



OPEN ACCESS

EDITED BY

Yukun Cao,
Huazhong University of Science and
Technology, China

REVIEWED BY

Shirin Talapbek kyzy,
Peoples' Friendship University of Russia, Russia
Hamid Osman,
Taif University, Saudi Arabia

*CORRESPONDENCE

Changmin Tang
✉ tangcm@hbtcu.edu.cn

RECEIVED 30 November 2022

ACCEPTED 26 July 2023

PUBLISHED 10 August 2023

CITATION

Lin T, Li Y, Li Y, Guo W, Guo X and
Tang C (2023) Individual- and institution-level
predictors of the turnover intention of medical
staff among rural primary medical institutions
in Xinjiang Production and Construction Corps,
China: a cross-sectional multi-level analysis.
Front. Psychol. 14:1112057.
doi: 10.3389/fpsyg.2023.1112057

COPYRIGHT

© 2023 Lin, Li, Li, Guo, Guo and Tang. This is
an open-access article distributed under the
terms of the [Creative Commons Attribution
License \(CC BY\)](https://creativecommons.org/licenses/by/4.0/). The use, distribution or
reproduction in other forums is permitted,
provided the original author(s) and the
copyright owner(s) are credited and that the
original publication in this journal is cited, in
accordance with accepted academic practice.
No use, distribution or reproduction is
permitted which does not comply with these
terms.

Individual- and institution-level predictors of the turnover intention of medical staff among rural primary medical institutions in Xinjiang Production and Construction Corps, China: a cross-sectional multi-level analysis

Taoyu Lin¹, Ye Li², Yuanyuan Li², Wei Guo², Xiaoying Guo² and Changmin Tang^{3*}

¹The People's Hospital of Suzhou New District, Suzhou, Jiangsu, China, ²School of Medicine, Shihezi University, Shihezi, Xinjiang, China, ³School of Management, Hubei University of Chinese Medicine, Wuhan, Hubei, China

Background: Primary medical staff (PMS) are the guardians of population health. However, their loss further worsens the shortage and uneven distribution of human health resources, which should be addressed immediately. This study aimed to investigate the current status of turnover intention of rural PMS in Xinjiang Production and Construction Corps (XPCC) in China and its influencing factors at the individual and institutional levels to provide reliable baseline data for intervention strategies to protect valuable rural PMS.

Methods: Participants were recruited from rural public health institutions of the XPCC using a cross-sectional multistage sampling process. Data on participants' turnover intention and individual- and institution-level indicators were obtained through standardized electronic questionnaires and statistical reports of regional health administrative departments. The key factors influencing PMS turnover intention were identified using univariate and multi-level logistic regression analysis.

Findings: Overall, 20.5% (447/2182) of participants reported turnover intention. Univariate analysis showed that the occurrence of turnover intention was significantly influenced by marriage, education, age, year of working, monthly income, human resource management practices (HRMP), job satisfaction, *per capita* served population (PCSP) and number of beds ($p < 0.05$). Multi-level logistic regression analysis showed that bachelor's degree or above and intermediate professional title were closely related to the occurrence of turnover intention ($p < 0.05$), age 41–50 years old and above, high human resource management practice, and high job satisfaction effectively reduced the odds ($p < 0.05$). The odds of turnover intention increased by 37% ($p < 0.10$) for PMS in institutions with PCSP more than 250 people. In contrast, the odds of turnover intention decreased to 68% ($p < 0.05$) for PMS in institutions with more than 50 beds.

Conclusion: Government-run primary medical institutions face the risk of PMS turnover intention. From a personal perspective, the high-risk population for turnover intention was mainly the PMS with bachelor's degrees or above

and intermediate professional titles. The low-risk population was the PMS with aged over 40 years, a higher evaluation of human resource management practice, and job satisfaction. From the perspective of primary medical institutions, larger institutions can reduce the turnover intention of individuals, whereas the size of the service population has the opposite effect.

KEYWORDS

primary medical staff, turnover intention, multi-level analysis, rural primary medical institution, China

1. Introduction

Primary medical staff (PMS) are guardians of population health. Appropriate PMS plays a vital role in controlling costs, promoting rational utilization of healthcare services, and improving equity in population access to healthcare services (Kuhlmann et al., 2018). Many countries have long been committed to improving PMS allocation and spatial distribution (World Health Organization, 2022a). However, with the aging of the population and the change in the disease spectrum, shortage and uneven distribution of PMS remain widespread, and the loss of PMS has always been an urgent problem to be overcome (World Health Organization, 2017; Skinner et al., 2019; World Health Organization, 2022a).

China's aging population is large and growing rapidly. Compared with highly aging countries, such as France, Great Britain, Australia, and Japan, the Chinese population has a low healthy life expectancy (1.6–2.6 years lower) and fewer doctors providing health services (2.5–19.0 fewer doctors per 1,000 population) (World Health Organization, 2022b). Notably, rural areas were even more worried. The population aged 65 years and older (17.7%) was 5.3% higher than the national average, and 60% of them had chronic diseases (National Bureau of Statistics, 2021; National Health Commission Statistical Information Center, 2021). Although the total number of PMSs providing basic medical services to rural residents increased, the equity of their distribution showed a downward trend (Figure 1). In the four provinces with the most severe decrease in PMS density (Figure 2), Xinjiang's vast territory (accounting for 1/6 of the national geographic area), and sparse population (only 1.83% of the national population), the regional distribution of rural PMS is more unfair than that of Liaoning, Shandong, and Shanxi provinces.

The Xinjiang Production and Construction Corps (XPCC), which is a special organization planned separately by China, is an important part of Xinjiang. Meanwhile, it is one of the core regions of China's "silk road economic belt" and the maintenance of national stability. Its geographical area covers almost the entire territory of Xinjiang, making the sparse population (less than 13% of Xinjiang's total population) more dependent on the services provided by the PMS (Li and Yu, 2020; Liu and Ye, 2020). However, the high aggregation of medical staff in urban areas has further altered the density of rural PMS (PMS density was lower than the national average) and caused

the loss of PMS (Lei et al., 2014). To date, little is known about this phenomenon. Therefore, predicting the loss of PMS in XPCC and tracing the root causes are crucial for the sustainable development of

