. In recent years, the concept of nurses' perceived professional benefits arises naturally, and has gradually attracted the attention of researchers. Nurses' perceived professional benefits (NPPB) refer to nurses' perceptions of the gains and benefits they receive in their profession during the hiring process, as well as their belief that working in nursing can promote their overall growth and development [4, 5]. Essentially, perceived professional benefits can be classified as an emotional experience and cognitive evaluation, which has two aspects: actual benefits and spiritual benefits [4]. However, there is a lack of in-depth research on the group heterogeneity of perceived professional benefits among nurse populations.

Background

It is estimated that 69% of the global health workforce consists of nurses [6]. Yet, the present physical and mental health of nurses is not encouraging, as they confront high levels of stress, burnout, turnover, and their own ageing [7-9]. Nursing is no longer a desirable and appealing profession [10], which makes nurse shortages a widespread worldwide concern [11]. These issues have a direct bearing on the sustainability and continued growth of the nursing workforce. In recent years, nursing in China has experienced remarkable growth, and the most recent statistics indicate that China has more than 5 million registered nurses [12]. Chinese nurses are extremely susceptible to burnout, and a high desire to leave is a serious concern [13, 14]. However, there is a dearth of comprehensive study and viable remedies.

The mental health of nurses is receiving increasing attention from managers and researchers in the context of positive psychology. It is beginning to be recognized that nurses' own positive psychology promotes job satisfaction and professional identity, lessens burnout, and hence reduces turnover rates [15, 16].

The profession of nursing can be beneficial to nurses in a number of ways. Previous studies [17, 18] reported that nursing preceptorship offers many benefits, and nurses may find themselves being more committed to the position as a result. A

For peer review only

qualitative study [19] found that nurses who were involved in caring for dying patients got a great lot of experience and benefited considerably; they can create a personal philosophy on death and life, in addition to professional growth. Nurses who served as advanced practice nurse roles perceived numerous benefits, including improved patient care quality and safety, professionalism, personal development, career development, intrinsic satisfaction with the role, and impact on other professional groups [20]. A person's perception of professional benefit is an endogenous motivation for his or her development and has a positive effect on that person's career. According to prior studies, improving the perceived professional benefit of nurses reduces burnout reduction and enables nurses to approach their work with a good attitude and obtain more favorable comments [21, 22].

Measures created by researchers to evaluate the perceived professional benefits of nurses were still in little supply. The Preceptor's Perspective of Benefits and Rewards (PPBR) measure was designed by Dibert, et al. [23] to evaluate the perceived benefits of clinical preceptor nurses, however, it is not relevant to general clinical nurses. A questionnaire entitled Nurses' Perceived Professional Benefits Questionnaire (NPPBQ) was developed to assess how Chinese nurses perceive the gains and benefits of their employment [5, 24]. This questionnaire has been utilized in a lot of research to date. While we now have a better grasp of nurses' perceptions of professional benefits, but the heterogeneity of the population is still lack, screening strategies for future precision interventions cannot be developed for identifying low-benefit populations.

To our knowledge, it has not been shown that sufficient evidence exists to answer the questions of whether nurses' perceived professional benefits differ in groups and what factors contribute to these differences. The current study was created to bridge that gap. This study's objective was to examine the characteristics and determinants of nurses' perceived professional benefits as well as the predictors of these latent profiles.

MATERIALS AND METHODS

For peer review only

Study design

An online survey with convenient sampling was used in this study to conduct a cross-sectional analysis. This study was designed and reported in accordance with the guidelines for Strengthening the Reporting of Observational Studies in Epidemiology (STROBE)[25].

Sample size estimation

An examination of the latent profiles of perceived professional benefits among nurses was conducted in this study. LPA needs a sample size larger than 500 [26, 27], therefore, the minimum sample size for this study was 500.

Participants

Participants in this study required to meet the inclusion criteria and be registered nurses. To be considered, candidates had to satisfy the following criteria to be considered: (1) having worked as a nurse in a medical facility, and (2) being willing to participate in this study. The following were the exclusion criteria: logical errors or missing information in questionnaire answers.

Measurements

Demographic

This study gathered and evaluated demographic data including age, gender, greatest degree of education, marital status, and other participant characteristics.

Nurses' Perceived Professional Benefits Questionnaire (NPPBQ)

The questionnaire was designed by Jing Hu, et al. [5] to investigate the gains and benefits that nurses perceived from their jobs. The authors then reduced it to 17 items by 2020 [24]. The questionnaire has five dimensions: personal growth, a good nurse-patient relationship, recognition from family and friends, a positive occupational perception, and team belonging. Items are scored on a 5-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = not sure, 4 = agree, 5 = strongly agree).

For peer review only

Cronbach's alphas for the questionnaires were 0.94, and the NPPBQ subquestionnaires' alphas were 0.84, 0.83, 0.74, 0.79, and 0.85.

Data collection

During the dates of July 6 and July 27, 2022, data was gathered. Wenjuanxing (www.wjx.cn) was used to develop a web-based questionnaire. Two researchers reviewed the online questionnaire for rigor and verified the feasibility of the questionnaire by completing it within the team. A poster was created to present the link and QR code. It was clearly shown on the poster who would be included and excluded from the survey. We distributed the questionnaire nationwide in China and did not limit the source and setting of nurses. The researcher contacted administrators or general nurses to disseminate the questionnaire. Wechat was used to send the poster and information letter. The survey can be completed by clicking on the link or scanning the QR code, completed questionnaires can be returned directly to the web.

Statistical analyses

The use of latent profile analysis (LPA) is frequently used to determine the number of subpopulations in a given sample. LPA is a statistical method that use potential category variables to explain the link between exogenous continuous-type indicators, permitting the assessment of the correlation between exogenous indicators and the maintenance of local independence among exogenous indicators [27]. Latent profile analysis was conducted using Mplus 7.4 software. Log likelihood (LL), Akaike information criterion (AIC), Akaike Information Criterion (BIC), Adjusted Bayesian Information Criteria (aBIC), Entropy, Lo-Mendell-Rubin (LMR), and the Bootstrapped Likelihood Ratio Test (BLRT) were used to assess model fit and determine the appropriate number of categories. In order to decide which model best fit the data, the models from each category's fitting results were combined with the aforementioned indicators. The data was examined using the SPSS 26.0 statistical program. We utilized frequency and composition ratios for categorical data, whereas mean and standard deviation were utilized for continuous variables. The chi-square

For peer review only

test was performed to compare category variables across groups. ANOVA was used to compare continuous variables among multiple groups. A multivariate logistic regression model was employed to analyze the variations in demographic variables. A statistically significant difference was indicated by $p < 0.05$.

Ethical considerations

The Ethics Committee of the First People's Hospital of Zunyi (2022-016) approved the study, and participants gave permission for data collection. Prior to completing the survey, participants will be provided with information about the purpose of the study and the major substance of the research. They will then be able to provide their informed consent through a yes or no response. In addition, participants were also informed that the study's findings would be given in aggregate form and that no participant could be identified. If a person declined to complete the questionnaire, the collection was immediately ended.

Patient and public involvement

Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

RESULTS

Participant characteristics

A total of 1409 nurses completed the questionnaire, while 58 nurses denied participation, for a total number of 1351 questionnaires received. 42 surveys were considered invalid due to insufficient or inaccurate information. 92.9 percent of the final 1309 surveys were correctly returned. The ages of the participants varied from 18 to 59 years old, with a mean age of 32.25 (SD: 6.18) years old. The bulk of participants were female (86.7%), whereas the minority were male (3.2%).

Characteristics of the different classes

For peer review only

On the basis of the NPPBQ's five dimensions, it was established that a model with three latent classes provided the greatest match. A class represents different categorisation methods, such as a class 1 for a single subgroup, a class 2 for two heterogeneous subgroups, and so forth. Table 1 provides the results. While the AIC and BIC in class 4 were lower in class 4 than in class 3, the entropy was greater; nonetheless, the lowest category probability in class 4 was 1.4%, which is unsatisfactory. As a consequence, we decided that the best-fitting model is class 3. Using a three-class model, Figure 1 illustrates the mean scores for each category within the NPPBQ's dimensions. The percentages increase from class 1 to class 3 as follows: 11.8% (155 nurses), 57.1% (747 nurses), and 31.1% (407 nurses). For the sake of brevity, based on the profile scores, we named class 1 as the low perceived professional benefits, class 2 as the moderate perceived professional benefits, and class 3 as the high perceived professional benefits.

Table 1 Potential profile analysis indicators (N=1309)

Model	LL[a]	AIC[b]	BIC[c]	aBIC[d]	Entropy	LMR[e] *p*-value	BLRT[f] *p*-value	Category probability
Class 1	-14709.353	29438.706	29490.476	29458.711	-	-	-	-
Class 2	-13420.425	26872.850	26955.682	26904.857	0.905	< 0.001	< 0.001	0.654/0.346
Class 3	-12583.629	25211.257	25325.152	25255.268	0.936	0.007	< 0.001	0.118/0.571/0.311
Class 4	-12307.807	24671.613	24816.570	24727.627	0.940	0.036	< 0.001	0.151/0.014/0.530/0.306

a Log likelihood, b Akaike information criterion, c Bayesian information criterion, d Adjusted bayesian information criterion, e Lo-Mendell-Rubin Likelihood Ratio Test, f Bootstrapped Likelihood Ratio Test

The scale and dimension scores of different profiles

The findings of a one-way ANOVA indicated statistically significant differences in the scale and dimension scores of different profiles (both p<0.001). The results were shown in Figure 2 demonstrates the outcomes.

For peer review only

Demographic and related characteristics of each profile

The ANOVA and chi-square tests indicated statistically significant differences between the three profiles differed statistically in terms of age, marital status, children, professional title, leadership role, working years, and number of night shifts per month. Table 2 is a summary of the results.

Table 2 Demographic and characteristics by latent profile (*N*=1309)

Variables	Class 1	Class 2	Class 3	χ^2/F	*p*
Age (SD)	30.94 (5.37)	31.76 (5.91)	33.64 (6.71)	16.545	< 0.001
Gender				0.600	0.741
Male	6 (3.9)	25 (3.3)	11 (2.7)		
Female	149 (96.1)	722 (96.7)	396 (97.3)		
Highest Degree				1.602	0.449
Junior college and below	29 (18.7)	111 (14.9)	60 (14.7)		
Bachelor's and above	126 (81.3)	636 (85.1)	347 (85.3)		
Marital status				25.768	< 0.001
Single/divorced/widowed	62 (40.0)	218 (29.2)	80 (19.7)		
Married	93 (60.0)	529 (70.8)	327 (80.3)		
Children				26.943	< 0.001
Yes	87 (56.1)	481 (64.4)	311 (76.4)		
No	68 (43.9)	266 (35.6)	96 (23.6)		
Professional title				23.589	< 0.001
Junior Level	102 (65.8)	448 (60.0)	207 (50.9)		
Intermediate level	50 (32.3)	280 (37.5)	172 (42.3)		
Senior level	3 (1.9)	19 (2.5)	28 (6.9)		
Leadership role				17.086	< 0.001
Yes	18 (11.6)	86 (11.5)	82 (20.1)		

For peer review only

No	137 (88.4)	661 (88.5)	325 (79.9)		
Working years (years)				32.903	< 0.001
≤5	52 (33.5)	217 (29.0)	79 (19.4)		
6–15	91 (58.7)	438 (58.6)	241 (59.2)		
≥16	12 (7.7)	92 (12.3)	87 (21.4)		
Average monthly income (yuan)*				7.990	0.239
≤3000	23 (14.8)	75 (10.0)	43 (10.6)		
3001~6000	93 (60.0)	415 (55.6)	217 (53.3)		
6001~9000	27 (17.4)	179 (24.0)	105 (25.8)		
≥9001	12 (7.7)	78 (10.4)	42 (10.3)		
Number of night shifts per month				17.797	0.001
0	42 (27.1)	233 (31.2)	164 (40.3)		
1–4	22 (14.2)	143 (19.1)	73 (17.9)		
≥5	91 (58.7)	371 (49.7)	170 (41.8)		

* 1 USD equals 7.31 Chinese Yuan, exchange rate on September 29, 2023

A multivariate logistic regression model was constructed using the variables with statistically significant differences as determined by ANOVA and chi-square tests. Of the three profiles, the class 3 was chosen as a reference to find the predictors linked with NPPBQ. As shown in Table 3, nurses who were single/divorced/widowed were more likely to belonged to low perceived professional benefits (*OR*: 1.984, 95%*CI*:1.028-3.828). The number of night shifts worked per month was associated with low perceived professional benefits (*OR*: 0.633, 95% *CI*: 0.405-0.988), compared to those with more than five night shifts, those without night shifts tended to fall into the high perceived professional benefits. Nurses without a leadership role were more likely to be in the moderate perceived professional benefits *(OR*: 1.489, 95% *CI*: 1.028-2.157).

For peer review only

Other variables were not statistically significant in the multivariate logistic regression.

Table 3 Predictors of latent profile membership

Variables	Class 1 VS Class 3			Class 2 VS Class 3		
	β	*OR*	95%*CI*	*β*	*OR*	95%*CI*
Age (SD)	0.004	1.004	0.941-1.070	-0.005	0.995	0.957-1.034
Marital status						
Single/divorced/widowed	0.685	1.984*	1.028-3.828	0.115	1.122	0.716-1.760
Married (Ref)						
Children						
No	0.177	1.194	0.622-2.293	0.240	1.272	0.822-1.967
Yes (Ref)						
Professional title						
Junior level	0.368	1.444	0.334-6.241	0.359	1.433	0.661-3.105
Intermediate level	0.378	1.460	0.370-5.766	0.429	1.535	0.764-3.085
Senior level (Ref)						
Leadership role						
No	0.139	1.984	1.028-3.828	0.398	1.489*	1.028-2.157
Yes (Ref)						
Working years (years)						
≤5	0.781	2.184	0.666-7.161	0.411	1.508	0.748-3.042
6–15	0.721	2.057	0.847-5.000	0.228	1.256	0.773-2.039
≥16 (Ref)						
Number of night shifts per month						
0	-0.458	0.633*	0.405-0.988	-0.223	0.800	0.601-1.064
1–4	-0.354	0.702	0.400-1.231	0.089	1.094	0.768-1.558

For peer review only

≥5 (Ref)	

243 *p < 0.05; *OR*, Odds ratio; 95% *CI*, 95% Confidence Interval; Ref, Reference.

For peer review only

DISCUSSION

The purpose of this research was to identify distinct profiles of nurses' perceived professional benefits. Furthermore, the current study employed multinomial logistic regression to investigate predictors of these profiles.

In this study, we investigated 1309 nurses who validly completed the questionnaire. As a result, three latent profiles were identified: low perceived professional benefits, moderate perceived professional benefits, and high perceived professional benefits. Our research revealed that the majority of nurses had a moderate or higher levels of perceived professional benefits, with just 11.8% of nurses belonging to the category of nurses with low perceived professional benefits. Most studies reported nurses had an upper-moderate level of perceived professional benefits [28, 29], and our findings are consistent with those of previous studies. Most importantly, our study clarified the heterogeneous subgroups of nurses' perceived professional benefits and their specific distribution.

In the last three years, nurses have been a key part of the fight against the COVID-19 outbreak. Despite heavy job pressure, nurses have had a feeling of professional calling and value [30], which has effectively enhanced their sense of professional benefit [1]. At the same time, the critical role of nurses in defending people's lives and health has earned the society's respect and recognition, as well as a positive social image [31, 32], which can further enhance nurses' sense of professional benefit. Our survey was conducted during the COVID-19 epidemic, and nurses' perceptions of professional benefit may be elevated.

Another finding of our study revealed that the membership of profiles can be predicted by some characteristics such as the number of night shifts, leadership role, and marriage status. Nursing is a continuous, 24-hour profession, and nurse's work normally takes the form of night shifts. It is widely proven that night shifts negatively impact the physical and emotional health of nurses [33-36]. Nurses working rotating night shifts were normally younger, and they had the lower scores of job satisfaction, quality of sleep, and quantity of sleep [37], these factors resulted in a low perceived professional benefits. Consistent with past research, our findings indicate that the

For peer review only

greater the frequency of night shifts, the lower the perceived professional benefit [29].

According to our results, 57.1% of nurses perceived professional benefits as moderate. The majority of nurses in the moderate perceived professional benefits group lacked a work title, while the majority of nurses in the highly perceived professional benefits group held a leadership role. This has been validated by other research, and our work provides more support for this notion [29]. Holding a managerial position at a hospital is a means of advancing one's career, and nurses highly value this opportunity.

Our study found that nurses who were single/divorced/widowed were more likely to belonged to low perceived professional benefits, which is consistent with earlier findings [29]. This may be because, unlike single/divorced/widowed nurses, married nurses receive more social support from their spouses and other family members.

We hypothesized that job fulfillment and social support are important influencing mechanisms that affect nurses' perceived professional benefits. The number of night shifts, leadership roles are important indicators of nurses' job fulfillment. Marital status is an important factor in social support. Each of these factors can have varying degrees of impact on the actual benefit or spiritual benefit [4]. Considering that nurses perceive professional benefits as a result of personal, organizational, environmental, and social factors, a well-developed theoretical framework is required to explain this phenomenon.

Unfortunately, our research failed to demonstrate that the profiles can be predicted by other factors in the model variables. Our findings in the univariate analysis results were consistent with earlier research. Nevertheless, because the bulk of prior research did not employ multi-factor models, it was impossible to compare our findings could not be compared to those of others. In addition, certain putative contributing elements were not adequately proven, and further research is required to confirm them in the future.

Our research has theoretical and practical implications for the future study of nurses' perceived professional benefits. First, the number of night shifts, leadership role, and marriage status are the most significant factors affecting nurses' perceived professional benefits, and in the future, we should focus on the degree of influence of

For peer review only

these three factors and explore the mechanisms from the theoretical level. Second, managers should pay active attention to the perceived professional benefits of clinical nurses, create a favorable working environment and professional growth atmosphere, and promote the professional success of nurses. Given that 11.8% of nurses still have a low perceived sense of career benefit, more tailored intervention programs are still needed in the future.

