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The impact of the nurse practice environment, workload, and professional support on job outcomes and standards of care at primary health care clinics in South Africa: A structural equation model approach

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ABSTRACT

Background: There is substantial evidence on the associations between a positive nurse practice environment and improved nurse and patient outcomes, as well as the factors that mediate these associations, in high-income countries and in hospital settings. The knowledge gaps in African and primary health care settings motivated this empirical study.
Objective: The objective of this study was to examine the impact of the dimensions of the nurse practice environment, specifically human resource management, foundations for nursing care, and participation in clinic affairs, on job outcomes and standards of care.
Design: A cross-sectional study was conducted between November 2021 and June 2022.
Setting: 180 primary health care clinics in two South African provinces of Gauteng and North West.
Participants: 665 nurses of all categories.
Methods: A causal model was developed with pathways between the nurse practice environment dimensions and the outcomes of job satisfaction, intention to leave, and standards of care. A set of standardised instruments was used to measure the study variables. Using structural equation modelling, workload and professional support were tested as potential mediators between the nurse practice environment and the outcome variables.
Results: The nurses scored the domain of foundations for nursing care 71.2 out of 100 on average, indicating high agreement, while the mean scores for nurses' participation in clinic affairs and human resources management were lower at 68.0 and 61.7 respectively. Although nurses expressed moderate satisfaction with professional support (67.7), they were less satisfied with their workload (52.2). The mean score of overall job satisfaction was moderate (58.9), with 53.8 % of the nurses reporting that they intended leaving the clinic where they were working. Thirty-six percent intended leaving the nursing profession, indicating low intention to stay. The final mediation model was judged to fit the data adequately based on goodness-of-fit indices,

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confirming that workload and professional support had a mediating role between the nurse practice environment dimensions of interest and both nurses' job outcomes and standards of care. *Conclusions:* We have highlighted the value of supportive practice environments, effective workload management, and enhanced professional support in improving nurses' job outcomes and satisfaction with standards of care. Improving nurses' practice environments at primary health care level may have a wide-ranging impact on the performance of the health system. Therefore, primary health care facility managers should ensure that workload is distributed equitably, professional support for nurses is enhanced, and the overall work environment is improved.

What is already known about the topic

- The nurse practice environment has an impact on nurse outcomes such as job satisfaction and turnover intentions, as well as patient outcomes.
- A number of studies have examined the effects of mediating factors on the association between the nurse practice environment and nurse and patient outcomes.

What this paper adds

- We have contributed to methodological innovation by using standardised instruments on the nurse practice environment and job satisfaction for primary health care clinics in an African setting.
- Using structural equation modelling, we demonstrated that the relationship between the nurse practice environment, nurse outcomes (job satisfaction and intention to leave), and standards of care was mediated by workload and professional support.
- Primary health care facility managers should ensure more equitable distribution of workloads and enhance professional support for nurses in clinics.

1. Introduction

The health workforce is central to an efficient and well-functioning health system, as reiterated by the 2030 Global Strategy on Human Resources for Health (World Health Organization, 2016). The importance of the health workforce was underscored during the COVID-19 pandemic (Rosa et al., 2020; World Health Organization, 2020). The 2022–2030 Working for Health Action Plan again emphasised the need for investment in creating healthy, safe, and positive practice environments for health workers (World Health Organization, 2022). Similarly, in South Africa, the 2030 Human Resources for Health Strategy contains specific recommendations to enhance the conditions of employment and the wellbeing of the health workforce (National Department of Health, 2020). This is because a positive practice environment enhances health worker recruitment and retention, and contributes to quality patient care and health system strengthening (Al Sabei et al., 2021; Alzahrani, 2022).

Nurses are the cornerstone of many health systems and they are vital to the achievement of universal health coverage (Ahmat et al., 2022). In South Africa, the universal health coverage vision is expressed through the national health insurance system, with primary health care as its foundation (National Department of Health, 2023). Hence, improving the work or practice environments of nurses at primary health care level could improve the performance of the health system (Rajan et al., 2024).

The nurse practice environment is defined as a work environment that *"supports nurses to function at the highest scope of clinical practice, to work effectively in an interdisciplinary team of caregivers, and to mobilise resources quickly"* (Lake, 2007, p.106S). Since the inception of this concept, several validated quantitative research tools have been developed to measure the nurse practice environment, including the Nurse Work Index (Lake, 2002; Lake and Friese, 2006), the Revised Nurse Work Index (Aiken and Patrician, 2000; Lake, 2002), and the Practice Environment Scale of the Nursing Work Index (Warshawsky and Havens, 2011), amongst others. Several research studies have examined the most important domains of nurse practice environments (Lucas et al., 2023; Janíková et al., 2021; Maassen et al., 2020). These include nurses' active participation in decision-making, adequacy of staffing and resources, collegial nurse-physician relationships, nurse autonomy, the quality of nursing leadership and management, organisational culture, professional development, and foundations for nursing care (Lucas et al., 2023; Janíková et al., 2021; Maassen et al., 2020). Foundations for nursing care capture nurses' perceptions of whether the health facility is supportive of the provision of high quality patient care (Lake, 2002).

Several researchers from the United States (Muir et al., 2023; Wei et al., 2023; Patrician et al., 2022), Europe (Zeleníková et al., 2020; Gurková et al., 2021), and the Middle East (Alharbi et al., 2020; AbuAlRub et al., 2023; Ambani et al., 2020) have attempted to show the direct association between the nurse practice environment and nurses' job outcomes (e.g., job satisfaction, turnover rates,

stress, and burnout). Researchers in South Africa (Bence et al., 2022; Holtzhausen et al., 2020), Ethiopia (Weldetsadika et al., 2019; Kassahun et al., 2022), Ghana (Poku et al., 2022), and Nigeria (Akinwale and George, 2020) have also reported a direct association between the nurse practice environment and nurses' job outcomes. The impact of workload on job outcomes has also been investigated (Hellín Gil et al., 2022, Jäppinen et al., 2022). High stress from the workload was associated with higher intent to leave the organisation, and lower job satisfaction (Jäppinen et al., 2022). Other researchers have reported the effects of nursing workload on the job satisfaction of nurses (Bautista et al., 2020, Hellín Gil et al., 2022), emotional exhaustion (Russeng et al., 2020; Asaloei et al., 2023), and on the quality of nursing care (Maghsoud et al., 2022).