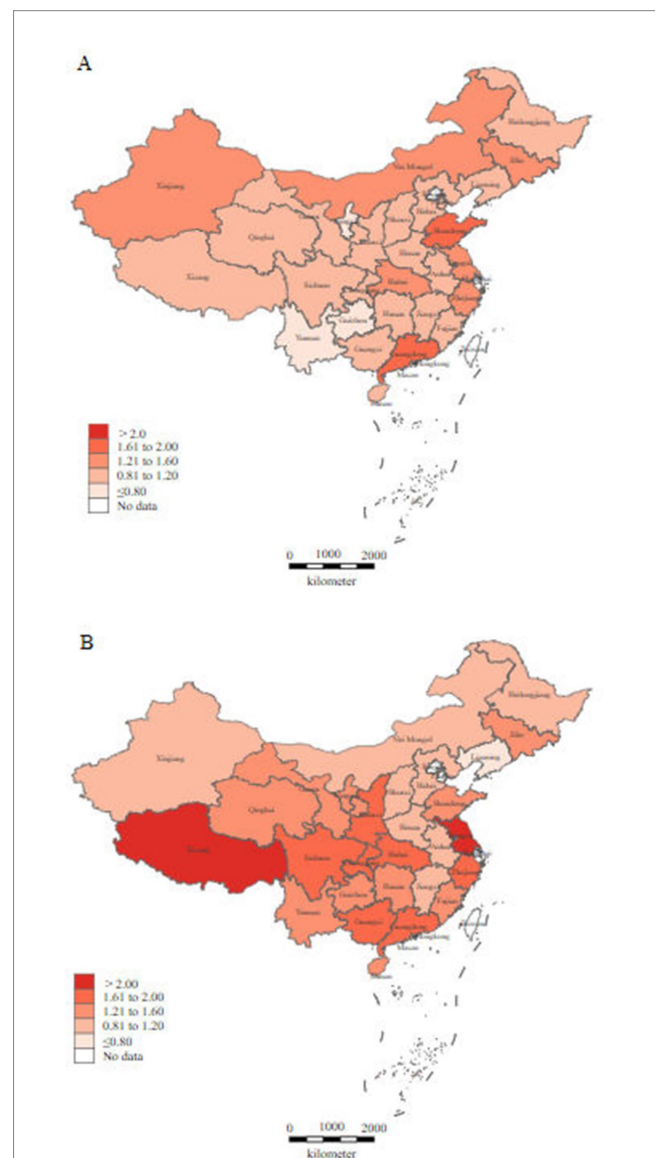


FIGURE 1
Geographical distribution of rural PMS density in 2010 (A) and 2020 (B). The data were collected from China Health Statistical Yearbook 2011 and China Health Statistical Yearbook 2021.

Abbreviations: PMS, Primary Medical Staff; XPCC, Xinjiang Production and Construction Corps; HRMP, Human Resource Management Practice; PCSP, *Per capita Served Population*; KMO, Kaiser-Meyer-Olkin.

PMS and the health level of population in this region, as well as the socio-economic development in China.

Turnover intention is the direct antecedent variable of turnover behavior (Al-Dabbagh et al., 2022), which is easier to measure and more accurate than the turnover information provided by those who have already resigned (de Oliveira et al., 2019). In China, 11.8–78.4% of PMS were strongly willing to leave (Mao et al., 2018). Compared with urban PMS, the risk of leaving rural PMS was higher by 1.3 times (Mao et al., 2018). According to a survey, 43.7% of PMS with turnover intention wanted to leave the health profession (Liu et al., 2017), and among those who left, 9.8% had switched to other industries (Li et al., 2021).

Evidence has established that the strength of turnover intention is influenced by individual factors, including age, marriage, education, seniority, wages, benefits, and subjective attitude (Liu and Mao, 2016; Liu et al., 2017; Kao et al., 2018; Ou et al., 2018; Liu et al., 2019; Worku et al., 2019; Bardoel et al., 2020; Gan et al., 2020; Li et al., 2020; Ran et al., 2020; Anderson et al., 2021; Kong et al., 2021; Li et al., 2021; Deng et al., 2022). Several factors at the organizational level also directly or indirectly affect the turnover intention of individuals, including organizational culture, commitment, empowerment and poor working conditions (Sun et al., 2013; Lee et al., 2016; Eneroth et al., 2017; Zhang et al., 2017; Kao et al., 2018; Worku et al., 2019;

Anderson et al., 2021; Li et al., 2021; Hwang and Yi, 2022), and their effects may be stronger than those of individual factors (Anderson et al., 2021; Ahmed et al., 2022). Under the background of the equalization policy of basic public health services, an increase in service radius and service population of an institution further aggravates the work burden of PMS, which is more likely to lead to strong turnover intention of individuals (Anderson et al., 2021; Li et al., 2021).

However, due to the inconsistency of study areas and participants, there was large heterogeneity in the research results. First, the groups at high risk of turnover intention differed. For example, a national study (Zhang et al., 2017) and another study from Shaanxi (Liu and Mao, 2016) had different findings on the high-risk age of turnover intention of PMS (31–45 vs. ≤30 years). Second, human resource management practice (HRMP) is key for preventing medical staff turnover and maintaining sustainable development (Onnis, 2019). However, previous studies mostly explored managers' perspectives (He et al., 2020, 2022) but ignored individual perceptions. Finally, individual turnover intentions are aggregated at different levels (e.g., organizations and regions). However, the existing literature mainly analyzes at the individual level (Gan et al., 2020; Lee and Jang, 2020; Deng et al., 2022) and pays little attention to the differences between primary medical institutions. Therefore, a comprehensive analysis of