Strengths and limitations

To the best of our knowledge, this is the first study to use the LPA approach to explore heterogeneous subgroups of nurses' perceived professional benefit with a large sample size, and we presented a unique perspective and a basis for future research on the perceived career benefits of nurses. The research was limited in some ways. First, this was a web-based survey, and the sample process and self-reporting strategy may have resulted in some bias. Second, we only polled nurses in mainland China, and our sample only reflected the current situation in a single nation. Lastly, the constraints of the study's design prohibited an in-depth assessment of the psychological factors behind nurses' perceptions of their professional benefit. As a result, more rigorously designed studies will be required in the future to investigate this issue in depth.

CONCLUSION

Our study identified three professional benefits profiles among nurses. The results of our study indicated that nurses enjoy a high level of professional benefits. Notwithstanding the study's limitations of the study and the present condition of nursing, it is vital that we engage on several levels to encourage a stable nursing workforce, including policy, organisation, financial income, and career development, so that nurses experience a sense of professional gain.

For peer review only

Acknowledgements

None.

AUTHOR CONTRIBUTIONS

Jiang Hu and Sun Changli were responsible for the conception and study design. Yao Qiangfang, Wang Xianwei and Liu Hanmei performed the data collection. Yao Qiangfang, Wang Xianwei and Wen Xueke contributed to the analysis of the data. Sun Changli and Jiang Hu were involved in drafting the manuscript and revising it. All authors have read and approved the final manuscript.

FUNDING

This study was funded by the the Science and Technology Joint Funds of Zunyi Science and Technology Bureau (2023-73).

CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

Ethics approval

This study involves human participants and was approved by the Ethics Committee of the First People's Hospital of Zunyi (2022-016). Participants gave informed consent to participate in the study before taking part.

Data availability statement

Data are available upon reasonable request. Data are available from the corresponding author and the first author on reasonable request.

For peer review only

REFFERENCES

1. Wang X, Chen F, Dai P, Lin X, Qi L: **Perceived professional benefits and associated factors among nurses during the COVID-19 pandemic: A cross-sectional study**. *Nurs Open* 2023, **10**(3):1461-1470.
2. Jiang H, Huang N, Tian W, Shi S, Yang G, Pu H: **Factors Associated With Post-traumatic Stress Disorder Among Nurses During COVID-19**. *Front Psychol* 2022, **13**:745158.
3. Liu S, Duan X, Han P, Shao H, Jiang J, Zeng L: **Occupational benefit perception of acute and critical care nurses: A qualitative meta-synthesis**. *Front Public Health* 2022, **10**:976146.
4. Zhou H, Zhu Y, Zhang X, Peng J, Li Q, Wang X, Wang L, Cai X, Lan L: **Psychological Capital and Perceived Professional Benefits: Testing the Mediating Role of Perceived Nursing Work Environment Among Chinese Nurses**. *J Psychosoc Nurs Ment Health Serv* 2018, **56**(4):38-47.
5. Hu J, Liu X: **The preparation of nurses' occupational benefit questionnaire and its reliability and validity test [J]**. *J Chin People's Liberation Army* 2013, **30**(22):1-5.
6. Malone B: **A Perspective on the State of the World's Nursing Report**. *Nurs Adm Q* 2021, **45**(1):6-12.
7. Ivziku D, de Maria M, Ferramosca FMP, Greco A, Tartaglini D, Gualandi R: **What determines physical, mental and emotional workloads on nurses? A cross-sectional study**. *J Nurs Manag* 2022, **30**(8):4387-4397.
8. Morgan B, Jordan L, Rivera LA: **Considerations for an aging nurse anesthetists workforce**. *Geriatr Nurs* 2020, **41**(6):1017-1019.

For peer review only

9. Tamata AT, Mohammadnezhad M: **A systematic review study on the factors affecting shortage of nursing workforce in the hospitals**. *Nurs Open* 2023, **10**(3):1247-1257.

10. van der Cingel M, Brouwer J: **What makes a nurse today? A debate on the nursing professional identity and its need for change**. *Nurs Philos* 2021, **22**(2):e12343.

11. Udod S: **A Call for Urgent Action: Innovations for Nurse Retention in Addressing the Nursing Shortage**. *Nurs Rep* 2023, **13**(1):145-147.

12. **China Statistical Yearbook** [http://www.stats.gov.cn/sj/ndsj/2022/indexch.htm]

13. Zeng LN, Zhang JW, Zong QQ, Chan SW, Browne G, Ungvari GS, Chen LG, Xiang YT: **Prevalence of burnout in mental health nurses in China: A meta-analysis of observational studies**. *Arch Psychiatr Nurs* 2020, **34**(3):141-148.

14. Chen JP, Dai YM, Qin Y, Liang SP, Cheng G, Liu Y, Yang CZ, He HG, Shen Q: **Factors influencing turnover intention among male nurses in China: A large-scale descriptive correlational study**. *Int Nurs Rev* 2023.

15. Yu JF, Ding YM, Jia RY, Liang DD, Wu Z, Lu GL, Chen CR: **Professional identity and emotional labour affect the relationship between perceived organisational justice and job performance among Chinese hospital nurses**. *J Nurs Manag* 2022, **30**(5):1252-1262.

16. Lin L, Liu X, He G: **Mindfulness and Job Satisfaction Among Hospital Nurses: The Mediating Roles of Positive Affect and Resilience**. *J Psychosoc Nurs Ment Health Serv* 2020, **58**(6):46-55.

17. Macey A, Green C, Jarden RJ: **ICU nurse preceptors' perceptions of benefits, rewards, supports and commitment to the preceptor role: A mixed-methods study**. *Nurse Educ*

For peer review only

Pract 2021, **51**:102995.

18. Natan MB, Qeadan H, Egbaria W: **The commitment of Israeli nursing preceptors to the role of preceptor**. *Nurse Educ Today* 2014, **34**(12):1425-1429.

19. Zheng RS, Guo QH, Dong FQ, Owens RG: **Chinese oncology nurses' experience on caring for dying patients who are on their final days: a qualitative study**. *Int J Nurs Stud* 2015, **52**(1):288-296.

20. Christiansen A, Vernon V, Jinks A: **Perceptions of the benefits and challenges of the role of advanced practice nurses in nurse-led out-of-hours care in Hong Kong: a questionnaire study**. *J Clin Nurs* 2013, **22**(7-8):1173-1181.

21. Wu B, Zhao Y, Xu D, Wang Y, Niu N, Zhang M, Zhi X, Zhu P, Meng A: **Factors associated with nurses' willingness to participate in care of patients with COVID-19: A survey in China**. *J Nurs Manag* 2020, **28**(7):1704-1712.

22. Liu X, Ju X, Liu X: **The relationship between resilience and intent to stay among Chinese nurses to support Wuhan in managing COVID-19: The serial mediation effect of post-traumatic growth and perceived professional benefits**. *Nurs Open* 2021, **8**(5):2866-2876.

23. Dibert C, Goldenberg D: **Preceptors' perceptions of benefits, rewards, supports and commitment to the preceptor role**. *J Adv Nurs* 1995, **21**(6):1144-1151.

24. Hu Y, Hu J, Li L, Zhao B, Liu X, Li F: **Development and preliminary validation of a brief nurses' perceived professional benefit questionnaire (NPPBQ)**. *BMC Med Res Methodol* 2020, **20**(1):18.

25. von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP: **The**

For peer review only

Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement: guidelines for reporting observational studies. *Int J Surg* 2014, **12**(12):1495-1499.

26. Nylund KL, Asparouhov T, Muthén BO: **Deciding on the number of classes in latent class analysis and growth mixture modeling: A Monte Carlo simulation study**. *Structural equation modeling: A multidisciplinary Journal* 2007, **14**(4):535-569.

27. Spurk D, Hirschi A, Wang M, Valero D, Kauffeld S: **Latent profile analysis: A review and "how to" guide of its application within vocational behavior research**. *Journal of vocational behavior* 2020, **120**:103445.

28. Ma HW, Dan X, Xu SH, Hou RN, Zhao NM: **[Current status of nurses' perceived professional benefits and influencing factors in 3A-level hospitals in Tianjin]**. *Zhonghua Lao Dong Wei Sheng Zhi Ye Bing Za Zhi* 2017, **35**(6):443-447.

29. Zhan T, Li H, Ding X: **Can social support enhance sense of coherence and perceived professional benefits among Chinese registered nurses? A mediation model**. *J Nurs Manag* 2020, **28**(3):488-494.

30. Savitsky B, Radomislensky I, Hendel T: **Nurses' occupational satisfaction during Covid-19 pandemic**. *Appl Nurs Res* 2021, **59**:151416.

31. Mohammed S, Peter E, Killackey T, Maciver J: **The "nurse as hero" discourse in the COVID-19 pandemic: A poststructural discourse analysis**. *Int J Nurs Stud* 2021, **117**:103887.

32. Begnini D, Cicolella DA, Freitas KR, Maranhão T, Rocha CMF, Kruse MHL: **Heroines in Covid-19 times: visibility of nursing in the pandemic**. *Rev Gaucha Enferm* 2021,

For peer review only

42(spe):e20200373.

33. James L, Elkins-Brown N, Wilson M, James SM, Dotson E, Edwards CD, Wintersteen-Arleth L, Stevens K, Butterfield P: **The effects of three consecutive 12-hour shifts on cognition, sleepiness, and domains of nursing performance in day and night shift nurses: A quasi-experimental study**. *Int J Nurs Stud* 2021, **123**:104041.

34. Weaver SH, de Cordova PB, Vitale TR, Hargwood P, Salmond S: **Experiences and perceptions of nurses working night shift: a qualitative systematic review**. *JBI Evid Synth* 2023, **21**(1):33-97.

35. Borroni E, Frigerio G, Polledri E, Mercadante R, Maggioni C, Fedrizzi L, Pesatori AC, Fustinoni S, Carugno M: **Metabolomic profiles in night shift workers: A cross-sectional study on hospital female nurses**. *Front Public Health* 2023, **11**:1082074.

36. Jørgensen JT, Rozing MP, Westendorp RGJ, Hansen J, Stayner LT, Simonsen MK, Andersen ZJ: **Shift work and incidence of psychiatric disorders: The Danish Nurse Cohort study**. *J Psychiatr Res* 2021, **139**:132-138.

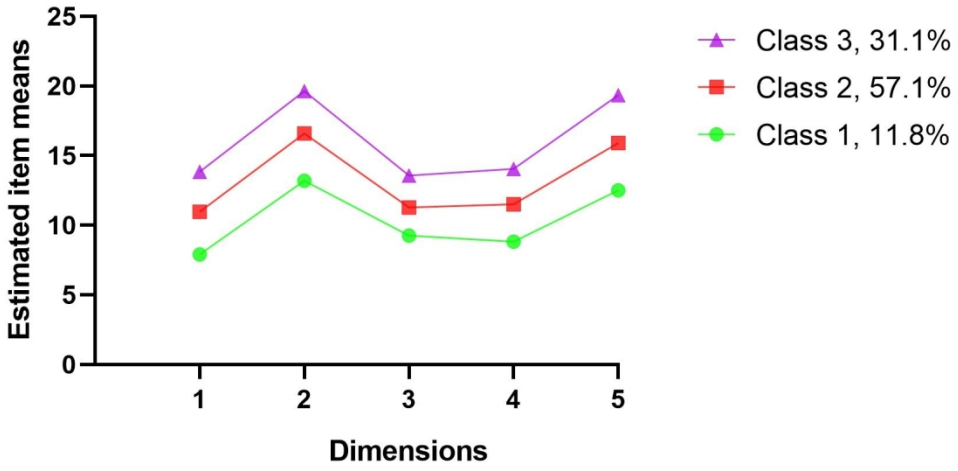
37. Ferri P, Guadi M, Marcheselli L, Balduzzi S, Magnani D, Di Lorenzo R: **The impact of shift work on the psychological and physical health of nurses in a general hospital: a comparison between rotating night shifts and day shifts**. *Risk Manag Healthc Policy* 2016, **9**:203-211.

For peer review only

Figure 1 Latent profiles of NPPBQ

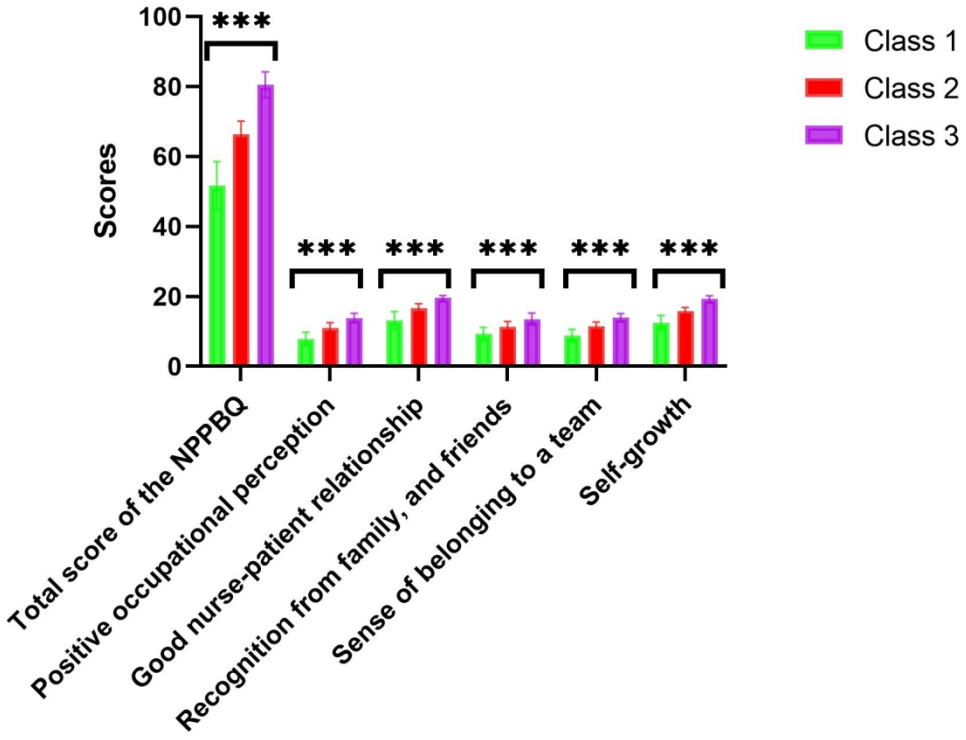
Figure 2 The scale and dimension scores of different profiles

For peer review only



Latent profiles of NPPBQ

145x76mm (300 x 300 DPI)



The scale and dimension scores of different profiles

145x114mm (300 x 300 DPI)

STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) 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 was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3-4
Objectives	3	State specific objectives, including any prespecified hypotheses	4-5
Methods			
Study design	4	Present key elements of study design early in the paper	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	5
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5-6
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	5-6
Bias	9	Describe any efforts to address potential sources of bias	6
Study size	10	Explain how the study size was arrived at	5
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	5-6
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	6
		(*b*) Describe any methods used to examine subgroups and interactions	NA
		(*c*) Explain how missing data were addressed	NA
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	NA
		(*e*) 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	7
		(b) Give reasons for non-participation at each stage	7
		(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	7
		(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	8
Main results	16	(*a*) 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

For peer review only

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

		(*b*) Report category boundaries when continuous variables were categorized	8
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	NA
Discussion			
Key results	18	Summarise key results with reference to study objectives	9-11
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	11
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	11
Generalisability	21	Discuss the generalisability (external validity) of the study results	11
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	12

*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.

For peer review only

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

BMJ Open

Latent profile analysis of nurses' perceived professional benefits in China: a cross-sectional study

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2023-078051.R2
Article Type:	Original research
Date Submitted by the Author:	12-Oct-2023
Complete List of Authors:	Sun, Changli; Third Affiliated Hospital of Zunyi Medical University Jiang, Hu; Third Affiliated Hospital of Zunyi Medical University Yao, Qingfang; The Third Affiliated Hospital of Zunyi Medical University Wang, Xianwei; The Third Affiliated Hospital of Zunyi Medical University Wen, Xueke; Third Affiliated Hospital of Zunyi Medical University Liu, Hanmei; Zunyi Medical University
Primary Subject Heading:	Occupational and environmental medicine
Secondary Subject Heading:	Nursing, Occupational and environmental medicine
Keywords:	Burnout, Professional, Burnout, China

SCHOLARONE™
Manuscripts

I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our licence.

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which Creative Commons licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

For peer review only

Latent profile analysis of nurses' perceived professional benefits in China: a cross-sectional study

Running Head: LPA of nurses' perceived professional benefits

Changli Sun[1], Hu Jiang[1]*, Qingfang Yao[2], Xianwei Wang[2], Xueke Wen[1] and Hanmei Liu[2],

[1] The Third Affiliated Hospital of Zunyi Medical University (The First People's Hospital of Zunyi), Zunyi, Guizhou, China

[2] Zunyi Medical University, Zunyi, Guizhou, China

*Correspondence: jianghuchn@163.com, Nursing Department, The Third Affiliated Hospital of Zunyi Medical University (The First People's Hospital of Zunyi), Zunyi, Guizhou, China

For peer review only

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

Latent profile analysis of nurses' perceived professional benefits in China: a cross-sectional study

ABSTRACT

Objective: To identify profiles of nurses' perceived professional benefits as well as their predictors.

Design: Cross-sectional study.

Setting: The study was carried out online in China.

Methods: From July 6 and July 27, 2022, a total of 1,309 registered nurses participated in the survey by convenient sampling. We collected the Nurses' Perceived Professional Benefits Questionnaire (NPPBQ) and demographic data. Using latent profile analysis (LPA), subgroups of nurses' perceived professional benefits were identified. Moreover, univariate and multinomial logistic regression analysis were conducted to find the factors that were linked with the profiles.

Results: The survey was validly completed by 1309 nurses, with a 92.9% effective return rate. The findings of the LPA demonstrated three unique profiles: low perceived professional benefits (11.8%), moderate perceived professional benefits (57.1%), and high perceived professional benefits (31.1%). There was a correlation between marital status, the number of night shifts per month, and leadership role.