A nurse practice environment that offers professional support and prospects for professional development was also found to influence job satisfaction and individual performance (Kim and Cho, 2022). Professional support includes the availability of managerial and collegial support, teamwork, feeling valued, the opportunity to discuss individual concerns, and the provision of the supportive supervision and guidance in the occupied role (Munyewende et al., 2014). Other researchers also demonstrated that supportive supervision is a determinant of job satisfaction (Tahiry and Ekmekcioglu, 2023; Altaş et al., 2024). Furthermore, nurses feel more competent and valued when team members work in a supportive environment that fosters team spirit (Al Sabei et al., 2021). On the other hand, some researchers have found that the absence of teamwork influenced workloads, leading to absenteeism, burnout, and low levels of job satisfaction (Bragadóttir et al., 2023).

Similarly, researchers in several countries showed a direct association between the nurse practice environment and patient outcomes (e.g., patient safety, quality of care, patient complaints, patient mortality) (Al-ghraiybah et al., 2024; Tenza et al., 2024; Lucas et al., 2023). Researchers in Australia found that adequate nurse staffing and a favourable nurse practice environment was linked to reduced patient mortality (Al-ghraiybah et al., 2024). In South Africa and Portugal, researchers found a strong association between the nurse practice environment, quality of care, and patient safety (Tenza et al., 2024; Lucas et al., 2023) .

Silva et al. (2020) found that the nurse practice environment and workload were predictors for the omission of nursing care in Brazilian critical care units. Researchers reported that inadequate nurse staffing and increased workload reduced the quality of nursing care (Falguera et al., 2021; Maghsoud et al., 2022). In contrast, other researchers have reported a high level of nursing care quality despite high workload and inadequate human resources and equipment (Gaalan et al., 2019; Kovacs and Lagarde, 2022), suggesting that the relationship between workload and the standards of care is not straightforward (Kovacs and Lagarde, 2022).

A growing number of researchers have examined the effects of different mediating factors between the nurse practice environment and job and patient outcomes (AbuAlRub et al., 2023; Labrague et al., 2022; Almotairy et al., 2022). In Saudi Arabia, Alharbi et al. (2020) found that the relationship between the sub-domain of nurse participation in hospital affairs and intention to leave was mediated by emotional exhaustion and job satisfaction. Another research team in Oman reported that job satisfaction significantly moderated the relationship between work environment and turnover intention (Al Sabei et al., 2019). Labrague et al. (2022) found that a favourable work environment in hospitals in Oman increased interprofessional collaboration, which in turn increased job satisfaction and nurse-reported care quality. In Belgium, other researchers found that burnout and workload occupied a mediating position between the nurse practice environment and the job outcomes and nurse reported standards of care (Van Bogaert et al., 2012b; Van Bogaert et al., 2013). Workload, decision latitude, and social capital were also observed to have a mediating position between the nurse practice environment and burnout dimensions (Van Bogaert et al., 2017). In contrast, AbuAlRub et al. (2023) found no support for the moderating effects of work environment and empowerment on the relationship between job stress and nurses' job satisfaction. Instead, these authors reported a direct effect of work environment and empowerment on job satisfaction (AbuAlRub et al., 2023).

These studies underscore the importance of mediating factors in explaining the associations between the nurse practice environment and nurse or patient outcomes (Al Sabei et al., 2019). However, researchers have conducted studies on the influence of mediating factors on these outcomes of interest in high-income countries and in hospital settings (AbuAlRub et al., 2023; Maassen et al., 2020). In addressing these gaps, the objective of this study was to examine the impact of three dimensions of the nurse practice environment on nurses' job outcomes and reported standards of care at primary health care clinics in South Africa. First was the impact of *human resource management*, comprising filling of vacant posts, managing staff absenteeism, giving recognition and praise to staff, and treating employees fairly. Second was the impact of *foundations for nursing care* that involved the availability of clinically competent nurses with primary health care skills, monitoring queues, offering nurses training opportunities, and ensuring nurses use clinical guidelines. Third was the impact of *participation in clinic affairs* that included the availability of a forum that included nurses in clinic operational matters, nurses' participation in decisions affecting the clinic, clear reporting structures, and the provision of assistance to nurses in finding solutions to problems. These dimensions were considered based on previous literature and the study data. Structural equation modelling (SEM) was used for analysis because it can test simultaneous relationships among complex and multi-dimensional phenomena (Tabacknick and Fidell, 2001).

2. Methods

2.1. Study design

A cross-sectional study was conducted between November 2021 and June 2022.

2.2. Study setting

Two South African provinces, Gauteng and North West, were selected purposively as the study setting, based on geographical proximity and the mix of urban (Gauteng) and rural (North West) characteristics. Our study setting consisted of all 8-hour fixed public

sector clinics[1] in Gauteng and North West provinces. Public sector mobile and satellite clinics and community health centres, as well as private sector clinics, were excluded. We selected clinics from both national health insurance pilot districts and non-national health insurance districts.

2.3. Participants

The population of interest comprised all categories of nurses working in 8-hour primary health care clinics, as these facilities constituted the central focus of the national health insurance system reforms. In Gauteng province, the total clinic nurse population at the time was 2159, comprising 1725 (79.8 %) professional nurses with at least 4 years of training at a nursing college or university; 282 enrolled/staff nurses with 2 years of training; and 152 auxiliary nurses/nursing assistants with 1 year of training. In North West province, there were 1743 nurses comprising 1176 (67.5 %) professional nurses, 29 enrolled/staff nurses, and 538 auxiliary nurses/nursing assistants working in primary care clinics.

A multi-stage cluster random sampling approach was used to first select clinics, then the study participants. We selected 180 clinics (Gauteng=126; North West=54) for the study. To allow for comparison between national health insurance and non-national health insurance districts, we first included all the clinics in the national health insurance pilot districts in each province (Gauteng=62 and North West=27) and then sampled an equal number of clinics from the non- national health insurance districts (four districts in Gauteng and three in North West). The clinics were randomly selected proportional to the total number of clinics in each district. Two additional non-national health insurance clinics were sampled from Gauteng to increase the number of eligible primary health care facility managers, as part of another study component.