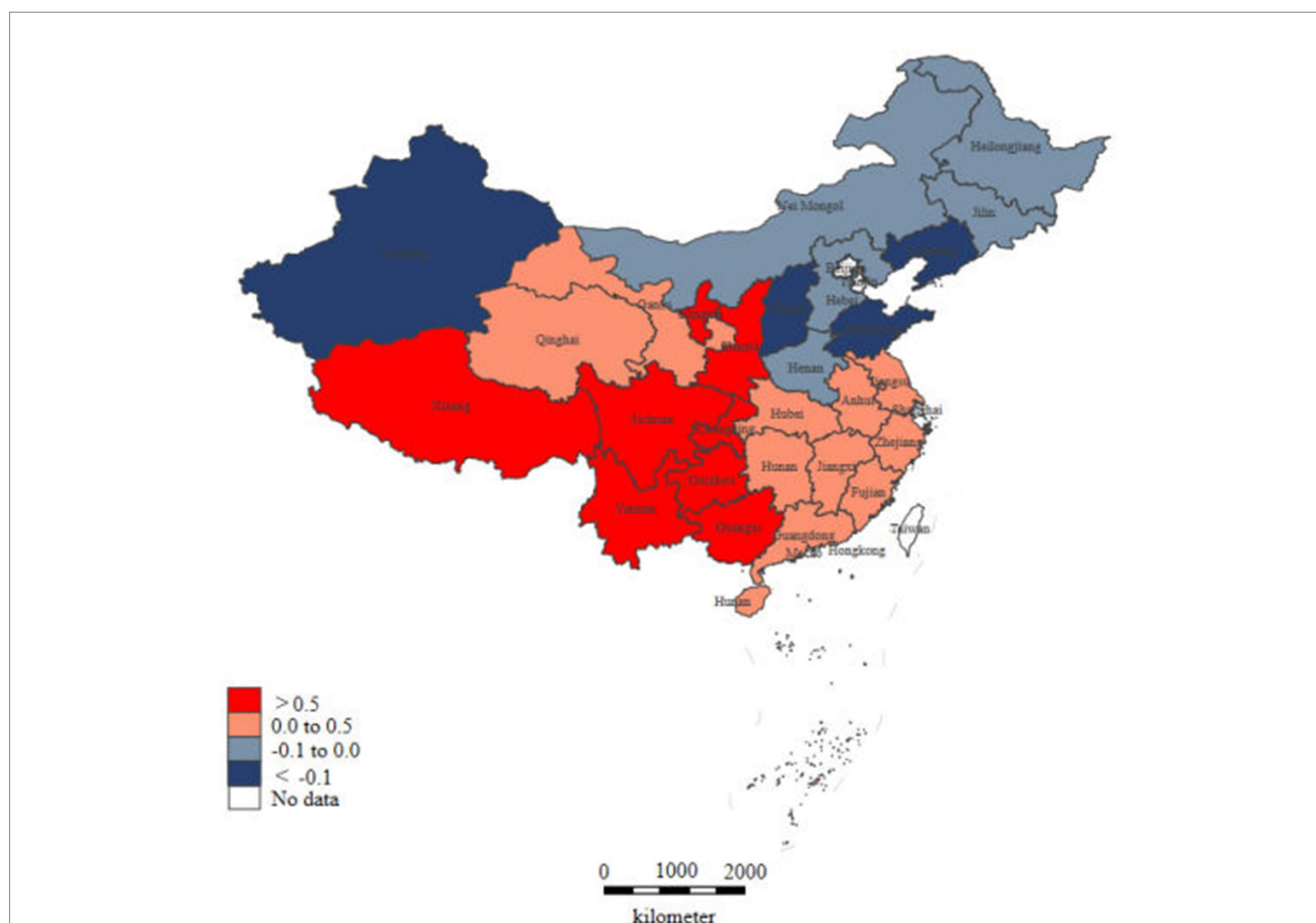
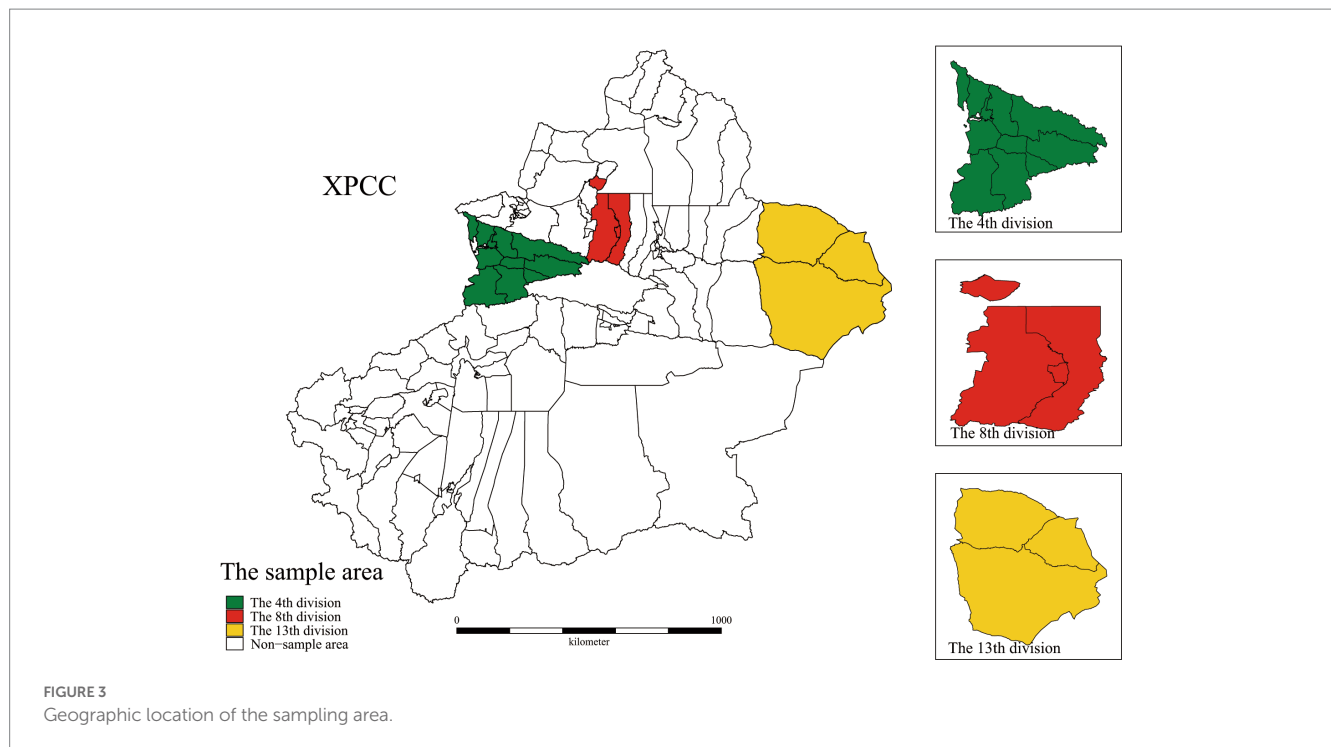


FIGURE 2 Changes in rural PMS density between 2010 and 2020. The data were collected from China Health Statistical Yearbook 2011 and China Health Statistical Yearbook 2021.



the odds of PMS turnover intention at individual and organizational levels is necessary.

From a long-term development perspective, the key challenge facing the XPCC is to systematically trace the root of rural PMS turnover intention at both the institutional and individual levels and effectively improve rural residents' access to basic medical services. Therefore, this study selected the rural PMS of the XPCC as the sample, adopted multi-level mixed effect models to capture the multiple hierarchical data structures of turnover intention, predicted the turnover intention of rural PMS, and determined the key influencing factors at the individual and institutional levels, to provide reliable baseline data for intervention strategies to protect valuable rural PMS and to provide a reference for similar regions and countries.

2. Materials and methods

2.1. Study design and data sources

In this cross-sectional survey design, participants were selected from rural public primary medical institutions in the XPCC using stratified multistage sampling methods. The sampling procedure was categorized into the following four stages. In Stage 1, according to the population size at the end of 2020, 14 divisions of the XPCC were categorized into high population size (ranking the top 4 in population size), medium population size (ranking 5–9 in population size), and small population size (ranking 10–14 in population size). One division on each layer was randomly selected as the sample division in Stage 2 (Figure 3). In Stage 3, all rural public primary medical institutions in each sample division were selected using cluster sampling. Finally, PMS were randomly selected from selected primary public health institutions and stratified by occupation and professional title. Furthermore, participants were screened at an individual level, and

eligible individuals were doctors, nurses, and other medical technicians working for 1 or more years. Those who refused to participate or could not complete the questionnaire independently were excluded.

Measurement indicators and tools were determined based on previous studies and thematic panel discussions. The indicator data for this study were obtained from two sources: demographic characteristics, personal perception of the organizational environment, and turnover intention were obtained from the standardized electronic questionnaire of the participants; data reflecting the institutional resource allocation were obtained from the statistical statements of the health administrative departments of the sample areas.

2.2. Measure

After obtaining written informed consent, all eligible participants independently completed a standardized electronic questionnaire. The questionnaire included basic information about the participants, HRMP, job satisfaction, and turnover intention. This study used measurement tools effectively applied in previous studies to measure HRMP, job satisfaction, and turnover intention to ensure the validity and accuracy of the measurement. All items were scored on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). When the average score of each scale was more than 3 points, it was counted as 1 point (indicating that the indicators of turnover intention, HRMP, and job satisfaction were at a high level), and the rest were 0 points (indicating that the indicators above were at a low level). Furthermore, the number of beds, health technicians in primary medical institutions, and population served by primary medical institutions (including the age structure of the population) in 2020 were extracted from the data in the statistical statements, which the related person in charge

of the health administration of the sample region provided. In all surveys, quality-assurance procedures were incorporated to improve the data quality.