Conclusions: According to our research, registered nurses have three unique professional benefit profiles. In order to sustain the nursing workforce, despite the fact that nurses get a high level of professional benefits, interventions are necessary to increase nurses' perception of their professional value.

Keywords: nurse, perceived professional benefits, latent profile analysis, cross-sectional study

Strengths and limitations of this study:

- This is the first study to use the LPA approach to explore heterogeneous subgroups

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

of nurses' perceived professional benefit with a large sample size.

- This study identified three unique professional benefit profiles among Chinese nurses.
- Only three influencing factors related to professional benefit profiles were found.
- This study was limited by the web-based cross-sectional design and convenient sampling method.

For peer review only

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

INTRODUCTION

Despite the fact that nursing is a high-risk, high-stress profession, nurses are able to achieve benefit findings [1-3]. In recent years, the concept of nurses' perceived professional benefits arises naturally, and has gradually attracted the attention of researchers. Nurses' perceived professional benefits (NPPB) refer to nurses' perceptions of the gains and benefits they receive in their profession during the hiring process, as well as their belief that working in nursing can promote their overall growth and development [4, 5]. Essentially, perceived professional benefits can be classified as an emotional experience and cognitive evaluation, which has two aspects: actual benefits and spiritual benefits [4]. However, there is a lack of in-depth research on the group heterogeneity of perceived professional benefits among nurse populations.

Background

It is estimated that 69% of the global health workforce consists of nurses [6]. Yet, the present physical and mental health of nurses is not encouraging, as they confront high levels of stress, burnout, turnover, and their own ageing [7-9]. Nursing is no longer a desirable and appealing profession [10], which makes nurse shortages a widespread worldwide concern [11]. These issues have a direct bearing on the sustainability and continued growth of the nursing workforce. In recent years, nursing in China has experienced remarkable growth, and the most recent statistics indicate that China has more than 5 million registered nurses [12]. Chinese nurses are extremely susceptible to burnout, and a high desire to leave is a serious concern [13, 14]. However, there is a dearth of comprehensive study and viable remedies.

The mental health of nurses is receiving increasing attention from managers and researchers in the context of positive psychology. It is beginning to be recognized that nurses' own positive psychology promotes job satisfaction and professional identity, lessens burnout, and hence reduces turnover rates [15, 16].

The profession of nursing can be beneficial to nurses in a number of ways. Previous studies [17, 18] reported that nursing preceptorship offers many benefits,

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

and nurses may find themselves being more committed to the position as a result. A qualitative study [19] found that nurses who were involved in caring for dying patients got a great lot of experience and benefited considerably; they can create a personal philosophy on death and life, in addition to professional growth. Nurses who served as advanced practice nurse roles perceived numerous benefits, including improved patient care quality and safety, professionalism, personal development, career development, intrinsic satisfaction with the role, and impact on other professional groups [20]. A person's perception of professional benefit is an endogenous motivation for his or her development and has a positive effect on that person's career. According to prior studies, improving the perceived professional benefit of nurses reduces burnout reduction and enables nurses to approach their work with a good attitude and obtain more favorable comments [21, 22].

Measures created by researchers to evaluate the perceived professional benefits of nurses were still in little supply. The Preceptor's Perspective of Benefits and Rewards (PPBR) measure was designed by Dibert, et al. [23] to evaluate the perceived benefits of clinical preceptor nurses, however, it is not relevant to general clinical nurses. A questionnaire entitled Nurses' Perceived Professional Benefits Questionnaire (NPPBQ) was developed to assess how Chinese nurses perceive the gains and benefits of their employment [5, 24]. This questionnaire has been utilized in a lot of research to date. While we now have a better grasp of nurses' perceptions of professional benefits, but the heterogeneity of the population is still lack, screening strategies for future precision interventions cannot be developed for identifying low-benefit populations.

To our knowledge, it has not been shown that sufficient evidence exists to answer the questions of whether nurses' perceived professional benefits differ in groups and what factors contribute to these differences. The current study was created to bridge that gap. This study's objective was to examine the characteristics and determinants of nurses' perceived professional benefits as well as the predictors of these latent profiles.

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

MATERIALS AND METHODS

Study design

An online survey with convenient sampling was used in this study to conduct a cross-sectional analysis. This study was designed and reported in accordance with the guidelines for Strengthening the Reporting of Observational Studies in Epidemiology (STROBE)[25].

Sample size estimation

An examination of the latent profiles of perceived professional benefits among nurses was conducted in this study. LPA needs a sample size larger than 500 [26, 27], therefore, the minimum sample size for this study was 500.

Participants

Participants in this study required to meet the inclusion criteria and be registered nurses. To be considered, candidates had to satisfy the following criteria to be considered: (1) having worked as a nurse in a medical facility, and (2) being willing to participate in this study. The following were the exclusion criteria: logical errors or missing information in questionnaire answers.

Measurements

Demographic

This study gathered and evaluated demographic data including age, gender, greatest degree of education, marital status, and other participant characteristics.

Nurses' Perceived Professional Benefits Questionnaire (NPPBQ)

The questionnaire was designed by Jing Hu, et al. [5] to investigate the gains and benefits that nurses perceived from their jobs. The authors then reduced it to 17 items by 2020 [24]. The questionnaire has five dimensions: personal growth, a good nurse-

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

patient relationship, recognition from family and friends, a positive occupational perception, and team belonging. Items are scored on a 5-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = not sure, 4 = agree, 5 = strongly agree). Cronbach's alphas for the questionnaires were 0.94, and the NPPBQ subquestionnaires' alphas were 0.84, 0.83, 0.74, 0.79, and 0.85.

Data collection

During the dates of July 6 and July 27, 2022, data was gathered. Wenjuanxing (www.wjx.cn) was used to develop a web-based questionnaire. Two researchers reviewed the online questionnaire for rigor and verified the feasibility of the questionnaire by completing it within the team. A poster was created to present the link and QR code. It was clearly shown on the poster who would be included and excluded from the survey. We distributed the questionnaire nationwide in China and did not limit the source and setting of nurses. The researcher contacted administrators or general nurses to disseminate the questionnaire. Wechat was used to send the poster and information letter. The survey can be completed by clicking on the link or scanning the QR code, completed questionnaires can be returned directly to the web.

Statistical analyses

The use of latent profile analysis (LPA) is frequently used to determine the number of subpopulations in a given sample. LPA is a statistical method that use potential category variables to explain the link between exogenous continuous-type indicators, permitting the assessment of the correlation between exogenous indicators and the maintenance of local independence among exogenous indicators [27]. Latent profile analysis was conducted using Mplus 7.4 software. Log likelihood (LL), Akaike information criterion (AIC), Akaike Information Criterion (BIC), Adjusted Bayesian Information Criteria (aBIC), Entropy, Lo-Mendell-Rubin (LMR), and the Bootstrapped Likelihood Ratio Test (BLRT) were used to assess model fit and determine the appropriate number of categories. In order to decide which model best

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

fit the data, the models from each category's fitting results were combined with the aforementioned indicators. The data was examined using the SPSS 26.0 statistical program. We utilized frequency and composition ratios for categorical data, whereas mean and standard deviation were utilized for continuous variables. The chi-square test was performed to compare category variables across groups. ANOVA was used to compare continuous variables among multiple groups. A multivariate logistic regression model was employed to analyze the variations in demographic variables. A statistically significant difference was indicated by $p < 0.05$.

Ethical considerations

The Ethics Committee of the First People's Hospital of Zunyi (2022-016) approved the study, and participants gave permission for data collection. Prior to completing the survey, participants will be provided with information about the purpose of the study and the major substance of the research. They will then be able to provide their informed consent through a yes or no response. In addition, participants were also informed that the study's findings would be given in aggregate form and that no participant could be identified. If a person declined to complete the questionnaire, the collection was immediately ended.

Patient and public involvement

Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

RESULTS

Participant characteristics

A total of 1409 nurses completed the questionnaire, while 58 nurses denied participation, for a total number of 1351 questionnaires received. 42 surveys were considered invalid due to insufficient or inaccurate information. 92.9 percent of the final 1309 surveys were correctly returned. The ages of the participants varied from 18

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

to 59 years old, with a mean age of 32.25 (SD: 6.18) years old. The bulk of participants were female (86.7%), whereas the minority were male (3.2%).

Characteristics of the different classes

On the basis of the NPPBQ's five dimensions, it was established that a model with three latent classes provided the greatest match. A class represents different categorisation methods, such as a class 1 for a single subgroup, a class 2 for two heterogeneous subgroups, and so forth. Table 1 provides the results. While the AIC and BIC in class 4 were lower in class 4 than in class 3, the entropy was greater; nonetheless, the lowest category probability in class 4 was 1.4%, which is unsatisfactory. As a consequence, we decided that the best-fitting model is class 3. Using a three-class model, Figure 1 illustrates the mean scores for each category within the NPPBQ's dimensions. The percentages increase from class 1 to class 3 as follows: 11.8% (155 nurses), 57.1% (747 nurses), and 31.1% (407 nurses). For the sake of brevity, based on the profile scores, we named class 1 as the low perceived professional benefits, class 2 as the moderate perceived professional benefits, and class 3 as the high perceived professional benefits.

Table 1 Potential profile analysis indicators (*N*=1309)

Model	LL[a]	AIC[b]	BIC[c]	aBIC[d]	Entropy	LMR[e] *p*-value	BLRT[f] *p*-value	Category probability
Class 1	-14709.353	29438.706	29490.476	29458.711	-	-	-	-
Class 2	-13420.425	26872.850	26955.682	26904.857	0.905	< 0.001	< 0.001	0.654/0.346
Class 3	-12583.629	25211.257	25325.152	25255.268	0.936	0.007	< 0.001	0.118/0.571/0.311
Class 4	-12307.807	24671.613	24816.570	24727.627	0.940	0.036	< 0.001	0.151/0.014/0.530/0.306

a Log likelihood, b Akaike information criterion, c Bayesian information criterion, d Adjusted bayesian information criterion, e Lo-Mendell-Rubin Likelihood Ratio Test, f Bootstrapped Likelihood Ratio Test

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

The scale and dimension scores of different profiles

The findings of a one-way ANOVA indicated statistically significant differences in the scale and dimension scores of different profiles (both $p<0.001$). The results were shown in Figure 2 demonstrates the outcomes.

Demographic and related characteristics of each profile

The ANOVA and chi-square tests indicated statistically significant differences between the three profiles differed statistically in terms of age, marital status, children, professional title, leadership role, working years, and number of night shifts per month. Table 2 is a summary of the results.

Table 2 Demographic and characteristics by latent profile (*N*=1309)

Variables	Class 1	Class 2	Class 3	χ^2/F	*p*
Age (SD)	30.94 (5.37)	31.76 (5.91)	33.64 (6.71)	16.545	< 0.001
Gender				0.600	0.741
Male	6 (3.9)	25 (3.3)	11 (2.7)		
Female	149 (96.1)	722 (96.7)	396 (97.3)		
Highest Degree				1.602	0.449
Junior college and below	29 (18.7)	111 (14.9)	60 (14.7)		
Bachelor's and above	126 (81.3)	636 (85.1)	347 (85.3)		
Marital status				25.768	< 0.001
Single/divorced/widowed	62 (40.0)	218 (29.2)	80 (19.7)		
Married	93 (60.0)	529 (70.8)	327 (80.3)		
Children				26.943	< 0.001
Yes	87 (56.1)	481 (64.4)	311 (76.4)		
No	68 (43.9)	266 (35.6)	96 (23.6)		
Professional title				23.589	< 0.001

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

Junior Level	102 (65.8)	448 (60.0)	207 (50.9)		
Intermediate level	50 (32.3)	280 (37.5)	172 (42.3)		
Senior level	3 (1.9)	19 (2.5)	28 (6.9)		
Leadership role				17.086	< 0.001
Yes	18 (11.6)	86 (11.5)	82 (20.1)		
No	137 (88.4)	661 (88.5)	325 (79.9)		
Working years (years)				32.903	< 0.001
≤5	52 (33.5)	217 (29.0)	79 (19.4)		
6–15	91 (58.7)	438 (58.6)	241 (59.2)		
≥16	12 (7.7)	92 (12.3)	87 (21.4)		
Average monthly income (yuan)*				7.990	0.239
≤3000	23 (14.8)	75 (10.0)	43 (10.6)		
3001~6000	93 (60.0)	415 (55.6)	217 (53.3)		
6001~9000	27 (17.4)	179 (24.0)	105 (25.8)		
≥9001	12 (7.7)	78 (10.4)	42 (10.3)		
Number of night shifts per month				17.797	0.001
0	42 (27.1)	233 (31.2)	164 (40.3)		
1–4	22 (14.2)	143 (19.1)	73 (17.9)		
≥5	91 (58.7)	371 (49.7)	170 (41.8)		

* 1 USD equals 7.31 Chinese Yuan, exchange rate on September 29, 2023

A multivariate logistic regression model was constructed using the variables with statistically significant differences as determined by ANOVA and chi-square tests. Of the three profiles, the class 3 was chosen as a reference to find the predictors linked with NPPBQ. As shown in Table 3, nurses who were single/divorced/widowed were

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

more likely to belonged to low perceived professional benefits (*OR*: 1.984, 95%*CI*:1.028-3.828). The number of night shifts worked per month was associated with low perceived professional benefits (*OR*: 0.633, 95% *CI*: 0.405-0.988), compared to those with more than five night shifts, those without night shifts tended to fall into the high perceived professional benefits. Nurses without a leadership role were more likely to be in the moderate perceived professional benefits *(OR*: 1.489, 95% *CI*: 1.028-2.157). Other variables were not statistically significant in the multivariate logistic regression.

Table 3 Predictors of latent profile membership

Variables	Class 1 VS Class 3			Class 2 VS Class 3		
	β	***OR***	**95%*CI***	***β***	***OR***	**95%*CI***
Age (SD)	0.004	1.004	0.941-1.070	-0.005	0.995	0.957-1.034
Marital status						
Single/divorced/widowed	0.685	1.984*	1.028-3.828	0.115	1.122	0.716-1.760
Married (Ref)						
Children						
No	0.177	1.194	0.622-2.293	0.240	1.272	0.822-1.967
Yes (Ref)						
Professional title						
Junior level	0.368	1.444	0.334-6.241	0.359	1.433	0.661-3.105
Intermediate level	0.378	1.460	0.370-5.766	0.429	1.535	0.764-3.085
Senior level (Ref)						
Leadership role						
No	0.139	1.984	1.028-3.828	0.398	1.489*	1.028-2.157
Yes (Ref)						
Working years (years)						

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

≤5	0.781	2.184	0.666-7.161	0.411	1.508	0.748-3.042
6–15	0.721	2.057	0.847-5.000	0.228	1.256	0.773-2.039
≥16 (Ref)						
Number of night shifts per month						
0	-0.458	0.633*	0.405-0.988	-0.223	0.800	0.601-1.064
1–4	-0.354	0.702	0.400-1.231	0.089	1.094	0.768-1.558
≥5 (Ref)						

*$p < 0.05$; *OR*, Odds ratio; 95% *CI*, 95% Confidence Interval; Ref, Reference.

For peer review only

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

DISCUSSION

The purpose of this research was to identify distinct profiles of nurses' perceived professional benefits. Furthermore, the current study employed multinomial logistic regression to investigate predictors of these profiles.

In this study, we investigated 1309 nurses who validly completed the questionnaire. As a result, three latent profiles were identified: low perceived professional benefits, moderate perceived professional benefits, and high perceived professional benefits. Our research revealed that the majority of nurses had a moderate or higher levels of perceived professional benefits, with just 11.8% of nurses belonging to the category of nurses with low perceived professional benefits. Most studies reported nurses had an upper-moderate level of perceived professional benefits [28, 29], and our findings are consistent with those of previous studies. Most importantly, our study clarified the heterogeneous subgroups of nurses' perceived professional benefits and their specific distribution.

In the last three years, nurses have been a key part of the fight against the COVID-19 outbreak. Despite heavy job pressure, nurses have had a feeling of professional calling and value [30], which has effectively enhanced their sense of professional benefit [1]. At the same time, the critical role of nurses in defending people's lives and health has earned the society's respect and recognition, as well as a positive social image [31, 32], which can further enhance nurses' sense of professional benefit. Our survey was conducted during the COVID-19 epidemic, and nurses' perceptions of professional benefit may be elevated.

Another finding of our study revealed that the membership of profiles can be predicted by some characteristics such as the number of night shifts, leadership role, and marriage status. Nursing is a continuous, 24-hour profession, and nurse's work normally takes the form of night shifts. It is widely proven that night shifts negatively impact the physical and emotional health of nurses [33-36]. Nurses working rotating night shifts were normally younger, and they had the lower scores of job satisfaction, quality of sleep, and quantity of sleep [37], these factors resulted in a low perceived

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

professional benefits. Consistent with past research, our findings indicate that the greater the frequency of night shifts, the lower the perceived professional benefit [29].

According to our results, 57.1% of nurses perceived professional benefits as moderate. The majority of nurses in the moderate perceived professional benefits group lacked a work title, while the majority of nurses in the highly perceived professional benefits group held a leadership role. This has been validated by other research, and our work provides more support for this notion [29]. Holding a managerial position at a hospital is a means of advancing one's career, and nurses highly value this opportunity.

Our study found that nurses who were single/divorced/widowed were more likely to belonged to low perceived professional benefits, which is consistent with earlier findings [29]. This may be because, unlike single/divorced/widowed nurses, married nurses receive more social support from their spouses and other family members.

We hypothesized that job fulfillment and social support are important influencing mechanisms that affect nurses' perceived professional benefits. The number of night shifts, leadership roles are important indicators of nurses' job fulfillment. Marital status is an important factor in social support. Each of these factors can have varying degrees of impact on the actual benefit or spiritual benefit [4]. Considering that nurses perceive professional benefits as a result of personal, organizational, environmental, and social factors, a well-developed theoretical framework is required to explain this phenomenon.