Both permanent and contract nurses who had worked in these clinics for at least 6 months were eligible for study participation. At each clinic, we obtained a roster of the nurses on duty on the day of data collection. Random sampling was used to select four frontline nurses from each of the selected clinics from the following categories: two professional nurses, one staff nurse, and one nursing assistant. In clinics without enrolled or auxiliary nurses, they were replaced with professional nurses. The final sample size was selected to be able to both detect significant effects and test for model structure. Power analysis indicated that the estimated sample size would allow the detection of small effect sizes of at least 0.15 (at 80 % power and 5 % level of significance for the initial SEM model) and be more than adequate for testing model structures (Westland, 2010; Soper, 2024).

2.4. Hypothetical model

Using Karasek (1979) and Kanter (1993) theoretical frameworks that describe the negative effect of high job demands and low job resources and the links between structural empowerment and occupational wellbeing respectively, we hypothesised that workload and professional support mediate the association between the nurse practice environment at primary health care clinics with nurse outcomes and perceived standards of care.

The hypothetical model (Fig. 1) was constructed based on the following hypotheses:

- *Hypothesis 1:* The nurse practice environment has an indirect impact on nurses' job outcomes (overall job satisfaction and intention to leave) and standards of care, with workload and professional support mediating this relationship.
- *Hypothesis 2:* The nurse practice environment domain of foundations for nursing care has a direct relationship with workload and standards of care.
- *Hypothesis 3:* The nurse practice environment domain of nurses' participation in clinic affairs has a direct relationship with professional support and an indirect relationship with standards of care.
- *Hypothesis 4:* The domain of human resource management has a direct relationship with workload and professional support.
- *Hypothesis 5:* The human resource management domain has a direct relationship with job outcomes and an indirect relationship with standards of care, with professional support mediating this relationship.
- *Hypothesis 6:* Workload and professional support have a direct relationship with job outcomes and standards of care.

2.5. Measurement instruments

A set of standardised measurement instruments were used to cover the domains of interest, combined into a single self-administered questionnaire. The questionnaire had four sections comprising demographic and employment characteristics, nurse practice environment, job satisfaction, and intention to leave. The *demographic and employment characteristics* included age, sex, type of employment (permanent or contract), length of service, years in nursing, and whether they chose to work at their current primary health care clinic. We used the revised *Practice Environment Scale* (Lake, 2002) to measure the nurse practice environment. Job satisfaction was measured using the *Measure of Job Satisfaction* (Traynor and Wade, 1993) and a single item on *overall job satisfaction* (Alharbi et al., 2020; Sihvola et al., 2023), while two items were used to measure *intention to leave* (Meyer et al., 1993). A summary of all the tools used in the study is provided in Supplementary Material S1. The key constructs measured in this paper are described in more detail below.

[1] A facility at and from which a range of primary health care services are provided and that is normally open 8 hours a day based on need of the community to be served.

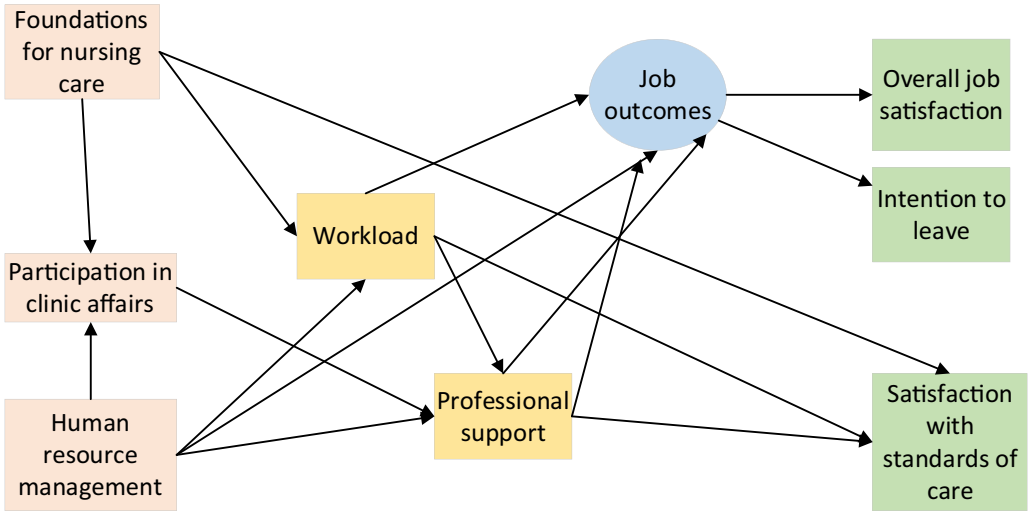


Fig. 1. Hypothetical model.

2.5.1. Nurse practice environment

The nurse work environment was measured using the revised *Practice Environment Scale of the Nursing Work Index*, which is a validated tool used internationally (Alharbi et al., 2020; Zangaro and Jones, 2019). This tool was adapted for relevance to the primary health care clinic level and the South African context. The internal consistency of each subscale has been demonstrated by previous researchers (Lake, 2002; AbuAlRub et al., 2023). The Cronbach's alpha for the entire scale is 0.82, ranging from 0.71 to 0.84 for its subscales (Lake, 2002; AbuAlRub et al., 2023; Al Sabei et al., 2021). Several researchers have also established its predictive validity in multiple settings in relation to nurse outcomes (Aiken et al., 2012; Warshawsky and Havens, 2011). In our study, the Cronbach's alpha was similarly high (above 0.70) (Supplementary Material S2). The study participants were asked to rate their agreement about the presence of specific work environment attributes in their current job using a 5-point Likert scale (1= strongly disagree and 5=strongly agree).

2.5.2. Workload

The applicability of the Measure of Job Satisfaction scale has previously been confirmed at the South African primary health care level (Munyewende et al., 2014). Workload was measured using the 7-item Satisfaction with Workload subscale of the Measure of Job Satisfaction using a 5-point Likert scale where 1 = very dissatisfied and 5 = very satisfied for each item. The participants indicated the extent to which they were satisfied or dissatisfied with a series of statements about their current job, such as *"the amount of time available to get through my work"* and *"the time available for patient care"*.