2.3. Outcome indicator

The turnover intention was measured using a 5-item scale (1 = “strongly disagree” to 5 = “strongly agree”) developed by Mobley (1977) and adapted by Lei et al. (2020) with the working status of medical staff in China. The higher the score, the stronger the turnover intention. The reliability and validity of the scale have been validated in previous studies (Cronbach’s alpha was 0.9, the KaiserMeyerOlkin (KMO) value was 0.8, and the single-factorial model explained 82.8% of the overall variance) (Lei et al., 2020).

2.4. Individual-level indicators

Individual-level indicators mainly consisted of two components: the participants’ personal characteristics and their perceptions of HRMP and job satisfaction. The former includes gender (female and male), age (≤ 30 , 31–40, 41–50, and ≥ 51 years), marital status (married and single), education level (technical secondary school, junior college, bachelor’s degree, and above), occupation (doctor, nurse, and other medical staff), professional title (junior title, middle title, senior professional title), working years (≤ 10 , 11–20, and ≥ 21 years), and monthly income ($\leq 4,000$ yuan and $> 4,000$ yuan). The latter was measured using the following scales:

The HRMP measure was based on a 15-item scale adapted by Lan (2012), which comprises three subscales: selection and allocation (three items), training and development (five items), performance, and salary management (seven items). The Cronbach’s alpha of the scale was 0.9, and the KMO value was > 0.6 . Three common factors were extracted through exploratory factor analysis, and the cumulative contribution rate was $> 70\%$ (Lan, 2012; He et al., 2020).

Job satisfaction was measured using the Minnesota Satisfaction Scale (Weiss et al., 1967), with a total of 20 items consisting of two subscales of satisfaction and external satisfaction. This scale has been widely used to measure the job satisfaction of medical staff in China and has good validity and reliability (Cronbach’s $\alpha = 0.87$ – 0.92 , KMO > 0.6 ; the cumulative contribution rate of the two common factors extracted was 64.2%) (Lan, 2012).

2.5. Institutional-level indicators

Institutional-level indicators in this study included two indicators: (1) the number of beds in primary medical institutions was a categorical variable (≤ 50 and > 50 beds) and (2) *per capita* served population (PCSP) was defined as the average number of the population served per PMS. The calculation formula is as follows:

$PCSP = \text{population served by the primary medical institution} / \text{total number of PMS in primary medical institutions}$.

Because the optimal number of people served per PMS was unknown, the PCSP was classified into two categories: 250 or fewer people serviced per PMS and more than 250 people serviced per PMS.

2.6. Statistical analysis

All statistical analyses were performed using the STATA 16.1 (Stata Corporation, College Station, TX, United States). First, the sample was analyzed using descriptive analysis, and the results were expressed as the frequency and proportion of categorical variables. Second, a univariate logistic regression model of turnover intention was constructed to screen for factors significantly related to turnover intention ($p < 0.10$). Third, a two-level logic model of PMS turnover intention was constructed, namely, level 1 (individual-level factors) and level 2 (institutional-level factors), which evaluated the determinants of turnover intention. Before performing the above processes, a null model with only a constant/intercept was used to verify the model’s validity for the dependent variables. The second model included individual-level indicators that significantly impacted PMS turnover intention. The final model included individual- and institutional-level indicators that significantly impacted PMS turnover intention. Significant results for all models are presented as odds ratios (ORs) with 95% confidence intervals (CI). The optimality criteria, including the Akaike Information Criterion (AIC) and log-likelihood ratio, were used for model comparison. The model with the smallest AIC was judged to have the best fit (Zhang et al., 2022). All tests were two-tailed, and a significant difference was set at $p < 0.05$.

3. Results

3.1. Descriptive analysis

As presented in Table 1, 2,182 PMS from 44 primary medical institutions were surveyed. Most PMS were female, aged 41–50 years old, married, junior college, doctorate, junior title, working time of more than 20 years, and had a monthly income of more than 4,000 yuan. Regarding personal perceptions at the organizational level, approximately 67.7% of PMS made high evaluations of the institution’s HRMP (rate 4 or 5), and approximately 55.7% of PMS reported that they were satisfied with their jobs (rate 4 or 5). Regarding institutional-level indicators, 55.7% of PMSs worked in primary medical institutions with more than 50 beds, and 88.3% of PMSs worked in institutions with a PCSP of no more than 250 people. Overall, 20.5% (447/2182) of participants reported turnover intention. The distribution of this sample is summarized in Table 1.

3.2. Univariate analysis

Figure 4 shows the results of the univariate analyses for PMS turnover intention based on individual- and institution-level indicators. Among the individual-level indicators, single and higher education levels were positively associated with turnover intention ($p < 0.05$ for all) and aged 41–50 years old and over 50 years, working time of more than 10 years, monthly income of more than 4,000 yuan, high HRMP level, and high job satisfaction were negatively associated with turnover intention ($p < 0.05$ for all). Regarding the institutional-level indicators, the odds of turnover intention was significantly higher in PMS working at institutions with PCSP more than 250 people (OR: 1.65, 95% CI: 1.31–2.08,

TABLE 1 Descriptive statistics of individual level indicators and institution level indicators of the PMS.

Demographic variable	Total (N = 2,182)	Turnover intention	
		Yes (n = 447)	No (n = 1735)
Individual-level indicators			
<i>Gender</i>			
Male	504 (23.1)	116 (26.0)	388 (22.4)
Female	1,678 (76.9)	331 (74.0)	1,347 (77.6)
<i>Age (year)</i>			
≤30	431 (19.8)	130 (29.1)	301 (17.4)
31–40	280 (12.8)	86 (19.2)	194 (11.2)
41–50	896 (41.1)	161 (36.0)	735 (42.4)
>50	575 (26.4)	70 (15.7)	505 (29.1)
<i>Marital status</i>			
Married	1831 (83.9)	358 (80.1)	1,473 (80.4)
Single	351 (16.1)	89 (19.9)	262 (19.6)
<i>Education level</i>			
Technical secondary school	431 (19.8)	54 (12.1)	377 (21.7)
Junior college	1,352 (62.0)	250 (55.9)	1,102 (63.5)
Bachelor degree and above	399 (18.3)	143 (32.0)	256 (14.8)
<i>Occupation</i>			
Doctor	1,187 (54.4)	255 (57.1)	932 (53.7)
Nurse	954 (43.7)	182 (40.7)	772 (44.5)
Other medical staff	41 (1.9)	10 (2.2)	31 (1.8)
<i>Professional titles</i>			
Junior title	1,227 (56.2)	264 (59.1)	963 (55.5)
Middle title	614 (28.1)	126 (28.2)	488 (28.1)
Senior professional title	341 (15.6)	57 (12.8)	284 (16.4)
<i>Years of working (year)</i>			
≤10	232 (10.6)	68 (15.2)	164 (9.5)
11–20	535 (24.5)	108 (24.2)	427 (24.6)
>20	1,415 (64.9)	271 (60.6)	1,144 (65.9)
<i>Monthly income (yuan)</i>			
≤4,000	1,069 (49.0)	261 (58.4)	808 (46.6)
>4,000	1,113 (51.0)	186 (41.6)	927 (53.4)
<i>HRMP</i>			
Low	706 (32.4)	292 (65.3)	414 (23.9)
High	1,476 (67.6)	155 (34.7)	1,321 (76.1)
<i>Job satisfaction</i>			
Low	1,216 (55.7)	378 (84.6)	838 (48.3)
High	966 (44.3)	69 (15.4)	897 (51.7)
Institutional-level indicators			
<i>Bed number (beds)</i>			
≤50	966 (44.3)	242 (54.1)	724 (41.7)
>50	1,216 (55.7)	205 (45.9)	1,011 (58.3)
<i>PCSP (people)</i>			
≤250	1927 (88.3)	374 (83.7)	1,553 (89.5)
>250	255 (11.7)	73 (16.3)	182 (10.5)

HRMP, human resource management practice; PCSP, Per capita service population. Numbers are n (%).