Unfortunately, our research failed to demonstrate that the profiles can be predicted by other factors in the model variables. Our findings in the univariate analysis results were consistent with earlier research. Nevertheless, because the bulk of prior research did not employ multi-factor models, it was impossible to compare our findings could not be compared to those of others. In addition, certain putative contributing elements were not adequately proven, and further research is required to confirm them in the future.

Our research has theoretical and practical implications for the future study of nurses' perceived professional benefits. First, the number of night shifts, leadership

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

role, and marriage status are the most significant factors affecting nurses' perceived professional benefits, and in the future, we should focus on the degree of influence of these three factors and explore the mechanisms from the theoretical level. Second, managers should pay active attention to the perceived professional benefits of clinical nurses, create a favorable working environment and professional growth atmosphere, and promote the professional success of nurses. Given that 11.8% of nurses still have a low perceived sense of career benefit, more tailored intervention programs are still needed in the future.

Strengths and limitations

To the best of our knowledge, this is the first study to use the LPA approach to explore heterogeneous subgroups of nurses' perceived professional benefit with a large sample size, and we presented a unique perspective and a basis for future research on the perceived career benefits of nurses. The research was limited in some ways. First, this was a web-based survey, and the sample process and self-reporting strategy may have resulted in some bias. Second, we only polled nurses in mainland China, and our sample only reflected the current situation in a single nation. Lastly, the constraints of the study's design prohibited an in-depth assessment of the psychological factors behind nurses' perceptions of their professional benefit. As a result, more rigorously designed studies will be required in the future to investigate this issue in depth.

CONCLUSION

Our study identified three professional benefits profiles among nurses. The results of our study indicated that nurses enjoy a high level of professional benefits. Notwithstanding the study's limitations of the study and the present condition of nursing, it is vital that we engage on several levels to encourage a stable nursing workforce, including policy, organisation, financial income, and career development, so that nurses experience a sense of professional gain.

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

Acknowledgements

None.

AUTHOR CONTRIBUTIONS

Jiang Hu and Sun Changli were responsible for the conception and study design. Yao Qiangfang, Wang Xianwei and Liu Hanmei performed the data collection. Yao Qiangfang, Wang Xianwei and Wen Xueke contributed to the analysis of the data. Sun Changli and Jiang Hu were involved in drafting the manuscript and revising it. All authors have read and approved the final manuscript.

FUNDING

This study was funded by the Science and Technology Joint Funds of Zunyi Science and Technology Bureau (2023-73).

CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

Ethics approval

This study involves human participants and was approved by the Ethics Committee of the First People's Hospital of Zunyi (2022-016). Participants gave informed consent to participate in the study before taking part.

Data availability statement

Data are available upon reasonable request. Data are available from the corresponding author and the first author on reasonable request.

For peer review only

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

REFFERENCES

1. Wang X, Chen F, Dai P, Lin X, Qi L: **Perceived professional benefits and associated factors among nurses during the COVID-19 pandemic: A cross-sectional study**. *Nurs Open* 2023, **10**(3):1461-1470.
2. Jiang H, Huang N, Tian W, Shi S, Yang G, Pu H: **Factors Associated With Post-traumatic Stress Disorder Among Nurses During COVID-19**. *Front Psychol* 2022, **13**:745158.
3. Liu S, Duan X, Han P, Shao H, Jiang J, Zeng L: **Occupational benefit perception of acute and critical care nurses: A qualitative meta-synthesis**. *Front Public Health* 2022, **10**:976146.
4. Zhou H, Zhu Y, Zhang X, Peng J, Li Q, Wang X, Wang L, Cai X, Lan L: **Psychological Capital and Perceived Professional Benefits: Testing the Mediating Role of Perceived Nursing Work Environment Among Chinese Nurses**. *J Psychosoc Nurs Ment Health Serv* 2018, **56**(4):38-47.
5. Hu J, Liu X: **The preparation of nurses' occupational benefit questionnaire and its reliability and validity test [J]**. *J Chin People's Liberation Army* 2013, **30**(22):1-5.
6. Malone B: **A Perspective on the State of the World's Nursing Report**. *Nurs Adm Q* 2021, **45**(1):6-12.
7. Ivziku D, de Maria M, Ferramosca FMP, Greco A, Tartaglini D, Gualandi R: **What determines physical, mental and emotional workloads on nurses? A cross-sectional study**. *J Nurs Manag* 2022, **30**(8):4387-4397.
8. Morgan B, Jordan L, Rivera LA: **Considerations for an aging nurse anesthetists**

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

workforce. *Geriatr Nurs* 2020, **41**(6):1017-1019.

9. Tamata AT, Mohammadnezhad M: **A systematic review study on the factors affecting shortage of nursing workforce in the hospitals**. *Nurs Open* 2023, **10**(3):1247-1257.

10. van der Cingel M, Brouwer J: **What makes a nurse today? A debate on the nursing professional identity and its need for change**. *Nurs Philos* 2021, **22**(2):e12343.

11. Udod S: **A Call for Urgent Action: Innovations for Nurse Retention in Addressing the Nursing Shortage**. *Nurs Rep* 2023, **13**(1):145-147.

12. **China Statistical Yearbook** [http://www.stats.gov.cn/sj/ndsj/2022/indexch.htm]

13. Zeng LN, Zhang JW, Zong QQ, Chan SW, Browne G, Ungvari GS, Chen LG, Xiang YT: **Prevalence of burnout in mental health nurses in China: A meta-analysis of observational studies**. *Arch Psychiatr Nurs* 2020, **34**(3):141-148.

14. Chen JP, Dai YM, Qin Y, Liang SP, Cheng G, Liu Y, Yang CZ, He HG, Shen Q: **Factors influencing turnover intention among male nurses in China: A large-scale descriptive correlational study**. *Int Nurs Rev* 2023.

15. Yu JF, Ding YM, Jia RY, Liang DD, Wu Z, Lu GL, Chen CR: **Professional identity and emotional labour affect the relationship between perceived organisational justice and job performance among Chinese hospital nurses**. *J Nurs Manag* 2022, **30**(5):1252-1262.

16. Lin L, Liu X, He G: **Mindfulness and Job Satisfaction Among Hospital Nurses: The Mediating Roles of Positive Affect and Resilience**. *J Psychosoc Nurs Ment Health Serv* 2020, **58**(6):46-55.

17. Macey A, Green C, Jarden RJ: **ICU nurse preceptors' perceptions of benefits, rewards,**

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

supports and commitment to the preceptor role: A mixed-methods study. *Nurse Educ Pract* 2021, **51**:102995.

18. Natan MB, Qeadan H, Egbaria W: **The commitment of Israeli nursing preceptors to the role of preceptor**. *Nurse Educ Today* 2014, **34**(12):1425-1429.

19. Zheng RS, Guo QH, Dong FQ, Owens RG: **Chinese oncology nurses' experience on caring for dying patients who are on their final days: a qualitative study**. *Int J Nurs Stud* 2015, **52**(1):288-296.

20. Christiansen A, Vernon V, Jinks A: **Perceptions of the benefits and challenges of the role of advanced practice nurses in nurse-led out-of-hours care in Hong Kong: a questionnaire study**. *J Clin Nurs* 2013, **22**(7-8):1173-1181.

21. Wu B, Zhao Y, Xu D, Wang Y, Niu N, Zhang M, Zhi X, Zhu P, Meng A: **Factors associated with nurses' willingness to participate in care of patients with COVID-19: A survey in China**. *J Nurs Manag* 2020, **28**(7):1704-1712.

22. Liu X, Ju X, Liu X: **The relationship between resilience and intent to stay among Chinese nurses to support Wuhan in managing COVID-19: The serial mediation effect of post-traumatic growth and perceived professional benefits**. *Nurs Open* 2021, **8**(5):2866-2876.

23. Dibert C, Goldenberg D: **Preceptors' perceptions of benefits, rewards, supports and commitment to the preceptor role**. *J Adv Nurs* 1995, **21**(6):1144-1151.

24. Hu Y, Hu J, Li L, Zhao B, Liu X, Li F: **Development and preliminary validation of a brief nurses' perceived professional benefit questionnaire (NPPBQ)**. *BMC Med Res Methodol* 2020, **20**(1):18.

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

25. von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP: **The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement: guidelines for reporting observational studies**. *Int J Surg* 2014, **12**(12):1495-1499.

26. Nylund KL, Asparouhov T, Muthén BO: **Deciding on the number of classes in latent class analysis and growth mixture modeling: A Monte Carlo simulation study**. *Structural equation modeling: A multidisciplinary Journal* 2007, **14**(4):535-569.

27. Spurk D, Hirschi A, Wang M, Valero D, Kauffeld S: **Latent profile analysis: A review and "how to" guide of its application within vocational behavior research**. *Journal of vocational behavior* 2020, **120**:103445.

28. Ma HW, Dan X, Xu SH, Hou RN, Zhao NM: **[Current status of nurses' perceived professional benefits and influencing factors in 3A-level hospitals in Tianjin]**. *Zhonghua Lao Dong Wei Sheng Zhi Ye Bing Za Zhi* 2017, **35**(6):443-447.

29. Zhan T, Li H, Ding X: **Can social support enhance sense of coherence and perceived professional benefits among Chinese registered nurses? A mediation model**. *J Nurs Manag* 2020, **28**(3):488-494.

30. Savitsky B, Radomislensky I, Hendel T: **Nurses' occupational satisfaction during Covid-19 pandemic**. *Appl Nurs Res* 2021, **59**:151416.

31. Mohammed S, Peter E, Killackey T, Maciver J: **The "nurse as hero" discourse in the COVID-19 pandemic: A poststructural discourse analysis**. *Int J Nurs Stud* 2021, **117**:103887.

32. Begnini D, Cicolella DA, Freitas KR, Maranhão T, Rocha CMF, Kruse MHL: **Heroines**

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

in Covid-19 times: visibility of nursing in the pandemic. *Rev Gaucha Enferm* 2021, **42**(spe):e20200373.

33. James L, Elkins-Brown N, Wilson M, James SM, Dotson E, Edwards CD, Wintersteen-Arleth L, Stevens K, Butterfield P: **The effects of three consecutive 12-hour shifts on cognition, sleepiness, and domains of nursing performance in day and night shift nurses: A quasi-experimental study**. *Int J Nurs Stud* 2021, **123**:104041.

34. Weaver SH, de Cordova PB, Vitale TR, Hargwood P, Salmond S: **Experiences and perceptions of nurses working night shift: a qualitative systematic review**. *JBI Evid Synth* 2023, **21**(1):33-97.

35. Borroni E, Frigerio G, Polledri E, Mercadante R, Maggioni C, Fedrizzi L, Pesatori AC, Fustinoni S, Carugno M: **Metabolomic profiles in night shift workers: A cross-sectional study on hospital female nurses**. *Front Public Health* 2023, **11**:1082074.

36. Jørgensen JT, Rozing MP, Westendorp RGJ, Hansen J, Stayner LT, Simonsen MK, Andersen ZJ: **Shift work and incidence of psychiatric disorders: The Danish Nurse Cohort study**. *J Psychiatr Res* 2021, **139**:132-138.

37. Ferri P, Guadi M, Marcheselli L, Balduzzi S, Magnani D, Di Lorenzo R: **The impact of shift work on the psychological and physical health of nurses in a general hospital: a comparison between rotating night shifts and day shifts**. *Risk Manag Healthc Policy* 2016, **9**:203-211.

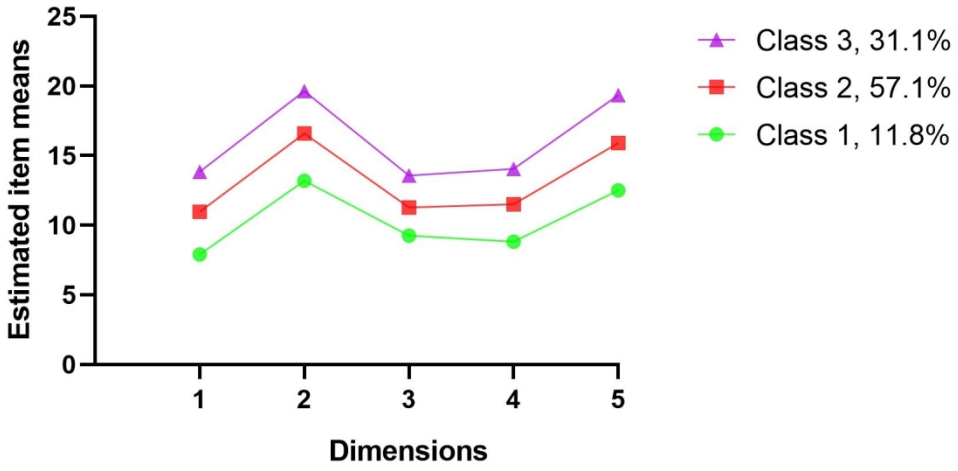
For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

Figure 1 Latent profiles of NPPBQ

Figure 2 The scale and dimension scores of different profiles

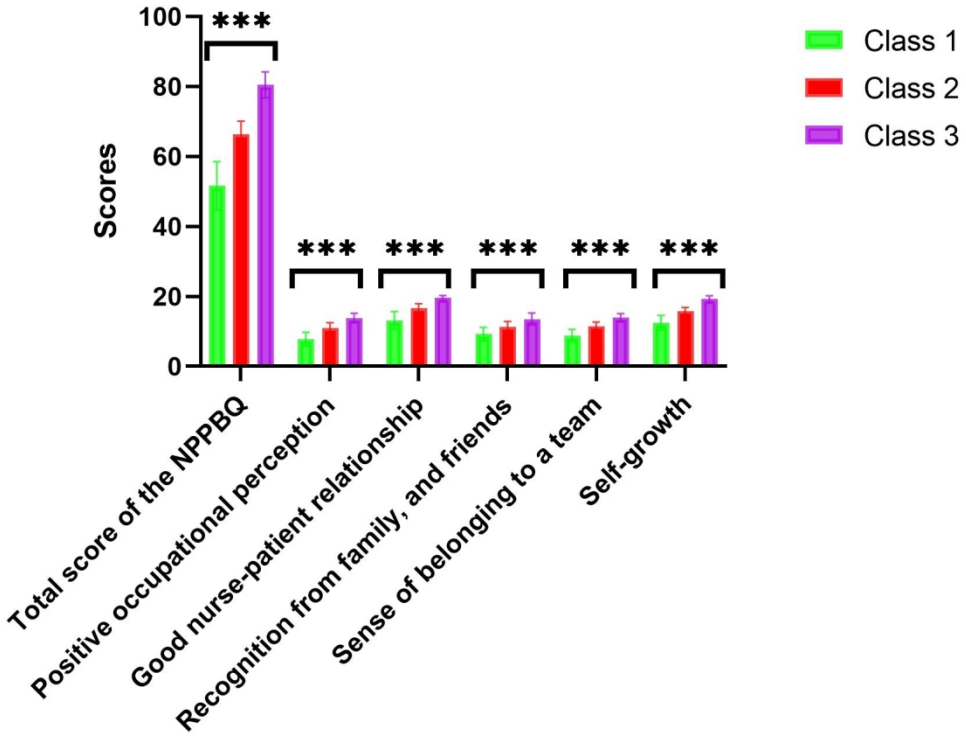
For peer review only

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml



Latent profiles of NPPBQ

145x76mm (300 x 300 DPI)



The scale and dimension scores of different profiles

145x114mm (300 x 300 DPI)

STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) 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 was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3-4
Objectives	3	State specific objectives, including any prespecified hypotheses	4-5
Methods			
Study design	4	Present key elements of study design early in the paper	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	5
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5-6
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	5-6
Bias	9	Describe any efforts to address potential sources of bias	6
Study size	10	Explain how the study size was arrived at	5
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	5-6
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	6
		(*b*) Describe any methods used to examine subgroups and interactions	NA
		(*c*) Explain how missing data were addressed	NA
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	NA
		(*e*) 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	7
		(b) Give reasons for non-participation at each stage	7
		(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	7
		(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	8
Main results	16	(*a*) 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

For peer review only

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

		(*b*) Report category boundaries when continuous variables were categorized	8
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	NA
Discussion			
Key results	18	Summarise key results with reference to study objectives	9-11
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	11
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	11
Generalisability	21	Discuss the generalisability (external validity) of the study results	11
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	12

*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.

For peer review only

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

BMJ Open

Latent profile analysis of nurses' perceived professional benefits in China: a cross-sectional study

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2023-078051.R3
Article Type:	Original research
Date Submitted by the Author:	16-Oct-2023
Complete List of Authors:	Sun, Changli; Third Affiliated Hospital of Zunyi Medical University Jiang, Hu; Third Affiliated Hospital of Zunyi Medical University Yao, Qingfang; The Third Affiliated Hospital of Zunyi Medical University Wang, Xianwei; The Third Affiliated Hospital of Zunyi Medical University Wen, Xueke; Third Affiliated Hospital of Zunyi Medical University Liu, Hanmei; Zunyi Medical University
Primary Subject Heading:	Occupational and environmental medicine
Secondary Subject Heading:	Nursing, Occupational and environmental medicine
Keywords:	Burnout, Professional, Burnout, China

SCHOLARONE™
Manuscripts

I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our licence.

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which Creative Commons licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

For peer review only

Latent profile analysis of nurses' perceived professional benefits in China: a cross-sectional study

Running Head: LPA of nurses' perceived professional benefits

Changli Sun[1], Hu Jiang[1]*, Qingfang Yao[2], Xianwei Wang[2], Xueke Wen[1] and Hanmei Liu[2],

[1] The Third Affiliated Hospital of Zunyi Medical University (The First People's Hospital of Zunyi), Zunyi, Guizhou, China

[2] Zunyi Medical University, Zunyi, Guizhou, China

*Correspondence: jianghuchn@163.com, Nursing Department, The Third Affiliated Hospital of Zunyi Medical University (The First People's Hospital of Zunyi), Zunyi, Guizhou, China

For peer review only

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

Latent profile analysis of nurses' perceived professional benefits in China: a cross-sectional study

ABSTRACT

Objective: To identify profiles of nurses' perceived professional benefits as well as their predictors.