2.5.3. Professional support

Similarly, professional support was measured using the 8-item Satisfaction with Professional Support subscale of the Measure of Job Satisfaction scale (Traynor and Wade, 1993). Respondents rated the extent of their satisfaction about a series of statements (such as *"the degree to which I feel part of a team", "the amount of support I receive from the primary health care facility manager"*) related to professional support in their current job on a 5-point Likert scale where 1 = very dissatisfied and 5 = very satisfied for each item.

2.5.4. Nurse job outcomes

In this study, three job outcomes were assessed: *overall job satisfaction, intention to leave the current clinic*, and *intention to leave the nursing profession*. Consistent with several previous studies (AbuAlRub et al., 2023; Alharbi et al., 2020), we used a single item to measure *overall job satisfaction.* The rationale for using a single item was to avoid conflation between the explanatory and outcome variables and in recognition that many established measures of nurses' job satisfaction have items that overlap with concepts and items of the Practice Environment Scale of the Nursing Work Index (Alharbi et al., 2020). The nurses were asked to rate their overall job satisfaction on a scale of 1 = very dissatisfied and 10 = very satisfied.

Nurses' *intention to leave* was measured using two items adapted from other previous studies (Meyer et al., 1993; Kutney-Lee et al., 2013) asking them to report their likelihood to leave their current clinic and the nursing profession. The participants were asked about their agreement with two statements on a 5-point scale where 1 indicated "strongly disagree" and 5 indicated "strongly agree". In our study, the Cronbach's alpha for job outcomes was 0.64 (Supplementary Material S2).

2.5.5. Standards of care

To measure standards of care, the 4-item Satisfaction with Standards of Care subscale of the Measure of Job Satisfaction scale was used. Respondents rated the extent of their satisfaction about a series of statements related to standards of care in their current job on a

5-point Likert scale where 1 indicated "very dissatisfied" and 5 indicated "very satisfied" including *"the standards of care provided to patients"* and *"the standard of care that I am currently able to give to patients"*.

Munyewende et al. (2014) reported Cronbach's alpha coefficients of between 0.75 to 0.94 for the overall Measure of Job Satisfaction scale. The concurrent and discriminant validity of this scale was also reported to be satisfactory (Traynor and Wade, 1993). In our study, the Cronbach's alpha coefficients of the subscales of Measure of Job Satisfaction (workload, professional support, and standards of care) were very high (above 0.80) (Supplementary Material S2).

2.6. Data collection

A self-administered questionnaire was developed on the REDCap interface, an online electronic survey system (Harris et al., 2009). Four fieldworkers were trained to assist with data collection. After providing their consent, frontline nurses were given tablets to complete the questionnaire themselves, with fieldworkers available to help or clarify the questions where necessary. The survey took between 15 and 20 min to complete.

2.7. Data analyses and model testing

The data was exported from the REDCap into Stata 17 for data cleaning and analysis. Stata was also used for all analysis including descriptive analysis, computation of Cronbach's alphas, and correlation coefficients (Aiken and Patrician, 2000; Van Bogaert et al., 2017).

All of the tools used a 5-point Likert scale, except the overall job satisfaction one, which used a Likert scoring of 1–10. To simplify the interpretation and comparability of the responses, we rescaled the original Likert scoring of 1–5 and 1–10 to new scales ranging

Table 1
Observed (a) and latent variables (b) of the causal structure of nurse practice environment, workload, professional support, and outcomes with mean scores and SEM model loadings.

	*$N = 662$	
	Mean (SD)	Loading
Nurse practice environment		
Foundations for nursing care (b)	**71.2 (19.1)**	
The PHC facility manager ensures that nurses are offered training opportunities to improve the standards of care they provide to patients (a)	68.3 (26.5)	0.63
Through supervision, the PHC facility manager ensures that nurses in this clinic always follow clinical guidelines for priority diseases (a)	74.8 (22.5)	0.68
This clinic has clinically competent nurses with relevant skills in primary care nursing (a)	77.1 (21.6)	0.45
The PHC facility manager regularly monitors the queues in the clinic to identify high risk patients (a)	65.7 (29.6)	0.59
Nurses' participation in clinic affairs (b)	**68.0 (23.1)**	
The PHC facility manager has created a forum that includes nurses to discuss or report on clinic operational matters (a)	65.6 (28.5)	0.64
The PHC facility manager ensures that nurses are given opportunities to participate in decisions that affect the running of the clinic (a)	65.8 (28.7)	0.69
The PHC facility manager has established clear reporting structures in this clinic (a)	69.0 (26.3)	0.74
The PHC facility manager assists nurses with finding solutions to the problems we bring to his/her attention (a)	67.1 (27.9)	0.75
Human resources management (b)	**61.7 (23.6)**	
When there is a need for additional staff in this clinic, the PHC facility manager ensures that the post is filled (a)	51.9 (30.6)	0.59
The clinic has a system in place to manage staff absenteeism actively (a)	61.7 (29.6)	0.59
The PHC facility manager gives due recognition and praise to nurses for a job well done (a)	63.0 (30.1)	0.64
The PHC facility manager treats all employees fairly (a)	57.4 (32.3)	0.68
Workload (b)	**52.2 (22.1)**	
The time available to get through my work (a)	60.2 (29.0)	0.48
My workload (a)	40.6 (32.0)	0.51
Overall staffing levels (a)	40.9 (30.9)	0.49
The time available for patient care (a)	57.9 (28.6)	0.49
Professional support (b)	**67.7 (20.1)**	
The degree to which I feel part of a team (a)	67.6 (25.5)	0.58
The amount of support and guidance I receive from the PHC facility manager (a)	65.9 (29.7)	0.74
The support available to me in my job (a)	66.2 (26.7)	0.73
The contact I have with colleagues (a)	76.0 (20.4)	0.52
Nurses' job outcomes (b)		
Intention to leave clinic (a)	53.8 (34.6)	−0.49
Intention to leave nursing (a)	35.6 (35.3)	−0.29
Overall job satisfaction (a)	58.9 (27.1)	0.59
Standards of care (b)	**75.0 (19.2)**	
The standards of care provided to patients (a)	72.5 (23.1)	0.57
The standards of care that I am currently able to give to patients (a)	77.5 (21.3)	0.47
The general standard of care given in this facility (a)	73.5 (22.1)	0.59
Patients receive the care that they need (a)	76.6 (20.9)	0.57

SEM= structural equation modelling; SD= standard deviation; PHC= primary health care.

from 0 to 100. Pertaining to the revised Practice Environment Scale of the Nursing Work Index scale, we classified the overall mean scores out of 100 for each domain as follows: 49.9 and less – *low agreement*; 50–69.9 *moderate agreement*; 70–79.9 *high agreement*; 80 and above *very high agreement*. The mean subscale scores were computed for each item and across the items for each of the seven domains, with higher scores indicating a more favourable or positive work environment, while a low score indicated an unfavourable or negative practice environment (Lake, 2002).