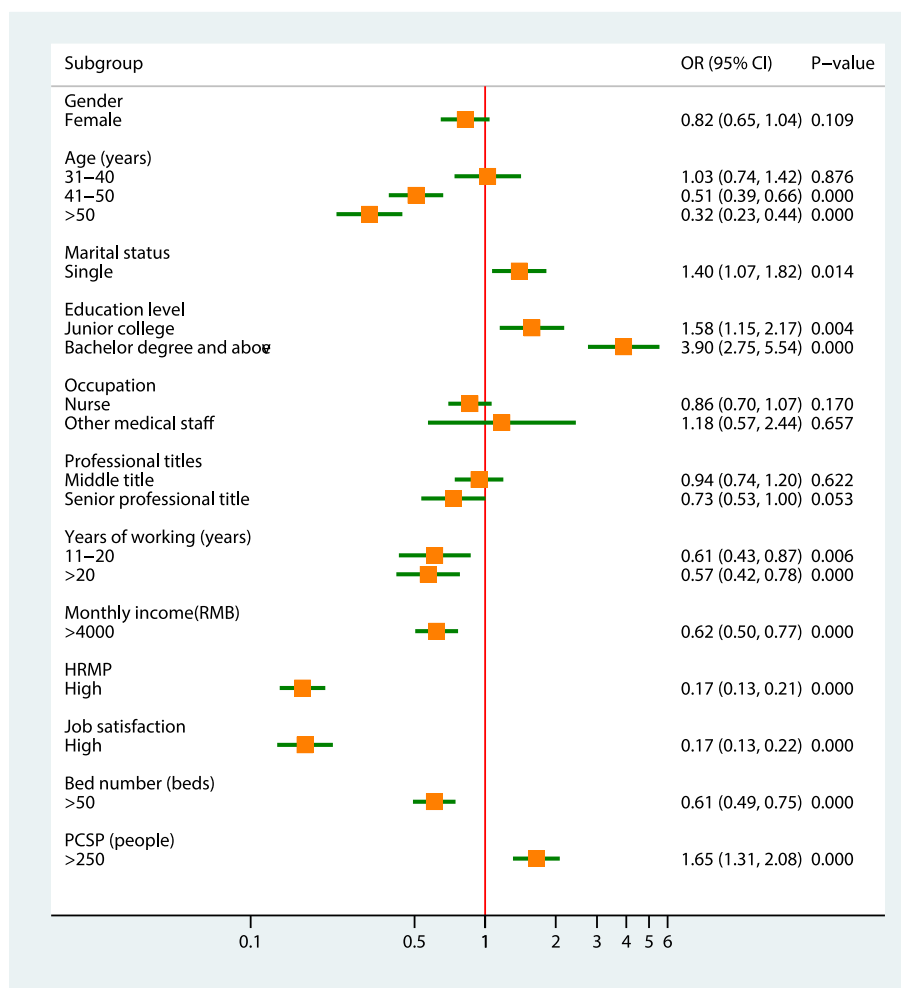


FIGURE 4 The results of the univariate analyses for PMS turnover intention based on individual- and institution-level indicators.

$p < 0.001$) than in those working at institutions with 250 people or less. In contrast, the odds of turnover intention was significantly lower in PMS working at institutions with more than 50 beds (OR: 0.61, 95%CI: 0.49–0.75, $p < 0.001$) than in those working at institutions with 50 beds or less.

3.3. Multi-level analysis

Three models were adapted to the multi-level logistic regression model (Table 2). The result of the random effects showed that in Model 1, which reflected the null model, the size of the intra-class correlation coefficient (ICC) was calculated to be 0.081, indicating that 8.1% of the variance in turnover intention is attributable to the institutional level (Kwon, 2020). The ICC values decreased to 4.4% in Model 2 (the inclusion of individual-level indicators that significantly influenced turnover intention in univariate analysis) and 2.3% in Model 3 (the full model with all the independent variables that significantly influenced turnover intention was considered). Compared with Model 1 and Model 2, Model 3 had the lowest Akaike information criterion (1770.51 vs 2167.88, 1771.17) and the highest log-likelihood ratio (−868.25 vs −1081.94, −872.58). Therefore,

Model 3 was considered to be the line of best fit suitable for predicting turnover intention among PMS.

The result of the fixed effects showed that in the individual-level indicators, the decrease in turnover intention was influenced by education and professional title, whereas age, HRMP, and job satisfaction influenced its increase. Regarding education, PMS with a bachelor's degree or above were 2.40 times (95% CI: 1.56–3.71, $p < 0.05$) more willing to choose to leave compared to those with technical secondary school. Regarding the professional title, the odds of turnover intention increased 51% (95% CI, 1.07–2.12, $p < 0.05$) for PHM with middle titles compared to those with the junior title. Regarding age, the odds of turnover intentions decreased to 33% (95% CI, 0.21–0.51, $p < 0.01$) in aged 41–50 years, and to 23% (95% CI, 0.14–0.38, $p < 0.01$) in more than aged 50 years compared with those in aged 30 years or less. Compared with lower HRMP and lower job satisfaction, the odds of turnover intention decreased to 26% (95% CI, 0.20–0.34, $p < 0.01$) in PMS with high HRMP and declined to 30% (95% CI, 0.21–0.41, $p < 0.01$) in PMS with high job satisfaction.

In institutional-level indicators, the odds of turnover intention increased by 37% (95% CI: 0.97–1.93, $p < 0.10$) for PMS in institutions with more than 250 PCSP people compared with those in institutions with PCSP 250 people or less. In contrast, the odds of turnover

TABLE 2 Mixed effects results on individual-, institutional-level indicators associated with PMS turnover intention.