Design: Cross-sectional study.

Setting: The study was carried out online in China.

Methods: From July 6 and July 27, 2022, a total of 1,309 registered nurses participated in the survey by convenient sampling. We collected the Nurses' Perceived Professional Benefits Questionnaire (NPPBQ) and demographic data. Using latent profile analysis (LPA), subgroups of nurses' perceived professional benefits were identified. Moreover, univariate and multinomial logistic regression analysis were conducted to find the factors that were linked with the profiles.

Results: The survey was validly completed by 1309 nurses, with a 92.9% effective return rate. The findings of the LPA demonstrated three unique profiles: low perceived professional benefits (11.8%), moderate perceived professional benefits (57.1%), and high perceived professional benefits (31.1%). There was a correlation between marital status, the number of night shifts per month, and leadership role.

Conclusions: According to our research, registered nurses have three unique professional benefit profiles. In order to sustain the nursing workforce, despite the fact that nurses get a high level of professional benefits, interventions are necessary to increase nurses' perception of their professional value.

Keywords: nurse, perceived professional benefits, latent profile analysis, cross-sectional study

Strengths and limitations of this study:

- The LPA approach was utilized in this study to investigate heterogeneous

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

subgroups of nurses' perceived professional benefit.

- This study identified three unique professional benefit profiles among Chinese nurses.
- Multivariate logistic regression analysis revealed only three contributing factors associated to professional benefit profiles.
- This study was limited by the web-based cross-sectional design and convenient sampling method.

For peer review only

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

INTRODUCTION

Despite the fact that nursing is a high-risk, high-stress profession, nurses are able to achieve benefit findings [1-3]. In recent years, the concept of nurses' perceived professional benefits arises naturally, and has gradually attracted the attention of researchers. Nurses' perceived professional benefits (NPPB) refer to nurses' perceptions of the gains and benefits they receive in their profession during the hiring process, as well as their belief that working in nursing can promote their overall growth and development [4, 5]. Essentially, perceived professional benefits can be classified as an emotional experience and cognitive evaluation, which has two aspects: actual benefits and spiritual benefits [4]. However, there is a lack of in-depth research on the group heterogeneity of perceived professional benefits among nurse populations.

Background

It is estimated that 69% of the global health workforce consists of nurses [6]. Yet, the present physical and mental health of nurses is not encouraging, as they confront high levels of stress, burnout, turnover, and their own ageing [7-9]. Nursing is no longer a desirable and appealing profession [10], which makes nurse shortages a widespread worldwide concern [11]. These issues have a direct bearing on the sustainability and continued growth of the nursing workforce. In recent years, nursing in China has experienced remarkable growth, and the most recent statistics indicate that China has more than 5 million registered nurses [12]. Chinese nurses are extremely susceptible to burnout, and a high desire to leave is a serious concern [13, 14]. However, there is a dearth of comprehensive study and viable remedies.

The mental health of nurses is receiving increasing attention from managers and researchers in the context of positive psychology. It is beginning to be recognized that nurses' own positive psychology promotes job satisfaction and professional identity, lessens burnout, and hence reduces turnover rates [15, 16].

The profession of nursing can be beneficial to nurses in a number of ways. Previous studies [17, 18] reported that nursing preceptorship offers many benefits,

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

and nurses may find themselves being more committed to the position as a result. A qualitative study [19] found that nurses who were involved in caring for dying patients got a great lot of experience and benefited considerably; they can create a personal philosophy on death and life, in addition to professional growth. Nurses who served as advanced practice nurse roles perceived numerous benefits, including improved patient care quality and safety, professionalism, personal development, career development, intrinsic satisfaction with the role, and impact on other professional groups [20]. A person's perception of professional benefit is an endogenous motivation for his or her development and has a positive effect on that person's career. According to prior studies, improving the perceived professional benefit of nurses reduces burnout reduction and enables nurses to approach their work with a good attitude and obtain more favorable comments [21, 22].

Measures created by researchers to evaluate the perceived professional benefits of nurses were still in little supply. The Preceptor's Perspective of Benefits and Rewards (PPBR) measure was designed by Dibert, et al. [23] to evaluate the perceived benefits of clinical preceptor nurses, however, it is not relevant to general clinical nurses. A questionnaire entitled Nurses' Perceived Professional Benefits Questionnaire (NPPBQ) was developed to assess how Chinese nurses perceive the gains and benefits of their employment [5, 24]. This questionnaire has been utilized in a lot of research to date. While we now have a better grasp of nurses' perceptions of professional benefits, but the heterogeneity of the population is still lack, screening strategies for future precision interventions cannot be developed for identifying low-benefit populations.

To our knowledge, it has not been shown that sufficient evidence exists to answer the questions of whether nurses' perceived professional benefits differ in groups and what factors contribute to these differences. The current study was created to bridge that gap. This study's objective was to examine the characteristics and determinants of nurses' perceived professional benefits as well as the predictors of these latent profiles.

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

MATERIALS AND METHODS

Study design

An online survey with convenient sampling was used in this study to conduct a cross-sectional analysis. This study was designed and reported in accordance with the guidelines for Strengthening the Reporting of Observational Studies in Epidemiology (STROBE)[25].

Sample size estimation

An examination of the latent profiles of perceived professional benefits among nurses was conducted in this study. LPA needs a sample size larger than 500 [26, 27], therefore, the minimum sample size for this study was 500.

Participants

Participants in this study required to meet the inclusion criteria and be registered nurses. To be considered, candidates had to satisfy the following criteria to be considered: (1) having worked as a nurse in a medical facility, and (2) being willing to participate in this study. The following were the exclusion criteria: logical errors or missing information in questionnaire answers.

Measurements

Demographic

This study gathered and evaluated demographic data including age, gender, greatest degree of education, marital status, and other participant characteristics.

Nurses' Perceived Professional Benefits Questionnaire (NPPBQ)

The questionnaire was designed by Jing Hu, et al. [5] to investigate the gains and benefits that nurses perceived from their jobs. The authors then reduced it to 17 items by 2020 [24]. The questionnaire has five dimensions: personal growth, a good nurse-

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

patient relationship, recognition from family and friends, a positive occupational perception, and team belonging. Items are scored on a 5-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = not sure, 4 = agree, 5 = strongly agree). Cronbach's alphas for the questionnaires were 0.94, and the NPPBQ subquestionnaires' alphas were 0.84, 0.83, 0.74, 0.79, and 0.85.

Data collection

During the dates of July 6 and July 27, 2022, data was gathered. Wenjuanxing (www.wjx.cn) was used to develop a web-based questionnaire. Two researchers reviewed the online questionnaire for rigor and verified the feasibility of the questionnaire by completing it within the team. A poster was created to present the link and QR code. It was clearly shown on the poster who would be included and excluded from the survey. We distributed the questionnaire nationwide in China and did not limit the source and setting of nurses. The researcher contacted administrators or general nurses to disseminate the questionnaire. Wechat was used to send the poster and information letter. The survey can be completed by clicking on the link or scanning the QR code, completed questionnaires can be returned directly to the web.

Statistical analyses

The use of latent profile analysis (LPA) is frequently used to determine the number of subpopulations in a given sample. LPA is a statistical method that use potential category variables to explain the link between exogenous continuous-type indicators, permitting the assessment of the correlation between exogenous indicators and the maintenance of local independence among exogenous indicators [27]. Latent profile analysis was conducted using Mplus 7.4 software. Log likelihood (LL), Akaike information criterion (AIC), Akaike Information Criterion (BIC), Adjusted Bayesian Information Criteria (aBIC), Entropy, Lo-Mendell-Rubin (LMR), and the Bootstrapped Likelihood Ratio Test (BLRT) were used to assess model fit and determine the appropriate number of categories. In order to decide which model best

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

fit the data, the models from each category's fitting results were combined with the aforementioned indicators. The data was examined using the SPSS 26.0 statistical program. We utilized frequency and composition ratios for categorical data, whereas mean and standard deviation were utilized for continuous variables. The chi-square test was performed to compare category variables across groups. ANOVA was used to compare continuous variables among multiple groups. A multivariate logistic regression model was employed to analyze the variations in demographic variables. A statistically significant difference was indicated by $p < 0.05$.

Ethical considerations

The Ethics Committee of the First People's Hospital of Zunyi (2022-016) approved the study, and participants gave permission for data collection. Prior to completing the survey, participants will be provided with information about the purpose of the study and the major substance of the research. They will then be able to provide their informed consent through a yes or no response. In addition, participants were also informed that the study's findings would be given in aggregate form and that no participant could be identified. If a person declined to complete the questionnaire, the collection was immediately ended.

Patient and public involvement

Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

RESULTS

Participant characteristics

A total of 1409 nurses completed the questionnaire, while 58 nurses denied participation, for a total number of 1351 questionnaires received. 42 surveys were considered invalid due to insufficient or inaccurate information. 92.9 percent of the final 1309 surveys were correctly returned. The ages of the participants varied from 18

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

to 59 years old, with a mean age of 32.25 (SD: 6.18) years old. The bulk of participants were female (86.7%), whereas the minority were male (3.2%).

Characteristics of the different classes

On the basis of the NPPBQ's five dimensions, it was established that a model with three latent classes provided the greatest match. A class represents different categorisation methods, such as a class 1 for a single subgroup, a class 2 for two heterogeneous subgroups, and so forth. Table 1 provides the results. While the AIC and BIC in class 4 were lower in class 4 than in class 3, the entropy was greater; nonetheless, the lowest category probability in class 4 was 1.4%, which is unsatisfactory. As a consequence, we decided that the best-fitting model is class 3. Using a three-class model, Figure 1 illustrates the mean scores for each category within the NPPBQ's dimensions. The percentages increase from class 1 to class 3 as follows: 11.8% (155 nurses), 57.1% (747 nurses), and 31.1% (407 nurses). For the sake of brevity, based on the profile scores, we named class 1 as the low perceived professional benefits, class 2 as the moderate perceived professional benefits, and class 3 as the high perceived professional benefits.

Table 1 Potential profile analysis indicators (*N*=1309)

Model	LL[a]	AIC[b]	BIC[c]	aBIC[d]	Entropy	LMR[e] *p*-value	BLRT[f] *p*-value	Category probability
Class 1	-14709.353	29438.706	29490.476	29458.711	-	-	-	-
Class 2	-13420.425	26872.850	26955.682	26904.857	0.905	< 0.001	< 0.001	0.654/0.346
Class 3	-12583.629	25211.257	25325.152	25255.268	0.936	0.007	< 0.001	0.118/0.571/0.311
Class 4	-12307.807	24671.613	24816.570	24727.627	0.940	0.036	< 0.001	0.151/0.014/0.530/0.306

a Log likelihood, b Akaike information criterion, c Bayesian information criterion, d Adjusted bayesian information criterion, e Lo-Mendell-Rubin Likelihood Ratio Test, f Bootstrapped Likelihood Ratio Test

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

The scale and dimension scores of different profiles

The findings of a one-way ANOVA indicated statistically significant differences in the scale and dimension scores of different profiles (both $p<0.001$). The results were shown in Figure 2 demonstrates the outcomes.

Demographic and related characteristics of each profile

The ANOVA and chi-square tests indicated statistically significant differences between the three profiles differed statistically in terms of age, marital status, children, professional title, leadership role, working years, and number of night shifts per month. Table 2 is a summary of the results.

Table 2 Demographic and characteristics by latent profile (*N*=1309)

Variables	Class 1	Class 2	Class 3	χ^2/F	*p*
Age (SD)	30.94 (5.37)	31.76 (5.91)	33.64 (6.71)	16.545	< 0.001
Gender				0.600	0.741
Male	6 (3.9)	25 (3.3)	11 (2.7)		
Female	149 (96.1)	722 (96.7)	396 (97.3)		
Highest Degree				1.602	0.449
Junior college and below	29 (18.7)	111 (14.9)	60 (14.7)		
Bachelor's and above	126 (81.3)	636 (85.1)	347 (85.3)		
Marital status				25.768	< 0.001
Single/divorced/widowed	62 (40.0)	218 (29.2)	80 (19.7)		
Married	93 (60.0)	529 (70.8)	327 (80.3)		
Children				26.943	< 0.001
Yes	87 (56.1)	481 (64.4)	311 (76.4)		
No	68 (43.9)	266 (35.6)	96 (23.6)		
Professional title				23.589	< 0.001

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

Junior Level	102 (65.8)	448 (60.0)	207 (50.9)		
Intermediate level	50 (32.3)	280 (37.5)	172 (42.3)		
Senior level	3 (1.9)	19 (2.5)	28 (6.9)		
Leadership role				17.086	< 0.001
Yes	18 (11.6)	86 (11.5)	82 (20.1)		
No	137 (88.4)	661 (88.5)	325 (79.9)		
Working years (years)				32.903	< 0.001
≤5	52 (33.5)	217 (29.0)	79 (19.4)		
6–15	91 (58.7)	438 (58.6)	241 (59.2)		
≥16	12 (7.7)	92 (12.3)	87 (21.4)		
Average monthly income (yuan)*				7.990	0.239
≤3000	23 (14.8)	75 (10.0)	43 (10.6)		
3001~6000	93 (60.0)	415 (55.6)	217 (53.3)		
6001~9000	27 (17.4)	179 (24.0)	105 (25.8)		
≥9001	12 (7.7)	78 (10.4)	42 (10.3)		
Number of night shifts per month				17.797	0.001
0	42 (27.1)	233 (31.2)	164 (40.3)		
1–4	22 (14.2)	143 (19.1)	73 (17.9)		
≥5	91 (58.7)	371 (49.7)	170 (41.8)		

* 1 USD equals 7.31 Chinese Yuan, exchange rate on September 29, 2023

A multivariate logistic regression model was constructed using the variables with statistically significant differences as determined by ANOVA and chi-square tests. Of the three profiles, the class 3 was chosen as a reference to find the predictors linked with NPPBQ. As shown in Table 3, nurses who were single/divorced/widowed were

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

more likely to belonged to low perceived professional benefits (*OR*: 1.984, 95%*CI*:1.028-3.828). The number of night shifts worked per month was associated with low perceived professional benefits (*OR*: 0.633, 95% *CI*: 0.405-0.988), compared to those with more than five night shifts, those without night shifts tended to fall into the high perceived professional benefits. Nurses without a leadership role were more likely to be in the moderate perceived professional benefits *(OR*: 1.489, 95% *CI*: 1.028-2.157). Other variables were not statistically significant in the multivariate logistic regression.

Table 3 Predictors of latent profile membership

Variables	Class 1 VS Class 3			Class 2 VS Class 3		
	β	***OR***	**95%*CI***	***β***	***OR***	**95%*CI***
Age (SD)	0.004	1.004	0.941-1.070	-0.005	0.995	0.957-1.034
Marital status						
Single/divorced/widowed	0.685	1.984*	1.028-3.828	0.115	1.122	0.716-1.760
Married (Ref)						
Children						
No	0.177	1.194	0.622-2.293	0.240	1.272	0.822-1.967
Yes (Ref)						
Professional title						
Junior level	0.368	1.444	0.334-6.241	0.359	1.433	0.661-3.105
Intermediate level	0.378	1.460	0.370-5.766	0.429	1.535	0.764-3.085
Senior level (Ref)						
Leadership role						
No	0.139	1.984	1.028-3.828	0.398	1.489*	1.028-2.157
Yes (Ref)						
Working years (years)						

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

≤5	0.781	2.184	0.666-7.161	0.411	1.508	0.748-3.042
6–15	0.721	2.057	0.847-5.000	0.228	1.256	0.773-2.039
≥16 (Ref)						
Number of night shifts per month						
0	-0.458	0.633*	0.405-0.988	-0.223	0.800	0.601-1.064
1–4	-0.354	0.702	0.400-1.231	0.089	1.094	0.768-1.558
≥5 (Ref)						

*$p < 0.05$; *OR*, Odds ratio; 95% *CI*, 95% Confidence Interval; Ref, Reference.

For peer review only

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

DISCUSSION

The purpose of this research was to identify distinct profiles of nurses' perceived professional benefits. Furthermore, the current study employed multinomial logistic regression to investigate predictors of these profiles.

In this study, we investigated 1309 nurses who validly completed the questionnaire. As a result, three latent profiles were identified: low perceived professional benefits, moderate perceived professional benefits, and high perceived professional benefits. Our research revealed that the majority of nurses had a moderate or higher levels of perceived professional benefits, with just 11.8% of nurses belonging to the category of nurses with low perceived professional benefits. Most studies reported nurses had an upper-moderate level of perceived professional benefits [28, 29], and our findings are consistent with those of previous studies. Most importantly, our study clarified the heterogeneous subgroups of nurses' perceived professional benefits and their specific distribution.

In the last three years, nurses have been a key part of the fight against the COVID-19 outbreak. Despite heavy job pressure, nurses have had a feeling of professional calling and value [30], which has effectively enhanced their sense of professional benefit [1]. At the same time, the critical role of nurses in defending people's lives and health has earned the society's respect and recognition, as well as a positive social image [31, 32], which can further enhance nurses' sense of professional benefit. Our survey was conducted during the COVID-19 epidemic, and nurses' perceptions of professional benefit may be elevated.

Another finding of our study revealed that the membership of profiles can be predicted by some characteristics such as the number of night shifts, leadership role, and marriage status. Nursing is a continuous, 24-hour profession, and nurse's work normally takes the form of night shifts. It is widely proven that night shifts negatively impact the physical and emotional health of nurses [33-36]. Nurses working rotating night shifts were normally younger, and they had the lower scores of job satisfaction, quality of sleep, and quantity of sleep [37], these factors resulted in a low perceived

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

professional benefits. Consistent with past research, our findings indicate that the greater the frequency of night shifts, the lower the perceived professional benefit [29].