Likewise, we also classified the overall mean scores out of 100 for each of the subscales of the Measure of Job Satisfaction (workload, professional support, and standard of care) and the overall job satisfaction measure as follows: 49.9 and less – *low satisfaction*; 50–69.9 *moderate satisfaction*; 70–79.9 *high satisfaction;* 80 and above *very high satisfaction*. A higher mean score indicated higher satisfaction with the constructs. With regards to intention to leave, we reported on a percentage of those intending to leave.

AMOS version 28 software (Arbuckle, 2019) was used for the confirmatory factor analysis (CFA), causal structure analysis, and model testing. Bentler and Chou (1987) recommend that model stability and a sufficiently powered analysis in structural equation modelling (SEM) is dependent on the ratio between the total number of variables (error measurements, observed (indicators) and latent variables (dimensions)) and the sample size, with a ratio of approximately five subjects per variable. Therefore, a selection of four observed items for each dimension of the revised Practice Environment Scale of the Nursing Work Index scale, workload, and professional support were included in the SEM model based on content to equalise measurement weighting across indicators (Byrne, 1994). A total of 27 variables (error measurements, observed and latent variables) were included in the model and analysed (Table 1). While the acceptable range for factor loading in SEM depends on various factors (Al-Atwi, 2015), other researchers suggest factor loadings of 0.40 or higher as acceptable (Tavakol and Wetzel, 2020). In our study, all of the SEM factor loadings were acceptable (ranging from 0.45 to 0.75), except for the item on intention to leave nursing (0.29) which indicates lower correlation (Table 1).

Prior to model testing, the data were analysed descriptively and intercorrelations were investigated. Following the construction of a correlation matrix for all the variables, the causal structure was then tested using SEM. The model was tested with the dimensions of the revised Practice Environment Scale of the Nursing Work Index scale, workload, professional support, job outcomes, and standards of care as latent variables. Maximum likelihood estimation and estimation of means and intercepts were calculated for model testing. We also confirmed that the missing data did not follow any specific pattern.

To verify and improve models' plausibility, various fit measures (e.g., Comparative Fit Index (CFI), Incremental Fit Index (IFI) and Root Mean Square Error of Approximation (RMSEA) were calculated and compared against accepted criterion levels (Van Bogaert et al., 2013). CFI and IFI values of >0.90 and RMSEA values <0.08 are considered to indicate a good fit. Mediating relationships were accepted in the model when the mediating variable statistically significantly explained the association of the predictor variable with the outcome variables (Baron and Kenny, 1986). Decisions regarding model modifications, such as deletion or inclusion of additional pathways, were based on the statistically significant impact of the chi-square value (e.g., modification indices) and on existing literature. A statistically significant level of $p < 0.05$ was used for all analyses.

2.8. Ethical considerations

Ethical clearance to conduct the study was obtained from the University of the Witwatersrand Human Research Ethics Committee

Table 2
Demographics and employment characteristics of frontline nurses ($n = 665$).

	Gauteng			North West		
Variables	Mean (SD)	*n	%	Mean (SD)	*n	%
		496	74.6		169	25.4
Age (years)	43.8 (10.2)			42.6 (11.1)		
Service years	12.7 (8.9)			10.5 (8.7)		
Years in current position	7.1 (5.7)			6.7 (7.3)		
Sex						
Male		42	8.5		27	15.9
Female		454	91.5		142	84.0
Current position						
PHC professional nurse		187	82.7		39	17.3
Professional nurse		179	72.8		67	27.2
Staff nurse/ enrolled nurse		88	90.7		9	9.3
Auxiliary nurse/ enrolled nurse assistant		42	43.8		54	56.3
Employment status						
Permanent position		483	77.4		141	22.6
Contract position		13	31.7		28	68.3
NHI site						
Yes		233	46.9		93	55.0
No		263	53.0		76	44.9
Chose to work at current PHC clinic						
Yes		266	53.6		108	63.9
No		230	46.4		61	43.8

* *n* represents the sample of the nurses who completed all the questions in the survey.
SD= standard deviation; PHC= primary health care; NHI= national health insurance.

(Medical) (#M180765). We also obtained permission from the Gauteng and North West Departments of Health, as well as the district health authorities. We adhered to all ethical standards of voluntary participation, respect, anonymity, and confidentiality. Prior to data collection, all participants received a detailed study information sheet, as well as verbal explanation of the study. Participants provided consent by pressing the 'yes' button on the first screen of the REDCap questionnaire.

3. Results

The total study sample was 665 nurses of all categories (Table 2): 496 in Gauteng (74.6 %) and 169 in North West (25.4 %). The participants were predominantly females, with a mean age of 43.8 years and 42.6 years in Gauteng and North West provinces respectively. The mean years of nursing experience was 12.7 in Gauteng and 10.5 in North West province, ranging from 6 months to 50 years. Tenure in the current position was 7.1 years for Gauteng and 6.7 years for North West province nurses, ranging from 6 months to 40 years. In Gauteng, the majority of the nurses (77.4 %) were in permanent positions, compared to only 22.6 % in North West province.

Table 1 shows that the 662 nurses with complete data perceived the practice environment domains of foundations for nursing care, nurses' participation in clinic affairs, and human resources management as favourable, with mean values out of 100 of 71.2, 68.0, and 61.7 respectively. However, two items in the human resource management domain, namely agreement on the primary health care facility manager ensuring that vacant positions are filled and fair treatment of all employees, had mean scores ratings of 51.9 and 57.4 respectively, indicating moderate agreement of nurses for these items.

