Author's response to reviews

Title: Measuring and Managing the Work Environment of the Mid-level Provider: The Neglected Human Resource.

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Author's response to reviews: see over

Response to Reviewer 1.

Reviewer's comments in black and responses in blue.

The abstract talks about "staff", "clinical staff", mid-level medical staff (clinical officers, medical assistants), are they not paramedical??, mid-level nurses (enrolled nurses), what is exactly included, what is all staff? What are low-level nurses? What are registered nurses: are they high-level nurses? What are mid-level providers? I believe mid-level health care providers. The study includes all "health professional workers" what are those? Does this include doctors? Assistant/auxiliary nurses? Please, describe each category in terms of qualifications (training)

The terminology in the abstract has been amended and a clear definition of mid-level cadres has been inserted in a foot-note. Further clarification is provided in the section headed "sample".

The review talks about lack of doctors. But what of lack of the mid-level health care providers? Nothing is said about that and yet to study is on that.

The paper makes the point that these mid-level cadres are the mainstay of the health system. They are not in short supply by comparison to doctors and registered nurses. However, there is mal-distribution of these health workers and some evidence that they may also be subject to push factors that cause them to leave the health sector. The study aims to explore their perceptions of their work environment and how these relate to their job satisfaction and intentions to stay in or leave their current posts.

374 health workers include total sample, please, describe the break down by each health worker category in the total health care worker workforce and the final sample participating.

The study did not collect demographic information on all staff in the facility, only the 153 that participated in the study. Table 1 shows the categories of health worker in the sample.

What of the use to the western instruments used in other developing, African countries (with health care workers?
How were the interviewers, describe? Were questionnaires administered in English? What was the result of the pilot? What was changed?
The instrument used was developed for nurses but in the study medical assistants and clinical officers (mini-doctors) are also included, how did this change the instrument? How was it exactly adapted? In the scale doctors and nurses are mentioned but not clinical official officers and medical assistants?

The Healthcare Providers Work Index (HPWI) is an adaptation of the Revised Nursing Work Index (NWI-R) developed by Aiken and her colleagues from the Nursing Work Index (NWI). Research with the NWIR has reported differing factor structures, suggesting that there is variability in how the questionnaire items are

understood across different samples. This may reflect the sensitivity of the questionnaire to the different contexts in which it has been used, or difficulties with particular items within the questionnaire. To ensure that the questionnaire was a valid and reliable measure for this study population we undertook two forms of analysis: a Principal Components Analysis to explore the factor structure; and a Rasch analysis to identify if the emergent factors were being optimally measured by the existing items The adaptation of the NWI-R has allowed us to develop a measure of work environment more broadly applicable to health workers. Previous studies that utilised the 15-item NWI-R scale with nursing cohorts have produced a variety of different subscales[i] [ii] with some replicating Aiken & Patrician's four factor model and others identifying only 3 factors. Items (d), (e) and (h) in particular did not load onto any subscale in a number of previous studies. Our analysis of the data from mid-level cadres has produced four distinct subscales; *adequate resources, management support, work relationships* and *autonomy/control over practice* accounting for almost 60 percent of the variance. With this cohort of health workers items (d) *health professionals control their own practice*, (e) *patient care assignments that foster continuity of care* and (h) *freedom to make important patient care and work decisions* load onto the factor autonomy/control over practice which accounts for 8% of the total variance. In addition item (g) *Not being placed in a position of having to do things that are against my professional judgment* failed to load onto any factor and was therefore removed.

Previous qualitative studies in Malawi have not been considered in above efforts, e.g.:

Peltzer, K. (1997). Psychocultural contexts of nursing in Malawi: sources of stress, burnout, coping and satisfiers. Psychopathologie Africaine, 28, 149-176.

Muula AS, Maseko FC. How are health professionals earning their living in Malawi? BMC Health Serv Res. 2006 Aug 9;6:97.

Reference to these studies has been included in the revised manuscript.

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[i] Choi JK, BaKken S, Larson E, Du YL, Sloane PW. Perceived nursing work environment of critical care nurses. *Nurs Res* 2004 ; **53** (6) : 370-378.

[ii] McCusker J, Dendukuri N, Cardinal L, Katofski L, Ricardi M. Nursing work environment and quality of care: Differences between units at the same hospital. *Int J Health Care Quality Assurance* 2005; **18** (7): 543-551.

Response to Reviewer 2.

Reviewer's comments in black and responses in blue.

2. The method somewhere is inadequately described, e.g., on page 4, Job satisfaction items. How job satisfaction was measured? What instrument was used or how it was developed?

Job satisfaction was explored through several items with scaled responses. None of the job satisfaction scales in the extant literature was entirely relevant and appropriate to the context of this research as in addition to job satisfaction we also wished to explore intentions to leave and perceived likelihood of obtaining another position. The items were identified from 1) existing questionnaires, 2) a review of the relevant literature, and 3) suggestions from a panel of researchers and policy makers with expertise in the area. The questions were intended to be descriptive of the particular context of the research, not to be additive.

3. Are the data sound and well controlled?
More information is needed on the description of the statistical tests used, e.g., not clear (on page 5) whether the authors used Student's t-test.

We have indicated where Student's t tests were used.

In addition, on page 5, when using principal component analyses, why the authors used varimax rotation? There is no need to get orthogonal factors here. PCA is adequate, however, but without rotation.

We have given a fuller explanation of the PCA and Rasch Analysis below.

Principal Components and Rasch analysis

Research with the NWIR has reported differing factor structures, suggesting that there is variability in how the questionnaire items are understood across different samples. This may reflect the sensitivity of the questionnaire to the different contexts in which it has been used, or difficulties with particular items within the questionnaire. We therefore undertook two forms of analysis: a Principal Components Analysis to explore the factor structure; and a Rasch analysis to identify if the emergent factors were being optimally measured by the existing items. Rasch analysis on the HPWI identified one item with unacceptable fit: mean square infit = 2.26, mean square outfit = 2.15, standardised infit = 7.1, standardised outfit = 6.9[ii] (Smith 1992). Following removal of the item, principal components analysis with varimax rotation was performed on the 14 items and 4 subscales, accounting for 59% of the variance in the items, were extracted. The PCA with rotation was conducted to achieve simple structure in the data, with each item only loading on to a single factor and each factor determined by a number of strongly loading items (Catell, 1978; Gorsuch, 1983). Rotation of the extracted components produced a more interpretable solution than the unrotated solution.

Cattell, R.B., (1978). The scientific use of factor analysis in behavioural and life sciences. New York, Plenum

Gorsuch, R.L. (1983). Factor Analysis (2nd edition). Hilldale, NJ; Lawrence Erlbaum Associates.

On page 7, the authors noted 'standard multiple regression analyses', however, no tables indicated such analyses. It is also not clear how the authors mean 'standard' - enter method?

Below the table for the regression analysis

	B	Std. Error	Standardised β
(Constant)	5.16	.37	
Adequate resources	-.08	.03	-.24**
Management support	-.01	.04	-.01
Working relationships	-.06	.04	-.15
Control over practice	-.05	.04	-.12

** p < .01

Note: We are not sure if simultaneous regression would be a more familiar term to the reviewer. In essence it was just to note that we did not do hierarchal regression or stepwise regression; in psychology these tend to be called standard but other disciplines call them "simultaneous".