According to our results, 57.1% of nurses perceived professional benefits as moderate. The majority of nurses in the moderate perceived professional benefits group lacked a work title, while the majority of nurses in the highly perceived professional benefits group held a leadership role. This has been validated by other research, and our work provides more support for this notion [29]. Holding a managerial position at a hospital is a means of advancing one's career, and nurses highly value this opportunity.

Our study found that nurses who were single/divorced/widowed were more likely to belonged to low perceived professional benefits, which is consistent with earlier findings [29]. This may be because, unlike single/divorced/widowed nurses, married nurses receive more social support from their spouses and other family members.

We hypothesized that job fulfillment and social support are important influencing mechanisms that affect nurses' perceived professional benefits. The number of night shifts, leadership roles are important indicators of nurses' job fulfillment. Marital status is an important factor in social support. Each of these factors can have varying degrees of impact on the actual benefit or spiritual benefit [4]. Considering that nurses perceive professional benefits as a result of personal, organizational, environmental, and social factors, a well-developed theoretical framework is required to explain this phenomenon.

Unfortunately, our research failed to demonstrate that the profiles can be predicted by other factors in the model variables. Our findings in the univariate analysis results were consistent with earlier research. Nevertheless, because the bulk of prior research did not employ multi-factor models, it was impossible to compare our findings could not be compared to those of others. In addition, certain putative contributing elements were not adequately proven, and further research is required to confirm them in the future.

Our research has theoretical and practical implications for the future study of nurses' perceived professional benefits. First, the number of night shifts, leadership

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

role, and marriage status are the most significant factors affecting nurses' perceived professional benefits, and in the future, we should focus on the degree of influence of these three factors and explore the mechanisms from the theoretical level. Second, managers should pay active attention to the perceived professional benefits of clinical nurses, create a favorable working environment and professional growth atmosphere, and promote the professional success of nurses. Given that 11.8% of nurses still have a low perceived sense of career benefit, more tailored intervention programs are still needed in the future.

Strengths and limitations

To the best of our knowledge, this is the first study to use the LPA approach to explore heterogeneous subgroups of nurses' perceived professional benefit with a large sample size, and we presented a unique perspective and a basis for future research on the perceived career benefits of nurses. The research was limited in some ways. First, this was a web-based survey, and the sample process and self-reporting strategy may have resulted in some bias. Second, we only polled nurses in mainland China, and our sample only reflected the current situation in a single nation. Lastly, the constraints of the study's design prohibited an in-depth assessment of the psychological factors behind nurses' perceptions of their professional benefit. As a result, more rigorously designed studies will be required in the future to investigate this issue in depth.

CONCLUSION

Our study identified three professional benefits profiles among nurses. The results of our study indicated that nurses enjoy a high level of professional benefits. Notwithstanding the study's limitations of the study and the present condition of nursing, it is vital that we engage on several levels to encourage a stable nursing workforce, including policy, organisation, financial income, and career development, so that nurses experience a sense of professional gain.

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

Acknowledgements

None.

AUTHOR CONTRIBUTIONS

Jiang Hu and Sun Changli were responsible for the conception and study design. Yao Qiangfang, Wang Xianwei and Liu Hanmei performed the data collection. Yao Qiangfang, Wang Xianwei and Wen Xueke contributed to the analysis of the data. Sun Changli and Jiang Hu were involved in drafting the manuscript and revising it. All authors have read and approved the final manuscript.

FUNDING

This study was funded by the Science and Technology Joint Funds of Zunyi Science and Technology Bureau (2023-73).

CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

Ethics approval

This study involves human participants and was approved by the Ethics Committee of the First People's Hospital of Zunyi (2022-016). Participants gave informed consent to participate in the study before taking part.

Data availability statement

Data are available upon reasonable request. Data are available from the corresponding author and the first author on reasonable request.

For peer review only

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

REFFERENCES

1. Wang X, Chen F, Dai P, Lin X, Qi L: **Perceived professional benefits and associated factors among nurses during the COVID-19 pandemic: A cross-sectional study**. *Nurs Open* 2023, **10**(3):1461-1470.
2. Jiang H, Huang N, Tian W, Shi S, Yang G, Pu H: **Factors Associated With Post-traumatic Stress Disorder Among Nurses During COVID-19**. *Front Psychol* 2022, **13**:745158.
3. Liu S, Duan X, Han P, Shao H, Jiang J, Zeng L: **Occupational benefit perception of acute and critical care nurses: A qualitative meta-synthesis**. *Front Public Health* 2022, **10**:976146.
4. Zhou H, Zhu Y, Zhang X, Peng J, Li Q, Wang X, Wang L, Cai X, Lan L: **Psychological Capital and Perceived Professional Benefits: Testing the Mediating Role of Perceived Nursing Work Environment Among Chinese Nurses**. *J Psychosoc Nurs Ment Health Serv* 2018, **56**(4):38-47.
5. Hu J, Liu X: **The preparation of nurses' occupational benefit questionnaire and its reliability and validity test [J]**. *J Chin People's Liberation Army* 2013, **30**(22):1-5.
6. Malone B: **A Perspective on the State of the World's Nursing Report**. *Nurs Adm Q* 2021, **45**(1):6-12.
7. Ivziku D, de Maria M, Ferramosca FMP, Greco A, Tartaglini D, Gualandi R: **What determines physical, mental and emotional workloads on nurses? A cross-sectional study**. *J Nurs Manag* 2022, **30**(8):4387-4397.
8. Morgan B, Jordan L, Rivera LA: **Considerations for an aging nurse anesthetists**

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

workforce. *Geriatr Nurs* 2020, **41**(6):1017-1019.

9. Tamata AT, Mohammadnezhad M: **A systematic review study on the factors affecting shortage of nursing workforce in the hospitals**. *Nurs Open* 2023, **10**(3):1247-1257.

10. van der Cingel M, Brouwer J: **What makes a nurse today? A debate on the nursing professional identity and its need for change**. *Nurs Philos* 2021, **22**(2):e12343.

11. Udod S: **A Call for Urgent Action: Innovations for Nurse Retention in Addressing the Nursing Shortage**. *Nurs Rep* 2023, **13**(1):145-147.

12. **China Statistical Yearbook** [http://www.stats.gov.cn/sj/ndsj/2022/indexch.htm]

13. Zeng LN, Zhang JW, Zong QQ, Chan SW, Browne G, Ungvari GS, Chen LG, Xiang YT: **Prevalence of burnout in mental health nurses in China: A meta-analysis of observational studies**. *Arch Psychiatr Nurs* 2020, **34**(3):141-148.

14. Chen JP, Dai YM, Qin Y, Liang SP, Cheng G, Liu Y, Yang CZ, He HG, Shen Q: **Factors influencing turnover intention among male nurses in China: A large-scale descriptive correlational study**. *Int Nurs Rev* 2023.

15. Yu JF, Ding YM, Jia RY, Liang DD, Wu Z, Lu GL, Chen CR: **Professional identity and emotional labour affect the relationship between perceived organisational justice and job performance among Chinese hospital nurses**. *J Nurs Manag* 2022, **30**(5):1252-1262.

16. Lin L, Liu X, He G: **Mindfulness and Job Satisfaction Among Hospital Nurses: The Mediating Roles of Positive Affect and Resilience**. *J Psychosoc Nurs Ment Health Serv* 2020, **58**(6):46-55.

17. Macey A, Green C, Jarden RJ: **ICU nurse preceptors' perceptions of benefits, rewards,**

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

supports and commitment to the preceptor role: A mixed-methods study. *Nurse Educ Pract* 2021, **51**:102995.

18. Natan MB, Qeadan H, Egbaria W: **The commitment of Israeli nursing preceptors to the role of preceptor**. *Nurse Educ Today* 2014, **34**(12):1425-1429.

19. Zheng RS, Guo QH, Dong FQ, Owens RG: **Chinese oncology nurses' experience on caring for dying patients who are on their final days: a qualitative study**. *Int J Nurs Stud* 2015, **52**(1):288-296.

20. Christiansen A, Vernon V, Jinks A: **Perceptions of the benefits and challenges of the role of advanced practice nurses in nurse-led out-of-hours care in Hong Kong: a questionnaire study**. *J Clin Nurs* 2013, **22**(7-8):1173-1181.

21. Wu B, Zhao Y, Xu D, Wang Y, Niu N, Zhang M, Zhi X, Zhu P, Meng A: **Factors associated with nurses' willingness to participate in care of patients with COVID-19: A survey in China**. *J Nurs Manag* 2020, **28**(7):1704-1712.

22. Liu X, Ju X, Liu X: **The relationship between resilience and intent to stay among Chinese nurses to support Wuhan in managing COVID-19: The serial mediation effect of post-traumatic growth and perceived professional benefits**. *Nurs Open* 2021, **8**(5):2866-2876.

23. Dibert C, Goldenberg D: **Preceptors' perceptions of benefits, rewards, supports and commitment to the preceptor role**. *J Adv Nurs* 1995, **21**(6):1144-1151.

24. Hu Y, Hu J, Li L, Zhao B, Liu X, Li F: **Development and preliminary validation of a brief nurses' perceived professional benefit questionnaire (NPPBQ)**. *BMC Med Res Methodol* 2020, **20**(1):18.

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

25. von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP: **The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement: guidelines for reporting observational studies**. *Int J Surg* 2014, **12**(12):1495-1499.

26. Nylund KL, Asparouhov T, Muthén BO: **Deciding on the number of classes in latent class analysis and growth mixture modeling: A Monte Carlo simulation study**. *Structural equation modeling: A multidisciplinary Journal* 2007, **14**(4):535-569.

27. Spurk D, Hirschi A, Wang M, Valero D, Kauffeld S: **Latent profile analysis: A review and "how to" guide of its application within vocational behavior research**. *Journal of vocational behavior* 2020, **120**:103445.

28. Ma HW, Dan X, Xu SH, Hou RN, Zhao NM: **[Current status of nurses' perceived professional benefits and influencing factors in 3A-level hospitals in Tianjin]**. *Zhonghua Lao Dong Wei Sheng Zhi Ye Bing Za Zhi* 2017, **35**(6):443-447.

29. Zhan T, Li H, Ding X: **Can social support enhance sense of coherence and perceived professional benefits among Chinese registered nurses? A mediation model**. *J Nurs Manag* 2020, **28**(3):488-494.

30. Savitsky B, Radomislensky I, Hendel T: **Nurses' occupational satisfaction during Covid-19 pandemic**. *Appl Nurs Res* 2021, **59**:151416.

31. Mohammed S, Peter E, Killackey T, Maciver J: **The "nurse as hero" discourse in the COVID-19 pandemic: A poststructural discourse analysis**. *Int J Nurs Stud* 2021, **117**:103887.

32. Begnini D, Cicolella DA, Freitas KR, Maranhão T, Rocha CMF, Kruse MHL: **Heroines**

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

in Covid-19 times: visibility of nursing in the pandemic. *Rev Gaucha Enferm* 2021, **42**(spe):e20200373.

33. James L, Elkins-Brown N, Wilson M, James SM, Dotson E, Edwards CD, Wintersteen-Arleth L, Stevens K, Butterfield P: **The effects of three consecutive 12-hour shifts on cognition, sleepiness, and domains of nursing performance in day and night shift nurses: A quasi-experimental study**. *Int J Nurs Stud* 2021, **123**:104041.

34. Weaver SH, de Cordova PB, Vitale TR, Hargwood P, Salmond S: **Experiences and perceptions of nurses working night shift: a qualitative systematic review**. *JBI Evid Synth* 2023, **21**(1):33-97.

35. Borroni E, Frigerio G, Polledri E, Mercadante R, Maggioni C, Fedrizzi L, Pesatori AC, Fustinoni S, Carugno M: **Metabolomic profiles in night shift workers: A cross-sectional study on hospital female nurses**. *Front Public Health* 2023, **11**:1082074.

36. Jørgensen JT, Rozing MP, Westendorp RGJ, Hansen J, Stayner LT, Simonsen MK, Andersen ZJ: **Shift work and incidence of psychiatric disorders: The Danish Nurse Cohort study**. *J Psychiatr Res* 2021, **139**:132-138.

37. Ferri P, Guadi M, Marcheselli L, Balduzzi S, Magnani D, Di Lorenzo R: **The impact of shift work on the psychological and physical health of nurses in a general hospital: a comparison between rotating night shifts and day shifts**. *Risk Manag Healthc Policy* 2016, **9**:203-211.

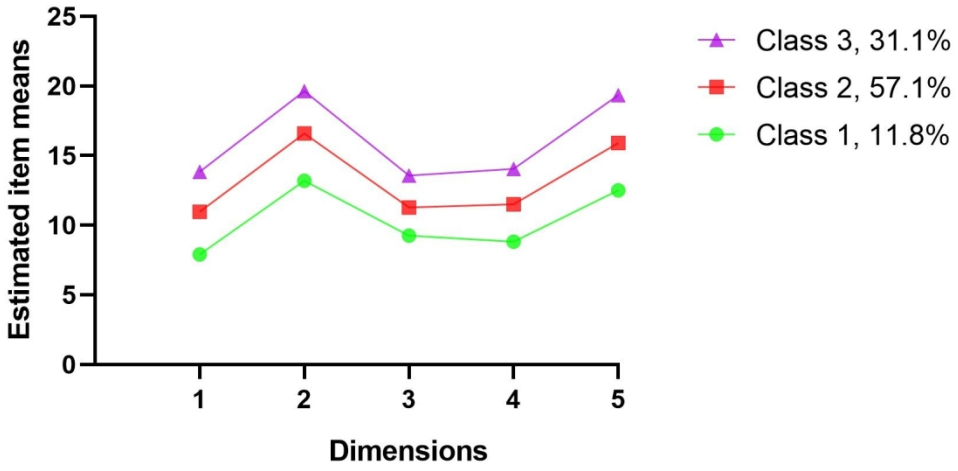
For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

Figure 1 Latent profiles of NPPBQ

Figure 2 The scale and dimension scores of different profiles

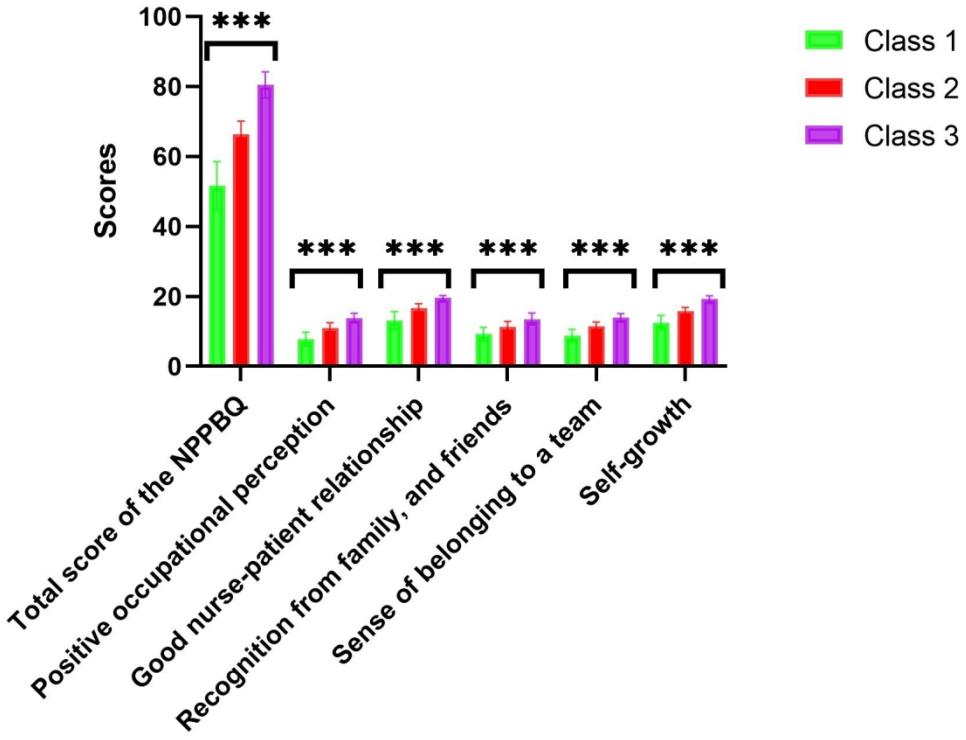
For peer review only

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml



Latent profiles of NPPBQ

145x76mm (300 x 300 DPI)



The scale and dimension scores of different profiles

145x114mm (300 x 300 DPI)

STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) 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 was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3-4
Objectives	3	State specific objectives, including any prespecified hypotheses	4-5
Methods			
Study design	4	Present key elements of study design early in the paper	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	5
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5-6
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	5-6
Bias	9	Describe any efforts to address potential sources of bias	6
Study size	10	Explain how the study size was arrived at	5
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	5-6
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	6
		(*b*) Describe any methods used to examine subgroups and interactions	NA
		(*c*) Explain how missing data were addressed	NA
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	NA
		(*e*) 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	7
		(b) Give reasons for non-participation at each stage	7
		(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	7
		(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	8
Main results	16	(*a*) 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

For peer review only

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

		(*b*) Report category boundaries when continuous variables were categorized	8
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	NA
Discussion			
Key results	18	Summarise key results with reference to study objectives	9-11
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	11
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	11
Generalisability	21	Discuss the generalisability (external validity) of the study results	11
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	12

*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.

For peer review only

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

BMJ Open

Latent profile analysis of nurses' perceived professional benefits in China: a cross-sectional study

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2023-078051.R4
Article Type:	Original research
Date Submitted by the Author:	17-Oct-2023
Complete List of Authors:	Sun, Changli; Third Affiliated Hospital of Zunyi Medical University Jiang, Hu; Third Affiliated Hospital of Zunyi Medical University Yao, Qingfang; The Third Affiliated Hospital of Zunyi Medical University Wang, Xianwei; The Third Affiliated Hospital of Zunyi Medical University Wen, Xueke; Third Affiliated Hospital of Zunyi Medical University Liu, Hanmei; Zunyi Medical University
Primary Subject Heading:	Occupational and environmental medicine
Secondary Subject Heading:	Nursing, Occupational and environmental medicine
Keywords:	Burnout, Professional, Burnout, China

SCHOLARONE™
Manuscripts

I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our licence.