Similarly, Table 1 shows that the mean score for workload was 52.2, suggesting moderate satisfaction of nurses with this aspect. Items that scored lower included satisfaction with "my workload" and "overall staffing levels", with mean values of 40.6 and 40.9 respectively. The mean score for professional support was slightly higher than that of workload (67.7), indicating moderate satisfaction with this aspect. In terms of nurses' job outcomes, 53.8 % of the nurses reported that they intended leaving the clinic where they were currently working while 35.6 % reported that they intended leaving the nursing profession. Regarding overall job satisfaction, the mean score was 58.9, indicating that the nurses were moderately satisfied with their current job.

In Supplementary Material S3, we show the correlations between study variables. There was a statistically significant positive correlation between the three Practice Environment Scale of the Nursing Work Index domains and the Measure of Job Satisfaction domains of workload and professional support. A statistically significant negative correlation was observed with *intention to leave clinic* for *foundations for nursing care, nurses' participation in clinic affairs, human resource management, satisfaction with workload*, and *satisfaction with professional support*. A negative correlation was also found for *intention to leave nursing* in relation to *foundations for nursing care, nurses' participation in clinic affairs, human resource management, satisfaction with workload*, and *satisfaction with professional support*. The correlation of *overall job satisfaction* with both *intention to leave clinic* and *intention to leave nursing* was also negative and statistically significant.

In the first SEM model (Fig. 2), based on the hypothesised model, the domain of foundations of nursing care, nurses' participation in

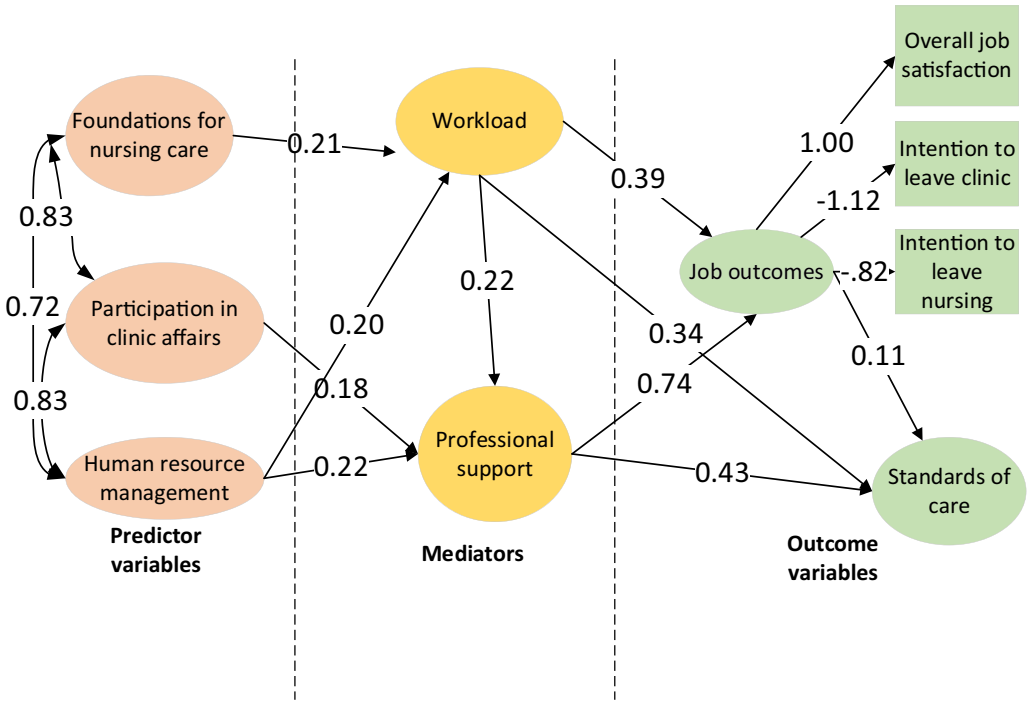


Fig. 2. Model 1 - tested causal model of nurse practice environment and outcomes.

clinic affairs and human resource management were inter-correlated. All estimated path coefficients were statistically significant ($p < 0.001$) and the model showed an adequate fit to the data, with an explained variance of 58.5 % on job outcomes and 38.0 % on standard of care.

Based on modification indices (MI), as well as empirical and theoretical grounds, a second model was tested (Fig. 3) with job satisfaction as a mediator instead of an outcome and with intention to leave and standards of care remaining as outcome variables. This model showed a better overall fit to the data ($\chi^2 = 905.15$; *d.f.* = 306; $p < 0.001$; *IFI* = 0.940, *CFI* = 0.939; *RMSEA* = 0.054) with an explained variance of 42.0 % on job outcomes and 29.2 % on standards of care.

All the estimated factor loadings were statistically significant ($p < 0.001$) (Table 1). Similarly, all the estimated path coefficients were statistically significant ($p < 0.001$), except one pathway between human resource management and overall job satisfaction, which was not confirmed ($p = 0.425$) (Fig. 3). The pathway between professional support and overall job satisfaction was statistically significant with $p < 0.05$.

Fig. 3 also demonstrates that the effect of foundations for nursing care on overall job satisfaction and on standards of care was mediated by workload. Likewise, the effect of nurses' participation in clinic affairs on standards of care, as well as that of human resource management on standards of care, was mediated by professional support. Similarly, the effect of human resource management on overall job satisfaction was mediated by professional support ($p < 0.05$). However, there was also a direct effect between human resource management and overall job satisfaction. Our final model did not show any effect between human resource management and workload nor a direct effect of human resource management on intention to leave. The effect between human resource management and intention to leave was mediated by overall job satisfaction. In addition, we did not find a direct effect between workload and intention to leave; the effect of workload on intention to leave was mediated by overall job satisfaction.

4. Discussion

This is one of the first studies that provides empirical evidence on the impact of the nurse practice environment, workload, and professional support on job outcomes and standards of care in a South African primary health care setting.