Variable	Model 1 OR (95% CI)	Model 2 OR (95% CI)	Model 3 OR (95% CI)
Individual variables			
<i>Age (year)</i>			
≤30		1 (Ref)	1 (Ref)
31–40		0.72 (0.47–1.10)	0.73 (0.47–1.11)
41–50		0.32 (0.21–0.49)***	0.33 (0.21–0.51)***
>50		0.22 (0.14–0.37)***	0.23 (0.14–0.38)***
<i>Marital status</i>			
Married		1 (Ref)	1 (Ref)
Single		1.09 (0.75–1.57)	1.08 (0.75–1.56)
<i>Education level</i>			
Technical secondary school		1 (Ref)	1 (Ref)
Junior college		1.23 (0.86–1.77)	1.21 (0.85–1.74)
Bachelor degree and above		2.47 (1.60–3.83)***	2.40 (1.56–3.71)***
<i>Professional titles</i>			
Junior title		1 (Ref)	1 (Ref)
Middle title		1.49 (1.06–2.10)**	1.51 (1.07–2.12)**
Senior professional title		1.33 (0.85–2.09)	1.37 (0.88–2.14)
<i>Years of working (year)</i>			
≤10		1 (Ref)	1 (Ref)
11–20		1.13 (0.71–1.78)	1.13 (0.71–1.78)
≥21		1.09 (0.72–1.65)	1.09 (0.72–1.65)
<i>Monthly income (yuan)</i>			
≤4,000		1 (Ref)	1 (Ref)
>4,000		0.83 (0.61–1.14)	0.80 (0.59–1.10)
<i>HRMP</i>			
Low		1 (Ref)	1 (Ref)
High		0.25 (0.19–0.33)***	0.26 (0.20–0.34)***
<i>Job satisfaction</i>			
Low		1 (Ref)	1 (Ref)
High		0.30 (0.21–0.41)***	0.30 (0.21–0.41)***
Institution variables			
<i>Number of beds (beds)</i>			
≤50			1 (Ref)
>50			0.68 (0.50–0.92)**
<i>PCSP (people)</i>			
≤250			1 (Ref)
>250			1.37 (0.97–1.93)*
<i>Random effect result</i>			
Variance (95% CI)	0.29 (0.15–0.55)	0.15 (0.06–0.40)	0.08 (0.02–0.35)
ICC	0.081	0.044	0.023
LR Test	48.95***	11.35***	3.00*
Wald chi-square	Reference	313.07***	323.87***
<i>Model fitness</i>			
Log-likelihood	–1081.94	–872.58	–868.25
AIC	2167.88	1771.17	1770.51
N	2,182	2,182	2,182

Model 1 is the null model, a baseline model without any explanatory variable; Model 2 is the model for individual-level indicators; Model 3 is the full model for individual- and institutional-level indicators; OR, Odds ratios; CI, Confidence interval; PCSP, Per capita service population; HRMP, Human resource management practice; Ref, Reference category; ICC Intra-Class Correlation, LR Test, likelihood ratio test, AIC Akaike's Information Criterion; *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

intention decreased to 68% (95% CI: 0.50–0.92, $p < 0.05$) for PMS in institutions with more than 50 beds compared with those in institutions with 50 beds or less.

4. Discussion

This study is a cross-sectional survey of PMS in representative rural areas of XPCC that reveals, for the first time, the prevalence of turnover intention among PMS in this area and identifies the high-risk population of turnover intention and the key factors at the individual level that effectively reduce the probability of turnover intention. Furthermore, new and substantial evidence has shown that the characteristics of primary medical institutions may partially explain the occurrence of turnover intentions.

Our data revealed that 20.5% of medical staff had considered leaving their jobs, which is relatively lower than other western regions (23.2–33.2%) (Liu and Mao, 2016; Liu et al., 2019; Deng et al., 2022) and lower than the global prevalence estimate (47%) (Shen et al., 2020). However, this does not imply that this region has a low prevalence. First, unlike the above study, the participants were only from public primary medical institutions held by the government, where PMS at these institutions are less likely to leave their jobs than at other types of institutions (Dong and Zhang, 2016). Notably, this result was still higher than those of some national cross-sectional studies (Sun et al., 2013; Li et al., 2020; Kong et al., 2021) and Guangdong, Shanghai, and other regions (Liu et al., 2017; Ou et al., 2018). Therefore, this indicates that the risk of PMS loss in primary medical institutions funded by the government is relatively high. For regions with low geographic accessibility to PMS, this risk will increase the cost of PMS and the cost of overall health services and reduce the utilization of health services for rural residents (Newman et al., 2014).

Unlike previous studies (Liu et al., 2017; Kao et al., 2018; Mao et al., 2018; Liu et al., 2019; Li et al., 2020; Shen et al., 2020; Li et al., 2021), this study found no strong correlation between salary and PMS turnover intention. The influence of age, education, and professional title on the odds of turnover intention is consistent with expectation (Liu and Mao, 2016; Liu et al., 2019; Chen et al., 2021; Deng et al., 2022) but with variations. This study only detected evidence of low odds in the age group 41–50 years and older, without a significant gap observed in younger age groups. Furthermore, this study adds to the evidence that the odds of turnover intention in PMS with a bachelor's degree or above were 2.4 times that in those with a technical secondary school degree. Moreover, we observed that the odds of turnover intention were in this region's group with middle titles rather than in the group with primary titles in previous studies (Liu and Mao, 2016; Liu et al., 2019; Shen et al., 2020; Chen et al., 2021; Deng et al., 2022). The above results illustrate that young, highly educated PMS with accumulated practical experience are high-risk populations for this prevalence. Facing the aging situation of the PMS of the XPCC (Lei et al., 2014), the high-quality and sustainable development of the PMS will be greatly affected.

We observed that 67.6 and 44.3% of the participants had higher evaluations of HRMP and job satisfaction, respectively. In addition, we confirmed that high HRMP and job satisfaction could significantly inhibit the occurrence of turnover intention. First, it is noteworthy that studies related to HRMP are currently focused on hospitals (He et al.,

2020, 2022); therefore, the results of this study can be used as baseline data for predicting the turnover risk of PMS in primary medical institutions. Second, HRMP includes salary, selection, training, and development. From the failure of salary to predict PMS turnover risk, it can be observed that individuals' perceptions of HRMP have a stronger early warning effect on turnover risk. Finally, a significant correlation between high job satisfaction and turnover intention has been confirmed by several studies (Lee et al., 2016; Liu and Mao, 2016; Liu et al., 2019; Lei et al., 2020), in which <42% of the participants were satisfied with their jobs, which is significantly lower than the results of the 11 provinces in Western China (Liu et al., 2019). Therefore, these findings are of great significance for adjusting and evaluating talent retention measures in later primary medical institutions.

The key strength of our study is that it is the first to confirm that 8.1% of the occurrence of turnover intention in PMS is attributed to the bed number and serving a population of primary medical institutions. The number of beds in primary medical institutions reduced the occurrence of turnover intention in PMS, while the number of serving a population *per capita* had the opposite effect. The former should be attributed to the fact that primary medical institutions with many beds have a larger scale, relatively strong comprehensive management capacity, and a relatively sound incentive mechanisms (Zhang et al., 2020). The latter reflects the level of human resource allocation and PMS workload. The greater the PCSP, the lower the level of human resource allocation, the heavier the work burden, and the more likely the PMS will consider leaving. Therefore, the government should focus on developing talent in small-scale primary medical institutions and strive to improve the fairness of human resource allocation.

4.1. Strengths and limitations

We use the multi-level model to explain the spatial aggregation of individual turnover intention at the institutional level to reduce the influence of the hierarchical structure on the results, thereby making the study results robust. This study firstly revealed the characteristics of PMS turnover intention in the XPCC area, which provided a basis for local governments or regions and countries with similar backgrounds to accurately identify high-risk groups and implement accurate talent retention strategies in rural areas. In addition, evidence of a significant correlation between the scale of primary medical institutions and service population size and individual turnover intention may provide a new way to fully understand the determinants of turnover intention prevalence.