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which Creative Commons licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

For peer review only

Latent profile analysis of nurses' perceived professional benefits in China: a cross-sectional study

Running Head: LPA of nurses' perceived professional benefits

Changli Sun[1], Hu Jiang[1]*, Qingfang Yao[2], Xianwei Wang[2], Xueke Wen[1] and Hanmei Liu[2],

[1] The Third Affiliated Hospital of Zunyi Medical University (The First People's Hospital of Zunyi), Zunyi, Guizhou, China

[2] Zunyi Medical University, Zunyi, Guizhou, China

*Correspondence: jianghuchn@163.com, Nursing Department, The Third Affiliated Hospital of Zunyi Medical University (The First People's Hospital of Zunyi), Zunyi, Guizhou, China

For peer review only

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

Latent profile analysis of nurses' perceived professional benefits in China: a cross-sectional study

ABSTRACT

Objective: To identify profiles of nurses' perceived professional benefits as well as their predictors.

Design: Cross-sectional study.

Setting: The study was carried out online in China.

Methods: From July 6 and July 27, 2022, a total of 1,309 registered nurses participated in the survey by convenient sampling. We collected the Nurses' Perceived Professional Benefits Questionnaire (NPPBQ) and demographic data. Using latent profile analysis (LPA), subgroups of nurses' perceived professional benefits were identified. Moreover, univariate and multinomial logistic regression analysis were conducted to find the factors that were linked with the profiles.

Results: The survey was validly completed by 1309 nurses, with a 92.9% effective return rate. The findings of the LPA demonstrated three unique profiles: low perceived professional benefits (11.8%), moderate perceived professional benefits (57.1%), and high perceived professional benefits (31.1%). There was a correlation between marital status, the number of night shifts per month, and leadership role.

Conclusions: According to our research, registered nurses have three unique professional benefit profiles. In order to sustain the nursing workforce, despite the fact that nurses get a high level of professional benefits, interventions are necessary to increase nurses' perception of their professional value.

Keywords: nurse, perceived professional benefits, latent profile analysis, cross-sectional study

Strengths and limitations of this study:

- This is a national survey data regarding perceived professional benefit among

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

Chinese nurses.

- The LPA approach was utilized in this study to investigate heterogeneous subgroups of nurses' perceived professional benefit.
- This study was limited by the web-based cross-sectional design and convenient sampling method.
- The cross-sectional design of the study makes it impossible to identify causal relationships between latent profiles and influencing factors.

For peer review only

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

INTRODUCTION

Despite the fact that nursing is a high-risk, high-stress profession, nurses are able to achieve benefit findings [1-3]. In recent years, the concept of nurses' perceived professional benefits arises naturally, and has gradually attracted the attention of researchers. Nurses' perceived professional benefits (NPPB) refer to nurses' perceptions of the gains and benefits they receive in their profession during the hiring process, as well as their belief that working in nursing can promote their overall growth and development [4, 5]. Essentially, perceived professional benefits can be classified as an emotional experience and cognitive evaluation, which has two aspects: actual benefits and spiritual benefits [4]. However, there is a lack of in-depth research on the group heterogeneity of perceived professional benefits among nurse populations.

Background

It is estimated that 69% of the global health workforce consists of nurses [6]. Yet, the present physical and mental health of nurses is not encouraging, as they confront high levels of stress, burnout, turnover, and their own ageing [7-9]. Nursing is no longer a desirable and appealing profession [10], which makes nurse shortages a widespread worldwide concern [11]. These issues have a direct bearing on the sustainability and continued growth of the nursing workforce. In recent years, nursing in China has experienced remarkable growth, and the most recent statistics indicate that China has more than 5 million registered nurses [12]. Chinese nurses are extremely susceptible to burnout, and a high desire to leave is a serious concern [13, 14]. However, there is a dearth of comprehensive study and viable remedies.

The mental health of nurses is receiving increasing attention from managers and researchers in the context of positive psychology. It is beginning to be recognized that nurses' own positive psychology promotes job satisfaction and professional identity, lessens burnout, and hence reduces turnover rates [15, 16].

The profession of nursing can be beneficial to nurses in a number of ways. Previous studies [17, 18] reported that nursing preceptorship offers many benefits,

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

and nurses may find themselves being more committed to the position as a result. A qualitative study [19] found that nurses who were involved in caring for dying patients got a great lot of experience and benefited considerably; they can create a personal philosophy on death and life, in addition to professional growth. Nurses who served as advanced practice nurse roles perceived numerous benefits, including improved patient care quality and safety, professionalism, personal development, career development, intrinsic satisfaction with the role, and impact on other professional groups [20]. A person's perception of professional benefit is an endogenous motivation for his or her development and has a positive effect on that person's career. According to prior studies, improving the perceived professional benefit of nurses reduces burnout reduction and enables nurses to approach their work with a good attitude and obtain more favorable comments [21, 22].

Measures created by researchers to evaluate the perceived professional benefits of nurses were still in little supply. The Preceptor's Perspective of Benefits and Rewards (PPBR) measure was designed by Dibert, et al. [23] to evaluate the perceived benefits of clinical preceptor nurses, however, it is not relevant to general clinical nurses. A questionnaire entitled Nurses' Perceived Professional Benefits Questionnaire (NPPBQ) was developed to assess how Chinese nurses perceive the gains and benefits of their employment [5, 24]. This questionnaire has been utilized in a lot of research to date. While we now have a better grasp of nurses' perceptions of professional benefits, but the heterogeneity of the population is still lack, screening strategies for future precision interventions cannot be developed for identifying low-benefit populations.

To our knowledge, it has not been shown that sufficient evidence exists to answer the questions of whether nurses' perceived professional benefits differ in groups and what factors contribute to these differences. The current study was created to bridge that gap. This study's objective was to examine the characteristics and determinants of nurses' perceived professional benefits as well as the predictors of these latent profiles.

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

MATERIALS AND METHODS

Study design

An online survey with convenient sampling was used in this study to conduct a cross-sectional analysis. This study was designed and reported in accordance with the guidelines for Strengthening the Reporting of Observational Studies in Epidemiology (STROBE)[25].

Sample size estimation

An examination of the latent profiles of perceived professional benefits among nurses was conducted in this study. LPA needs a sample size larger than 500 [26, 27], therefore, the minimum sample size for this study was 500.

Participants

Participants in this study required to meet the inclusion criteria and be registered nurses. To be considered, candidates had to satisfy the following criteria to be considered: (1) having worked as a nurse in a medical facility, and (2) being willing to participate in this study. The following were the exclusion criteria: logical errors or missing information in questionnaire answers.

Measurements

Demographic

This study gathered and evaluated demographic data including age, gender, greatest degree of education, marital status, and other participant characteristics.

Nurses' Perceived Professional Benefits Questionnaire (NPPBQ)

The questionnaire was designed by Jing Hu, et al. [5] to investigate the gains and benefits that nurses perceived from their jobs. The authors then reduced it to 17 items by 2020 [24]. The questionnaire has five dimensions: personal growth, a good nurse-

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

patient relationship, recognition from family and friends, a positive occupational perception, and team belonging. Items are scored on a 5-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = not sure, 4 = agree, 5 = strongly agree). Cronbach's alphas for the questionnaires were 0.94, and the NPPBQ subquestionnaires' alphas were 0.84, 0.83, 0.74, 0.79, and 0.85.

Data collection

During the dates of July 6 and July 27, 2022, data was gathered. Wenjuanxing (www.wjx.cn) was used to develop a web-based questionnaire. Two researchers reviewed the online questionnaire for rigor and verified the feasibility of the questionnaire by completing it within the team. A poster was created to present the link and QR code. It was clearly shown on the poster who would be included and excluded from the survey. We distributed the questionnaire nationwide in China and did not limit the source and setting of nurses. The researcher contacted administrators or general nurses to disseminate the questionnaire. Wechat was used to send the poster and information letter. The survey can be completed by clicking on the link or scanning the QR code, completed questionnaires can be returned directly to the web.

Statistical analyses

The use of latent profile analysis (LPA) is frequently used to determine the number of subpopulations in a given sample. LPA is a statistical method that use potential category variables to explain the link between exogenous continuous-type indicators, permitting the assessment of the correlation between exogenous indicators and the maintenance of local independence among exogenous indicators [27]. Latent profile analysis was conducted using Mplus 7.4 software. Log likelihood (LL), Akaike information criterion (AIC), Akaike Information Criterion (BIC), Adjusted Bayesian Information Criteria (aBIC), Entropy, Lo-Mendell-Rubin (LMR), and the Bootstrapped Likelihood Ratio Test (BLRT) were used to assess model fit and determine the appropriate number of categories. In order to decide which model best

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

fit the data, the models from each category's fitting results were combined with the aforementioned indicators. The data was examined using the SPSS 26.0 statistical program. We utilized frequency and composition ratios for categorical data, whereas mean and standard deviation were utilized for continuous variables. The chi-square test was performed to compare category variables across groups. ANOVA was used to compare continuous variables among multiple groups. A multivariate logistic regression model was employed to analyze the variations in demographic variables. A statistically significant difference was indicated by $p < 0.05$.

Ethical considerations

The Ethics Committee of the First People's Hospital of Zunyi (2022-016) approved the study, and participants gave permission for data collection. Prior to completing the survey, participants will be provided with information about the purpose of the study and the major substance of the research. They will then be able to provide their informed consent through a yes or no response. In addition, participants were also informed that the study's findings would be given in aggregate form and that no participant could be identified. If a person declined to complete the questionnaire, the collection was immediately ended.

Patient and public involvement

Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

RESULTS

Participant characteristics

A total of 1409 nurses completed the questionnaire, while 58 nurses denied participation, for a total number of 1351 questionnaires received. 42 surveys were considered invalid due to insufficient or inaccurate information. 92.9 percent of the final 1309 surveys were correctly returned. The ages of the participants varied from 18

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

to 59 years old, with a mean age of 32.25 (SD: 6.18) years old. The bulk of participants were female (86.7%), whereas the minority were male (3.2%).

Characteristics of the different classes

On the basis of the NPPBQ's five dimensions, it was established that a model with three latent classes provided the greatest match. A class represents different categorisation methods, such as a class 1 for a single subgroup, a class 2 for two heterogeneous subgroups, and so forth. Table 1 provides the results. While the AIC and BIC in class 4 were lower in class 4 than in class 3, the entropy was greater; nonetheless, the lowest category probability in class 4 was 1.4%, which is unsatisfactory. As a consequence, we decided that the best-fitting model is class 3. Using a three-class model, Figure 1 illustrates the mean scores for each category within the NPPBQ's dimensions. The percentages increase from class 1 to class 3 as follows: 11.8% (155 nurses), 57.1% (747 nurses), and 31.1% (407 nurses). For the sake of brevity, based on the profile scores, we named class 1 as the low perceived professional benefits, class 2 as the moderate perceived professional benefits, and class 3 as the high perceived professional benefits.

Table 1 Potential profile analysis indicators (*N*=1309)

Model	LL[a]	AIC[b]	BIC[c]	aBIC[d]	Entropy	LMR[e] *p*-value	BLRT[f] *p*-value	Category probability
Class 1	-14709.353	29438.706	29490.476	29458.711	-	-	-	-
Class 2	-13420.425	26872.850	26955.682	26904.857	0.905	< 0.001	< 0.001	0.654/0.346
Class 3	-12583.629	25211.257	25325.152	25255.268	0.936	0.007	< 0.001	0.118/0.571/0.311
Class 4	-12307.807	24671.613	24816.570	24727.627	0.940	0.036	< 0.001	0.151/0.014/0.530/0.306

a Log likelihood, b Akaike information criterion, c Bayesian information criterion, d Adjusted bayesian information criterion, e Lo-Mendell-Rubin Likelihood Ratio Test, f Bootstrapped Likelihood Ratio Test

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

The scale and dimension scores of different profiles

The findings of a one-way ANOVA indicated statistically significant differences in the scale and dimension scores of different profiles (both $p<0.001$). The results were shown in Figure 2 demonstrates the outcomes.

Demographic and related characteristics of each profile

The ANOVA and chi-square tests indicated statistically significant differences between the three profiles differed statistically in terms of age, marital status, children, professional title, leadership role, working years, and number of night shifts per month. Table 2 is a summary of the results.

Table 2 Demographic and characteristics by latent profile (*N*=1309)

Variables	Class 1	Class 2	Class 3	χ^2/F	*p*
Age (SD)	30.94 (5.37)	31.76 (5.91)	33.64 (6.71)	16.545	< 0.001
Gender				0.600	0.741
Male	6 (3.9)	25 (3.3)	11 (2.7)		
Female	149 (96.1)	722 (96.7)	396 (97.3)		
Highest Degree				1.602	0.449
Junior college and below	29 (18.7)	111 (14.9)	60 (14.7)		
Bachelor's and above	126 (81.3)	636 (85.1)	347 (85.3)		
Marital status				25.768	< 0.001
Single/divorced/widowed	62 (40.0)	218 (29.2)	80 (19.7)		
Married	93 (60.0)	529 (70.8)	327 (80.3)		
Children				26.943	< 0.001
Yes	87 (56.1)	481 (64.4)	311 (76.4)		
No	68 (43.9)	266 (35.6)	96 (23.6)		
Professional title				23.589	< 0.001

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

Junior Level	102 (65.8)	448 (60.0)	207 (50.9)		
Intermediate level	50 (32.3)	280 (37.5)	172 (42.3)		
Senior level	3 (1.9)	19 (2.5)	28 (6.9)		
Leadership role				17.086	< 0.001
Yes	18 (11.6)	86 (11.5)	82 (20.1)		
No	137 (88.4)	661 (88.5)	325 (79.9)		
Working years (years)				32.903	< 0.001
≤5	52 (33.5)	217 (29.0)	79 (19.4)		
6–15	91 (58.7)	438 (58.6)	241 (59.2)		
≥16	12 (7.7)	92 (12.3)	87 (21.4)		
Average monthly income (yuan)*				7.990	0.239
≤3000	23 (14.8)	75 (10.0)	43 (10.6)		
3001~6000	93 (60.0)	415 (55.6)	217 (53.3)		
6001~9000	27 (17.4)	179 (24.0)	105 (25.8)		
≥9001	12 (7.7)	78 (10.4)	42 (10.3)		
Number of night shifts per month				17.797	0.001
0	42 (27.1)	233 (31.2)	164 (40.3)		
1–4	22 (14.2)	143 (19.1)	73 (17.9)		
≥5	91 (58.7)	371 (49.7)	170 (41.8)		

* 1 USD equals 7.31 Chinese Yuan, exchange rate on September 29, 2023

A multivariate logistic regression model was constructed using the variables with statistically significant differences as determined by ANOVA and chi-square tests. Of the three profiles, the class 3 was chosen as a reference to find the predictors linked with NPPBQ. As shown in Table 3, nurses who were single/divorced/widowed were

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

more likely to belonged to low perceived professional benefits (*OR*: 1.984, 95%*CI*:1.028-3.828). The number of night shifts worked per month was associated with low perceived professional benefits (*OR*: 0.633, 95% *CI*: 0.405-0.988), compared to those with more than five night shifts, those without night shifts tended to fall into the high perceived professional benefits. Nurses without a leadership role were more likely to be in the moderate perceived professional benefits *(OR*: 1.489, 95% *CI*: 1.028-2.157). Other variables were not statistically significant in the multivariate logistic regression.

Table 3 Predictors of latent profile membership

Variables	Class 1 VS Class 3			Class 2 VS Class 3		
	β	***OR***	**95%*CI***	***β***	***OR***	**95%*CI***
Age (SD)	0.004	1.004	0.941-1.070	-0.005	0.995	0.957-1.034
Marital status						
Single/divorced/widowed	0.685	1.984*	1.028-3.828	0.115	1.122	0.716-1.760
Married (Ref)						
Children						
No	0.177	1.194	0.622-2.293	0.240	1.272	0.822-1.967
Yes (Ref)						
Professional title						
Junior level	0.368	1.444	0.334-6.241	0.359	1.433	0.661-3.105
Intermediate level	0.378	1.460	0.370-5.766	0.429	1.535	0.764-3.085
Senior level (Ref)						
Leadership role						
No	0.139	1.984	1.028-3.828	0.398	1.489*	1.028-2.157
Yes (Ref)						
Working years (years)						

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

≤5	0.781	2.184	0.666-7.161	0.411	1.508	0.748-3.042
6–15	0.721	2.057	0.847-5.000	0.228	1.256	0.773-2.039
≥16 (Ref)						
Number of night shifts per month						
0	-0.458	0.633*	0.405-0.988	-0.223	0.800	0.601-1.064
1–4	-0.354	0.702	0.400-1.231	0.089	1.094	0.768-1.558
≥5 (Ref)						

*$p < 0.05$; *OR*, Odds ratio; 95% *CI*, 95% Confidence Interval; Ref, Reference.

For peer review only

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

DISCUSSION

The purpose of this research was to identify distinct profiles of nurses' perceived professional benefits. Furthermore, the current study employed multinomial logistic regression to investigate predictors of these profiles.

In this study, we investigated 1309 nurses who validly completed the questionnaire. As a result, three latent profiles were identified: low perceived professional benefits, moderate perceived professional benefits, and high perceived professional benefits. Our research revealed that the majority of nurses had a moderate or higher levels of perceived professional benefits, with just 11.8% of nurses belonging to the category of nurses with low perceived professional benefits. Most studies reported nurses had an upper-moderate level of perceived professional benefits [28, 29], and our findings are consistent with those of previous studies. Most importantly, our study clarified the heterogeneous subgroups of nurses' perceived professional benefits and their specific distribution.

In the last three years, nurses have been a key part of the fight against the COVID-19 outbreak. Despite heavy job pressure, nurses have had a feeling of professional calling and value [30], which has effectively enhanced their sense of professional benefit [1]. At the same time, the critical role of nurses in defending people's lives and health has earned the society's respect and recognition, as well as a positive social image [31, 32], which can further enhance nurses' sense of professional benefit. Our survey was conducted during the COVID-19 epidemic, and nurses' perceptions of professional benefit may be elevated.