In our study, the nurse practice environment domains of *foundations for nursing care, human resource management*, and *participation in clinic affairs* were reported as favourable. However, lower mean scores on items on the filling of vacant posts and fair treatment of all employees in the domain of *human resource management* suggest that these items were considered as unfavourable by nurses. The inability to fill vacant positions could be explained by the cost containment measures that have been introduced in South Africa for several years now, which aimed to ensure efficiency savings, prioritisation of spending on service delivery, and reduction of wasteful expenditure (Eagar et al., 2019; Ndebele, 2021). This led to reduced funding in the public health sector and consequently, a moratorium on the filling of vacant posts, including critical personnel like nurses (Ndebele, 2021). This is a countrywide problem that is not necessarily under the control of the primary health care facility managers nor the Ministry of Health. While these economic challenges are acknowledged, it is also important to consider that high vacancy rates and understaffing of the nursing personnel have a negative impact on the overall delivery of quality health services (Osaro and Chima, 2014; Chipeta, 2014). In their study, Osaro and Chima

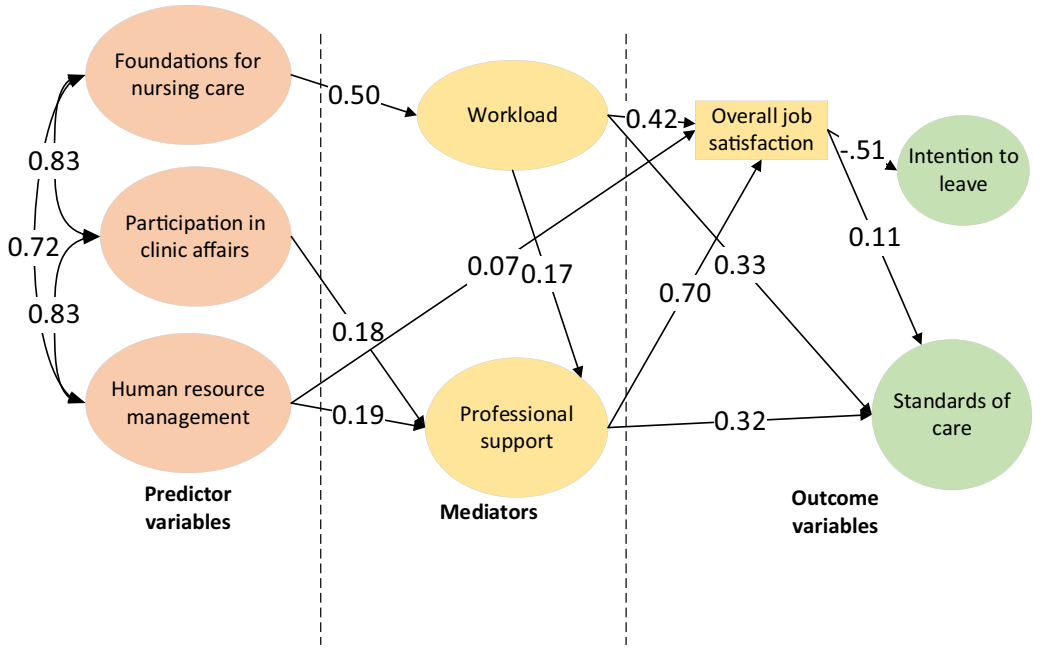


Fig. 3. Model 2 - final causal model on nurse practice environment and outcomes.

(2014) also reported that a moratorium on filling vacant posts was associated with decreased employee morale and productivity.

Although the facility managers may not have control of the personnel budget to fill posts, they have more control in ensuring that all staff are treated fairly. Unfair treatment of staff creates conflict and disharmony among health workers (Serapelwane and Manyedi, 2022), resulting in psychological distress, negative impact on teamwork, and low productivity (Chipeta et al., 2016; Saleh et al., 2018). To ensure fair treatment of staff, primary health care facility managers should avoid favouritism and discrimination of staff (Serapelwane and Manyedi, 2022). In-service training of primary health care facility managers focusing on professional working relationships and on maintaining equality in the workplace may also be considered as an integral part of improving treatment of staff by their supervisors (Serapelwane and Manyedi, 2022).

Nurses in our study also reported that they were moderately satisfied with *workload* and *professional support*. With regards to *workload*, the lowest scores were specifically obtained for the items on 'my workload' and 'overall staffing levels'. Due to unfilled vacant posts and staff shortages, nurses would often have to work with limited human resources, and this increased their workload. Researchers have demonstrated that employee workload impacts on health worker exhaustion, individual and organisational stress, employee performance, job satisfaction, and turnover intention (Inegbedion et al., 2020; Asaloei et al., 2023, Hellín Gil et al., 2022). Primary health care facility managers should make deliberate efforts to improve nurses' working conditions by ensuring a more equitable distribution of workloads and create a sense of fairness amongst nurses (Inegbedion et al., 2020).

Consistent with other available evidence (Munyewende et al., 2014), this study also found that there was high rating of satisfaction with the *standards of care* by primary health care clinic nurses, suggesting that these nurses were highly satisfied with the standards of care they provided to patients and the general standard of care given at their facilities. While this is encouraging, in our study, satisfaction with *standards of care* was based on nurses' perspectives, which are subjective, rather than a more objective measure of patient outcomes. This is a study limitation. However, it is still useful to assess nurses' views because these have implications for the overall standards of care they provide to patients.

More concerning was the relatively high proportion of nurses intending to leave their clinic or the profession because this was considered to be an important predictor to their subsequent departure from work (Galanis et al., 2024; Ki and Choi-Kwon, 2022). These results on intention to leave are also worrying because nurses have already mentioned dissatisfaction with workload as an issue. Work overload, poor economic situation, limited opportunities for promotion, lack of recognition, and low job rewards are some of the factors contributing to nurses' intention to leave their profession in low- and middle-income country (Ayalew et al., 2021). Primary health care facility managers have a role to play in influencing the turnover intentions of nurses by creating favourable work environments that addresses some of these factors which could improve nurse retention within their clinics.

Our study was conducted during the COVID-19 pandemic, which may have increased intention to leave. Other researchers found that the pandemic exacerbated the nurses' intention to leave work (Ulupınar and Erden, 2024; Nashwan et al., 2021) because of COVID-related stress and trauma, fear of contracting COVID (Alnaeem et al., 2022; Labrague and De los Santos, 2021), the death of health personnel due to COVID (Ulupınar and Erden, 2024), discomfort in taking care of patients with COVID (Lavoie-Tremblay et al., 2022), a shortage of personal protective equipment, burnout (de Cordova et al., 2022), and physical exhaustion because of increased workload (Ulupınar and Erden, 2024; Said and El-Shafei, 2021).

Regarding the relationship between nurse practice environment domains and outcomes, our study supported hypothesis 1. We found that the relationship between the *nurse practice environment* and *job outcomes* and *standards of care* was mediated by *workload* and *professional support*. Hypothesis 2 was partially supported in our final model. While there was a direct relationship between the domain of *foundations for nursing care* and *workload*, the relationship between *standards of care* and *foundations for nursing care* was mediated by workload. We also found an indirect but positive relationship between *foundations for nursing care* and *overall job satisfaction* and *standards of care*, as well as an indirect negative relationship between *foundations for nursing care* and *intention to leave*.

In our final model, hypothesis 3 was supported. The *participation in clinic affairs* domain was directly associated with *professional support*, and an indirect positive relationship between nurses' *participation in clinic affairs* and *standards of care* and *overall job satisfaction* was also observed in our study. This finding was supported by researchers from Saudi Arabia and Oman that reported that nurses' participation in hospital affairs was positively associated with the outcomes of emotional exhaustion and job satisfaction (Alharbi et al., 2020) and reduced the likelihood of burnout (Al Sabei et al., 2019). Our study also found an indirect negative association between *nurses' participation in clinic affairs* and *intention to leave*. Increasing nurses' participation in clinic affairs may enhance their autonomy, which is one of the critical work-related factors that has been associated with lower turnover intentions (Alqasmi and Ahmed, 2023). Furthermore, enhancing nurses' participation in clinic affairs could be one of the promising cost-effective strategies for establishing positive work environments and, therefore, improving the job satisfaction and retention of nurses (Albashayreh et al., 2019).

Hypothesis 4 was partially supported in our study. Although there was a direct relationship between the domain of *human resource management* and *professional support*, no relationship was found between *workload* and *human resource management* in our final model. This was an unexpected result considering that workload management is one of the critical activities of human resource management. Similarly, our study partially supported hypothesis 5. There was no direct relationship between the *human resource management* domain and *job outcomes*; this relationship was mediated by *job satisfaction*. However, as hypothesised, the relationship between *human resource management* and *standards of care* was moderated by *professional support*. In addition, our study found an indirect relationship between *human resource management* and *standards of care* as well as an indirect negative association between *human resource management* and *intention to leave*. However, there was a weak but positive direct relationship between *human resource management* and *overall job satisfaction*. We could not find studies that have reported any effect between *human resource management* and outcomes. Instead, some of the elements of the positive practice environment that have been found to improve nurses' job satisfaction include quality and supportive leadership, collegial nurse-physician relationship, foundations for nursing care, nurse autonomy, and patient

centred care (Bence et al., 2022).

In our study, hypothesis 6 was also partially supported. Although *workload* and *professional support* had a direct effect on *standards of care, job satisfaction* mediated the relationship between *workload* and *job outcomes*, as well as between *professional support* and *job outcomes*.

From our analysis, we further confirmed the hypothesised positions of each variable, except for *overall job satisfaction* in our second model, which proved to be the third mediator between *intention to leave* and *standards of care* outcomes, in addition to *workload* and *professional support*. As expected, moderate overall job satisfaction of primary health care clinic nurses negatively predicted high intentions to leave the clinic. This finding is supported by other studies in low- and middle-income country (Akinwale and George, 2020; Kim et al., 2021) . However, *overall job satisfaction* positively predicted perceptions of good *standards of care*. The effect between *human resource management* and *intention to leave* was also mediated by *overall job satisfaction*.

Although our study did not find a direct association between *nurses' participation in clinic affairs* and outcomes, other researchers confirmed these associations (Alharbi et al., 2020; Albashayreh et al., 2019; Al Sabei et al., 2019). Future research is needed to confirm certain additional pathways not found in our study, such as the direct pathways between *human resource management* and *workload*, as well as between *human resource management* and *standards of care*. There is also a clear need from both research and practice perspectives to confirm the role of *professional support* as a mediator for nurse practice environment dimensions and outcomes. In addition, a qualitative study is also required to explain and confirm the associations described in the present analysis.

We used well-established validated tools with proven psychometric properties across multiple studies and countries with different contexts (AbuAlRub et al., 2023; Lake, 2002).The application of these tools in a primary health care setting in a low- and middle-income country, and confirmation of the mediation role of workload and professional support, are major contributions of the present study. Structural equation modelling also proved to be a suitable analytical method to explore the direct and indirect relationships in this study.

4.1. Limitations

We used a cross-sectional study design that captured only the perspectives of the nurses who remained in public service and were present on the day of data collection. Longitudinal studies could be considered in future studies to overcome this limitation. All measures were nurse-reported, subjecting the study to potential social desirability bias. In addition, as noted in the discussion section, satisfaction with standards of care was based on nurses' subjective perspectives, rather than a more objective measure of patient outcomes. We conducted this study in only two provinces; therefore, the generalisability of the findings may be limited.

5. Conclusion

We found that the relationship between nurse practice environment, job outcomes, and standards of care was mediated by workload and professional support, thus pointing to the need for targeted interventions on these mediators by primary health care facility managers. Our study also highlights the value of supportive practice environments, effective workload management, and enhanced professional support in improving nurses' job outcomes and satisfaction with standards of care. As primary health care is the stated foundation of the South African health system and the path to universal health coverage, improving nurses' practice environments at primary health care level may have wide-ranging impact on the performance of the health system. Therefore, primary health care facility managers should initiate measures that can reduce nurses' workload, enhance professional support, and improve the overall work environment. Such measures could ultimately lead to increased job satisfaction and nurse retention in primary healthcare clinic settings in low- and middle-income countries.

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CRediT authorship contribution statement

Prudence Ditlopo: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Conceptualization. **Laetitia C. Rispel:** Writing – review & editing, Visualization, Validation, Supervision, Methodology, Funding acquisition, Conceptualization. **Peter Van Bogaert:** Writing – review & editing, Visualization, Validation, Supervision, Methodology, Formal analysis, Data curation, Conceptualization. **Duane Blaauw:** Writing – review & editing, Visualization, Validation, Supervision, Methodology, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to

influence the work reported in this paper.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.ijnsa.2024.100241.

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