Not to be ignored, this study had some limitations. First, although this study included many individual- and institution-level indicators that affect turnover intention, there are still potential confounding factors, including medical insurance, pension insurance, service radius, and hardware facilities of primary medical institutions. Second, the sample size was limited to XPCC. Therefore, if the research results are extended to the entire region of Xinjiang and other regions, it will be necessary to further expand the sample area.

In conclusion, the geographical accessibility of medical resources in the rural areas of the XPCC is poor, and the loss of a few primary medical workers can reduce the utilization of medical services for rural residents. However, we observed that one in five medical workers

working in government-run primary medical institutions considered leaving their jobs. From a personal perspective, although junior medical workers over the age of 40 years have a lower probability of turnover intention, those with an undergraduate degree or above and middle titles are at a higher risk. However, we found that individuals with a higher evaluation of HRMP and job satisfaction could also effectively reduce risk. Therefore, organizations should pay attention to the training, development, and use of primary medical workers and create a good working environment. From the perspective of primary medical institutions, larger institutions can reduce the turnover intention of individuals, while the size of the service population has the opposite effect. Therefore, the Government should focus on resource-disadvantaged primary care institutions and equitable distribution of medical workers.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving human participants were reviewed and approved by Ethics Committee of the First Affiliated Hospital, Shihezi University School of Medicine. The patients/participants provided their written informed consent to participate in this study.

Author contributions

TL conceived and designed the experiments. CT provides project administration and resources. TL, CT, and YL conducted the surveys

References

- Ahmed, F. R., Bani-Issa, W., Timmins, F., Dias, J. M., Al-Yateem, N., Subu, M. A., et al. (2022). Managing during the COVID-19 pandemic: a cross-sectional study of health care workers' perceived organizational support and its consequences on their compassion, resilience and turnover intention. *J Nurs Manage* 30, 2642–2652. doi: 10.1111/jonm.13824
- Al-Dabbagh, S. A., Sulaiman, H. M., and Abdulkarim, N. A. (2022). Workload assessment of medical doctors at primary health care centers in the Duhok governorate. *Hum Resour. Health* 19:117. doi: 10.1186/s12960-021-00664-2
- Anderson, M., O'Neill, C., Clark, J. M., Street, A., Woods, M., Johnston-Webber, C., et al. (2021). Securing a sustainable and fit-for-purpose UK health and care workforce. *Lancet* 397, 1992–2011. doi: 10.1016/S0140-6736(21)00231-2
- Bardoel, E. A., Russell, G., Advocat, J., Mayson, S., and Kay, M. (2020). Turnover among Australian general practitioners: a longitudinal gender analysis. *Hum. Resour. Health* 18:99. doi: 10.1186/s12960-020-00525-4
- Chen, G. M., Sang, L. Z., Rong, J., Yan, H. S., Liu, H. Z., Cheng, J., et al. (2021). Current status and related factors of turnover intention of primary medical staff in Anhui Province, China: a cross-sectional study. *Hum. Resour. Health* 19:23. doi: 10.1186/s12960-021-00563-6
- de Oliveira, M. Z., de Andrade, A. L., Beria, F. M., and Gomes, W. B. (2019). Models for antecedents of turnover intention and behavior among Brazilian employees. *Int J Educ Vocat Guidance* 19, 363–389. doi: 10.1007/s10775-018-9384-3
- Deng, Z., Wang, H., Ping, W., Zhang, X., Feng, J., and Gan, Y. (2022). Analysis of turnover intention and related factors of general practitioners in Western China. *Chin Soc Med* 39, 441–445. doi: 10.3969/j.issn.1673-5625.2022.04.019
- Dong, K., and Zhang, D. (2016). China's social nonprofit medical institutions: motivations, challenges and countermeasures. *Chin J Health Policy* 9, 1–6. doi: 10.3969/j.issn.1674-2982.2016.09.001
- Eneroth, M., Gustafsson Sendén, M., Schenck Gustafsson, K., Wall, M., and Fridner, A. (2017). Threats or violence from patients was associated with turnover intention among foreign-born GPs - a comparison of four workplace factors associated with attitudes of wanting to quit one's job as a GP. *Scand. J. Prim. Health Care* 35, 208–213. doi: 10.1080/02813432.2017.1333319
- Gan, Y., Jiang, H., Li, L. Q., Yang, Y. D., Wang, C., Liu, J. X., et al. (2020). A national survey of turnover intention among general practitioners in China. *Int. J. Health Plann. Manag.* 35, 482–493. doi: 10.1002/hpm.2921
- He, J., Wu, D., Cheng, S., Wei, N., and Du, S. (2022). Study on the correlation between human resource management cognition and job engagement of medical staff in a grade a tertiary hospital in Shenzhen. *Chin JSoc Med* 39, 261–265. doi: 10.3969/j.issn.1673-5625.2022.03.006
- He, J., Wu, L., Wei, H., Zhu, S., Wen, P., Wei, N., et al. (2020). Study on the influencing factors of human resource management cognition on job satisfaction of medical staff in a grade-a tertiary hospital in Shenzhen. *MedSoc* 33, 87–91. doi: 10.13723/j.yxysh.2020.09.019
- Hwang, E., and Yi, Y. (2022). Workplace spirituality and organizational justice in turnover intention of mental health professionals at small-sized centres. *J Nurs Manage* 30, 328–335. doi: 10.1111/jonm.13459
- Kao, A. C., Jager, A. J., Koenig, B. A., Moller, A. C., Tutty, M. A., Williams, G. C., et al. (2018). Physician perception of pay fairness and its association with work satisfaction, intent to leave practice, and personal health. *J. Gen. Intern. Med.* 33, 812–817. doi: 10.1007/s11606-017-4303-8
- Kong, C., Zhao, X., Yu, Y., Yu, M., and Yuan, B. (2021). Studying on the influence of career development on the turnover intention of primary medical staffs. *Chin Health Serv Manag* 38:342–7+51.

and collected data. YeL, YuL, and WG analyzed and interpreted the data and wrote the first draft of the article. CT critically revised the article for important intellectual content. All authors contributed to the article, reviewed the manuscript, and approved the submitted version.

Funding

This study was supported by the National Natural Science Foundation of China (grant number: 72064033).

Acknowledgments

The authors would like to thank all the medical personnel involved in this study. The authors would also like to thank the relevant health managers of Corps' 4th, 8th, and 13th Divisions for their assistance in this study.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as potential conflicts of interest.

Publisher's note

All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.

- Kuhlmann, E., Groenewegen, P. P., Bond, C., Burau, V., and Hunter, D. J. (2018). Primary care workforce development in Europe: an overview of health system responses and stakeholder views. *Health Policy* 122, 1055–1062. doi: 10.1016/j.healthpol.2018.07.021
- Kwon, M. J. (2020). Occupational health inequalities by issues on gender and social class in labor market: absenteeism and presenteeism across 26 OECD countries. *Front. Public Health* 8:84. doi: 10.3389/fpubh.2020.00084
- Lan, J. *Analysis of the Impact of Hospital Human Resource Management on Job Satisfaction of Medical Staff [Master's thesis]*. Wuhan: Hangzhou Normal University(2012).
- Lee, E., and Jang, I. (2020). Nurses' fatigue, job stress, organizational culture, and turnover intention: a culture-work-health model. *West. J. Nurs. Res.* 42, 108–116. doi: 10.1177/0193945919839189
- Lee, B. K., Seo, D. K., Lee, J. T., Lee, A. R., Jeon, H. N., and Han, D. U. (2016). Impact of work environment and work-related stress on turnover intention in physical therapists. *J. Phys. Ther. Sci.* 28, 2358–2361. doi: 10.1589/jpts.28.2358
- Lei, D., Jing, M., Li, F., and Li, X. (2014). Analyzing the development and changes of health professionals in farms of Xinjiang production and construction corps under the new medical reform. *Chin Health Serv Manag* 31:518–9+59.
- Lei, M., Wang, Z., Liu, J., Jia, L., Luo, Y., and Lu, Z. (2020). Research on factors influencing turnover intention of rural primary medical staff based on job acquisition and satisfaction. *Chin J Health Stat* 37:547–9+53.
- Li, Z., Song, R., Huang, L., and Wu, H. (2021). Development of village doctors in China: financial compensation and health system support. *MedSoc* 34, 37–41. doi: 10.13723/j.yxysh.2021.11.008
- Li, W. J., Xu, A. L., Lu, M. Q., Lin, G. H., Wo, T., and Xi, X. Y. (2020). Influence of primary health care physicians' perceived overqualification on turnover intention in China. *Qual. Manag. Health Care* 29, 158–163. doi: 10.1097/QMH.0000000000000259
- Li, W., and Yu, X.. *Statistical Yearbook of Xinjiang Production and Construction Corps*. Beijing: China Statistics Press (2020).
- Liu, K., Jing, L., Zhou, X., Sun, X., Wang, L., Lou, J., et al. (2017). Rural healthcare workers' turnover intention during the reform incentive policies for rural healthcare professionals implemented. *Chin Gen Pract* 20, 2338–2341. doi: 10.3969/j.issn.1007-9572.2017.19.009
- Liu, J., and Mao, Y. (2016). Analysis on turnover intention and its influencing factors of human resource for health in the western rural Chinese primary healthcare institutions: a case study of Shaanxi Province. *Chin J Health Policy* 9, 33–38. doi: 10.3969/j.issn.1674-2982.2016.03.007
- Liu, A., and Ye, Z.. *China Statistical Yearbook*. Beijing: China Statistics Press (2020).
- Liu, J. L., Zhu, B., Wu, J. X., and Mao, Y. (2019). Job satisfaction, work stress, and turnover intentions among rural health workers: a cross-sectional study in 11 western provinces of China. *BMC Fam. Pract.* 20:9. doi: 10.1186/s12875-019-0904-0
- Mao, Y., He, R. X., Liu, J. L., Zhang, N., and Zhu, B. (2018). Turnover intention of primary health workers in China: a systematic review. *Lancet* 392:S17. doi: 10.1016/S0140-6736(18)32646-1
- Mobley, W. H. (1977). Intermediate linkages in the relationship between job satisfaction and employee turnover. *J Appl Psychol* 62, 237–240. doi: 10.1037/0021-9010.62.2.237
- National Bureau of Statistics. Bulletin of the seventh National Population Census. (2021). Available at: http://www.stats.gov.cn/xxgk/sjfb/zxfb2020/202105/t20210511_1817200.html (accessed September 15, 2022).
- National Health Commission Statistical Information Center. *The Sixth National Health Service Statistical Survey Report*. Beijing: The People's Health Publishing House (2021).
- Newman, S. J., Ye, J., and Leep, C. J. (2014). Workforce turnover at local health departments: nature, characteristics, and implications. *Am. J. Prev. Med.* 47, S337–S343. doi: 10.1016/j.amepre.2014.07.023
- Onnis, L. A. (2019). Human resource management policy choices, management practices and health workforce sustainability: remote Australian perspectives. *Asia Pac. J. Hum. Resour.* 57, 3–23. doi: 10.1111/1744-7941.12159
- Ou, W., Liu, K., Mai, M., and Ke, L. (2018). Study on fatigue status and turnover intention of primary health care workers in Guangdong. *Guangdong Med J* 39, 3081–3085. doi: 10.13820/j.cnki.gdyx.20181107.007
- Ran, L., Chen, X. Y., Peng, S. Z., Zheng, F., Tan, X. D., and Duan, R. H. (2020). Job burnout and turnover intention among Chinese primary healthcare staff: the mediating effect of satisfaction. *BMJ Open* 10:e036702. doi: 10.1136/bmjopen-2019-036702
- Shen, X., Jiang, H., Xu, H. B., Ye, J., Lv, C. Z., Lu, Z. X., et al. (2020). The global prevalence of turnover intention among general practitioners: a systematic review and meta-analysis. *BMC Fam. Pract.* 21:246. doi: 10.1186/s12875-020-01309-4
- Skinner, L., Staiger, D. O., Auerbach, D. I., and Buerhaus, P. I. (2019). Implications of an aging rural physician workforce. *N. Engl. J. Med.* 381, 299–301. doi: 10.1056/NEJMp1900808
- Sun, Y., Luo, Z. N., and Fang, P. Q. (2013). Factors influencing the turnover intention of Chinese community health service workers based on the investigation results of five provinces. *J. Community Health* 38, 1058–1066. doi: 10.1007/s10900-013-9714-9
- Weiss, D. J., Dawis, R. V., and England, G. W. (1967). Manual for the Minnesota satisfaction questionnaire. *Minn Stud Vocat Rehabil* 22:12.
- Worku, N., Feleke, A., Debie, A., and Nigusie, A. (2019). Magnitude of intention to leave and associated factors among health workers working at primary hospitals of North Gondar zone, Northwest Ethiopia: mixed methods. *Biomed. Res. Int.* 2019:7092964. doi: 10.1155/2019/7092964
- World Health Organization. A year of action to expand and transform the health workforce. (2017). Available at: <https://www.who.int/news/item/13-12-2017-a-year-of-action-to-expand-and-transform-the-health-workforce> (accessed September 15, 2022).
- World Health Organization. Global strategy on human resources for health: Workforce 2030. (2022a). Available at: <https://www.who.int/publications/i/item/9789241511131> (accessed September 15, 2022).
- World Health Organization. World health statistics 2022. (2022b). Available at: <https://www.who.int/data/gho/publications/world-health-statistics> (accessed September 15, 2022).
- Zhang, X., Anser, M. K., Ahuru, R. R., Zhang, Z., Peng, M. Y., Osobohien, R., et al. (2022). Do predictors of health facility delivery among reproductive-age women differ by health insurance enrollment? A multi-level analysis of Nigeria's data. *Front. Public Health* 10:797272. doi: 10.3389/fpubh.2022.797272
- Zhang, L., Qing, J., Zhang, Y., Lin, C., Meng, Y., and Tao, M. (2020). Practice and effect of "first-class financial supply, second-class performance management" plan in primary health care institutions. *Chin Gen Pract* 23, 1–6+13. doi: 10.12114/j.issn.1007-9572.2020.00.093
- Zhang, M., Yan, F., Wang, W., and Li, G. (2017). Is the effect of person-organisation fit on turnover intention mediated by job satisfaction? A survey of community health workers in China. *BMJ Open* 7:e013872. doi: 10.1136/bmjopen-2016-013872