Another finding of our study revealed that the membership of profiles can be predicted by some characteristics such as the number of night shifts, leadership role, and marriage status. Nursing is a continuous, 24-hour profession, and nurse's work normally takes the form of night shifts. It is widely proven that night shifts negatively impact the physical and emotional health of nurses [33-36]. Nurses working rotating night shifts were normally younger, and they had the lower scores of job satisfaction, quality of sleep, and quantity of sleep [37], these factors resulted in a low perceived

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

professional benefits. Consistent with past research, our findings indicate that the greater the frequency of night shifts, the lower the perceived professional benefit [29].

According to our results, 57.1% of nurses perceived professional benefits as moderate. The majority of nurses in the moderate perceived professional benefits group lacked a work title, while the majority of nurses in the highly perceived professional benefits group held a leadership role. This has been validated by other research, and our work provides more support for this notion [29]. Holding a managerial position at a hospital is a means of advancing one's career, and nurses highly value this opportunity.

Our study found that nurses who were single/divorced/widowed were more likely to belonged to low perceived professional benefits, which is consistent with earlier findings [29]. This may be because, unlike single/divorced/widowed nurses, married nurses receive more social support from their spouses and other family members.

We hypothesized that job fulfillment and social support are important influencing mechanisms that affect nurses' perceived professional benefits. The number of night shifts, leadership roles are important indicators of nurses' job fulfillment. Marital status is an important factor in social support. Each of these factors can have varying degrees of impact on the actual benefit or spiritual benefit [4]. Considering that nurses perceive professional benefits as a result of personal, organizational, environmental, and social factors, a well-developed theoretical framework is required to explain this phenomenon.

Unfortunately, our research failed to demonstrate that the profiles can be predicted by other factors in the model variables. Our findings in the univariate analysis results were consistent with earlier research. Nevertheless, because the bulk of prior research did not employ multi-factor models, it was impossible to compare our findings could not be compared to those of others. In addition, certain putative contributing elements were not adequately proven, and further research is required to confirm them in the future.

Our research has theoretical and practical implications for the future study of nurses' perceived professional benefits. First, the number of night shifts, leadership

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

role, and marriage status are the most significant factors affecting nurses' perceived professional benefits, and in the future, we should focus on the degree of influence of these three factors and explore the mechanisms from the theoretical level. Second, managers should pay active attention to the perceived professional benefits of clinical nurses, create a favorable working environment and professional growth atmosphere, and promote the professional success of nurses. Given that 11.8% of nurses still have a low perceived sense of career benefit, more tailored intervention programs are still needed in the future.

Strengths and limitations

To the best of our knowledge, this is the first study to use the LPA approach to explore heterogeneous subgroups of nurses' perceived professional benefit with a large sample size, and we presented a unique perspective and a basis for future research on the perceived career benefits of nurses. The research was limited in some ways. First, this was a web-based survey, and the sample process and self-reporting strategy may have resulted in some bias. Second, we only polled nurses in mainland China, and our sample only reflected the current situation in a single nation. Lastly, the constraints of the study's design prohibited an in-depth assessment of the psychological factors behind nurses' perceptions of their professional benefit. As a result, more rigorously designed studies will be required in the future to investigate this issue in depth.

CONCLUSION

Our study identified three professional benefits profiles among nurses. The results of our study indicated that nurses enjoy a high level of professional benefits. Notwithstanding the study's limitations of the study and the present condition of nursing, it is vital that we engage on several levels to encourage a stable nursing workforce, including policy, organisation, financial income, and career development, so that nurses experience a sense of professional gain.

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

Acknowledgements

None.

AUTHOR CONTRIBUTIONS

Jiang Hu and Sun Changli were responsible for the conception and study design. Yao Qiangfang, Wang Xianwei and Liu Hanmei performed the data collection. Yao Qiangfang, Wang Xianwei and Wen Xueke contributed to the analysis of the data. Sun Changli and Jiang Hu were involved in drafting the manuscript and revising it. All authors have read and approved the final manuscript.

FUNDING

This study was funded by the Science and Technology Joint Funds of Zunyi Science and Technology Bureau (2023-73).

CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

Ethics approval

This study involves human participants and was approved by the Ethics Committee of the First People's Hospital of Zunyi (2022-016). Participants gave informed consent to participate in the study before taking part.

Data availability statement

Data are available upon reasonable request. Data are available from the corresponding author and the first author on reasonable request.

For peer review only

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

REFFERENCES

1. Wang X, Chen F, Dai P, Lin X, Qi L: **Perceived professional benefits and associated factors among nurses during the COVID-19 pandemic: A cross-sectional study**. *Nurs Open* 2023, **10**(3):1461-1470.
2. Jiang H, Huang N, Tian W, Shi S, Yang G, Pu H: **Factors Associated With Post-traumatic Stress Disorder Among Nurses During COVID-19**. *Front Psychol* 2022, **13**:745158.
3. Liu S, Duan X, Han P, Shao H, Jiang J, Zeng L: **Occupational benefit perception of acute and critical care nurses: A qualitative meta-synthesis**. *Front Public Health* 2022, **10**:976146.
4. Zhou H, Zhu Y, Zhang X, Peng J, Li Q, Wang X, Wang L, Cai X, Lan L: **Psychological Capital and Perceived Professional Benefits: Testing the Mediating Role of Perceived Nursing Work Environment Among Chinese Nurses**. *J Psychosoc Nurs Ment Health Serv* 2018, **56**(4):38-47.
5. Hu J, Liu X: **The preparation of nurses' occupational benefit questionnaire and its reliability and validity test [J]**. *J Chin People's Liberation Army* 2013, **30**(22):1-5.
6. Malone B: **A Perspective on the State of the World's Nursing Report**. *Nurs Adm Q* 2021, **45**(1):6-12.
7. Ivziku D, de Maria M, Ferramosca FMP, Greco A, Tartaglini D, Gualandi R: **What determines physical, mental and emotional workloads on nurses? A cross-sectional study**. *J Nurs Manag* 2022, **30**(8):4387-4397.
8. Morgan B, Jordan L, Rivera LA: **Considerations for an aging nurse anesthetists**

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

workforce. *Geriatr Nurs* 2020, **41**(6):1017-1019.

9. Tamata AT, Mohammadnezhad M: **A systematic review study on the factors affecting shortage of nursing workforce in the hospitals**. *Nurs Open* 2023, **10**(3):1247-1257.

10. van der Cingel M, Brouwer J: **What makes a nurse today? A debate on the nursing professional identity and its need for change**. *Nurs Philos* 2021, **22**(2):e12343.

11. Udod S: **A Call for Urgent Action: Innovations for Nurse Retention in Addressing the Nursing Shortage**. *Nurs Rep* 2023, **13**(1):145-147.

12. **China Statistical Yearbook** [http://www.stats.gov.cn/sj/ndsj/2022/indexch.htm]

13. Zeng LN, Zhang JW, Zong QQ, Chan SW, Browne G, Ungvari GS, Chen LG, Xiang YT: **Prevalence of burnout in mental health nurses in China: A meta-analysis of observational studies**. *Arch Psychiatr Nurs* 2020, **34**(3):141-148.

14. Chen JP, Dai YM, Qin Y, Liang SP, Cheng G, Liu Y, Yang CZ, He HG, Shen Q: **Factors influencing turnover intention among male nurses in China: A large-scale descriptive correlational study**. *Int Nurs Rev* 2023.

15. Yu JF, Ding YM, Jia RY, Liang DD, Wu Z, Lu GL, Chen CR: **Professional identity and emotional labour affect the relationship between perceived organisational justice and job performance among Chinese hospital nurses**. *J Nurs Manag* 2022, **30**(5):1252-1262.

16. Lin L, Liu X, He G: **Mindfulness and Job Satisfaction Among Hospital Nurses: The Mediating Roles of Positive Affect and Resilience**. *J Psychosoc Nurs Ment Health Serv* 2020, **58**(6):46-55.

17. Macey A, Green C, Jarden RJ: **ICU nurse preceptors' perceptions of benefits, rewards,**

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

supports and commitment to the preceptor role: A mixed-methods study. *Nurse Educ Pract* 2021, **51**:102995.

18. Natan MB, Qeadan H, Egbaria W: **The commitment of Israeli nursing preceptors to the role of preceptor**. *Nurse Educ Today* 2014, **34**(12):1425-1429.

19. Zheng RS, Guo QH, Dong FQ, Owens RG: **Chinese oncology nurses' experience on caring for dying patients who are on their final days: a qualitative study**. *Int J Nurs Stud* 2015, **52**(1):288-296.

20. Christiansen A, Vernon V, Jinks A: **Perceptions of the benefits and challenges of the role of advanced practice nurses in nurse-led out-of-hours care in Hong Kong: a questionnaire study**. *J Clin Nurs* 2013, **22**(7-8):1173-1181.

21. Wu B, Zhao Y, Xu D, Wang Y, Niu N, Zhang M, Zhi X, Zhu P, Meng A: **Factors associated with nurses' willingness to participate in care of patients with COVID-19: A survey in China**. *J Nurs Manag* 2020, **28**(7):1704-1712.

22. Liu X, Ju X, Liu X: **The relationship between resilience and intent to stay among Chinese nurses to support Wuhan in managing COVID-19: The serial mediation effect of post-traumatic growth and perceived professional benefits**. *Nurs Open* 2021, **8**(5):2866-2876.

23. Dibert C, Goldenberg D: **Preceptors' perceptions of benefits, rewards, supports and commitment to the preceptor role**. *J Adv Nurs* 1995, **21**(6):1144-1151.

24. Hu Y, Hu J, Li L, Zhao B, Liu X, Li F: **Development and preliminary validation of a brief nurses' perceived professional benefit questionnaire (NPPBQ)**. *BMC Med Res Methodol* 2020, **20**(1):18.

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

25. von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP: **The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement: guidelines for reporting observational studies**. *Int J Surg* 2014, **12**(12):1495-1499.

26. Nylund KL, Asparouhov T, Muthén BO: **Deciding on the number of classes in latent class analysis and growth mixture modeling: A Monte Carlo simulation study**. *Structural equation modeling: A multidisciplinary Journal* 2007, **14**(4):535-569.

27. Spurk D, Hirschi A, Wang M, Valero D, Kauffeld S: **Latent profile analysis: A review and "how to" guide of its application within vocational behavior research**. *Journal of vocational behavior* 2020, **120**:103445.

28. Ma HW, Dan X, Xu SH, Hou RN, Zhao NM: **[Current status of nurses' perceived professional benefits and influencing factors in 3A-level hospitals in Tianjin]**. *Zhonghua Lao Dong Wei Sheng Zhi Ye Bing Za Zhi* 2017, **35**(6):443-447.

29. Zhan T, Li H, Ding X: **Can social support enhance sense of coherence and perceived professional benefits among Chinese registered nurses? A mediation model**. *J Nurs Manag* 2020, **28**(3):488-494.

30. Savitsky B, Radomislensky I, Hendel T: **Nurses' occupational satisfaction during Covid-19 pandemic**. *Appl Nurs Res* 2021, **59**:151416.

31. Mohammed S, Peter E, Killackey T, Maciver J: **The "nurse as hero" discourse in the COVID-19 pandemic: A poststructural discourse analysis**. *Int J Nurs Stud* 2021, **117**:103887.

32. Begnini D, Cicolella DA, Freitas KR, Maranhão T, Rocha CMF, Kruse MHL: **Heroines**

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

in Covid-19 times: visibility of nursing in the pandemic. *Rev Gaucha Enferm* 2021, **42**(spe):e20200373.

33. James L, Elkins-Brown N, Wilson M, James SM, Dotson E, Edwards CD, Wintersteen-Arleth L, Stevens K, Butterfield P: **The effects of three consecutive 12-hour shifts on cognition, sleepiness, and domains of nursing performance in day and night shift nurses: A quasi-experimental study**. *Int J Nurs Stud* 2021, **123**:104041.

34. Weaver SH, de Cordova PB, Vitale TR, Hargwood P, Salmond S: **Experiences and perceptions of nurses working night shift: a qualitative systematic review**. *JBI Evid Synth* 2023, **21**(1):33-97.

35. Borroni E, Frigerio G, Polledri E, Mercadante R, Maggioni C, Fedrizzi L, Pesatori AC, Fustinoni S, Carugno M: **Metabolomic profiles in night shift workers: A cross-sectional study on hospital female nurses**. *Front Public Health* 2023, **11**:1082074.

36. Jørgensen JT, Rozing MP, Westendorp RGJ, Hansen J, Stayner LT, Simonsen MK, Andersen ZJ: **Shift work and incidence of psychiatric disorders: The Danish Nurse Cohort study**. *J Psychiatr Res* 2021, **139**:132-138.

37. Ferri P, Guadi M, Marcheselli L, Balduzzi S, Magnani D, Di Lorenzo R: **The impact of shift work on the psychological and physical health of nurses in a general hospital: a comparison between rotating night shifts and day shifts**. *Risk Manag Healthc Policy* 2016, **9**:203-211.

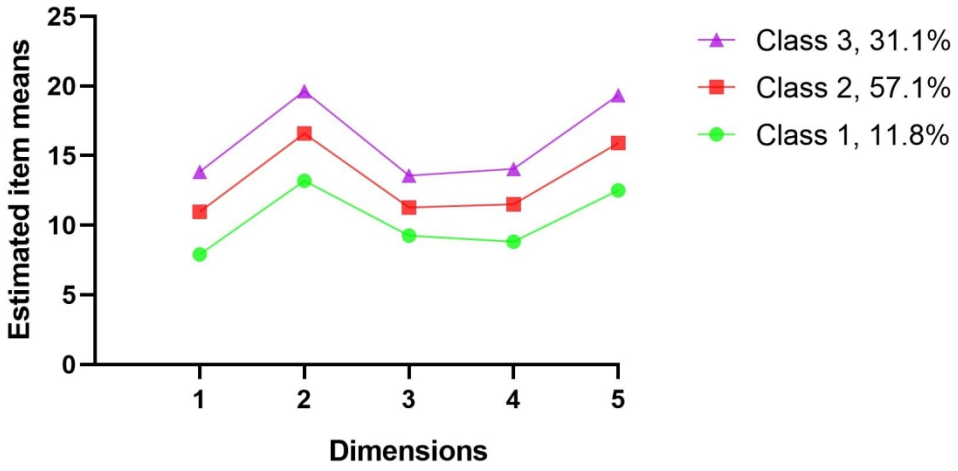
For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

Figure 1 Latent profiles of NPPBQ

Figure 2 The scale and dimension scores of different profiles

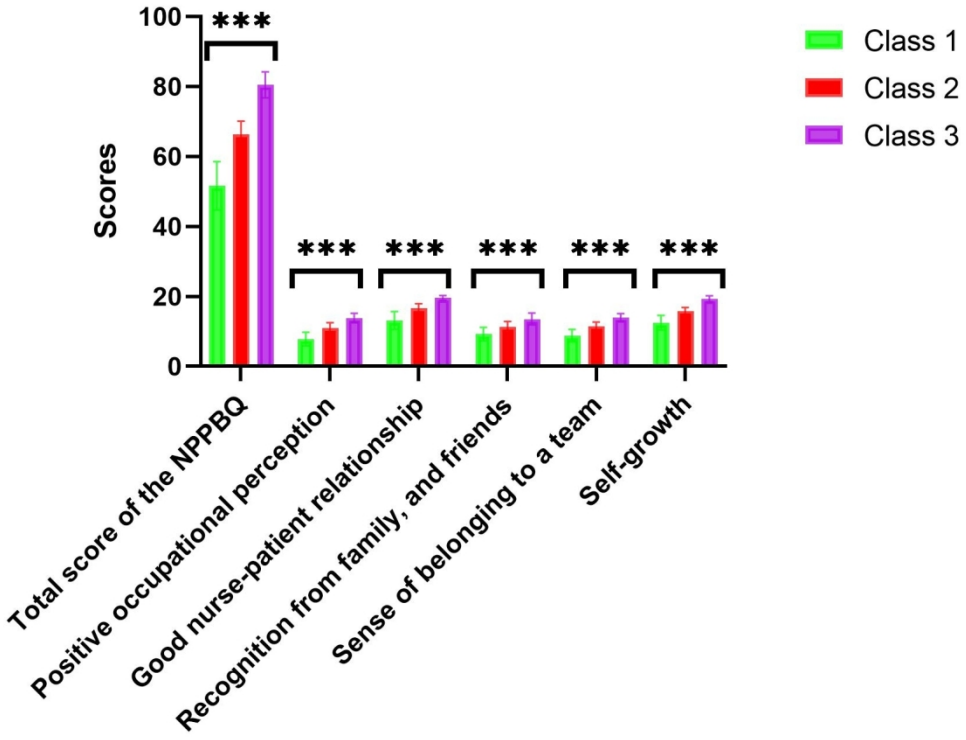
For peer review only

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml



Latent profiles of NPPBQ

145x76mm (300 x 300 DPI)



The scale and dimension scores of different profiles

145x114mm (300 x 300 DPI)

STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) 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 was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3-4
Objectives	3	State specific objectives, including any prespecified hypotheses	4-5
Methods			
Study design	4	Present key elements of study design early in the paper	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	5
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5-6
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	5-6
Bias	9	Describe any efforts to address potential sources of bias	6
Study size	10	Explain how the study size was arrived at	5
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	5-6
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	6
		(*b*) Describe any methods used to examine subgroups and interactions	NA
		(*c*) Explain how missing data were addressed	NA
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	NA
		(*e*) 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	7
		(b) Give reasons for non-participation at each stage	7
		(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	7
		(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	8
Main results	16	(*a*) 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

For peer review only

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

		(*b*) Report category boundaries when continuous variables were categorized	8
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	NA
Discussion			
Key results	18	Summarise key results with reference to study objectives	9-11
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	11
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	11
Generalisability	21	Discuss the generalisability (external validity) of the study results	11
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	12

*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.

For peer review only

For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml