The Relationship Between Staffing Sufficiently by the Workload Indicator of Staffing Needs and HIV Outcomes in Namibia

Gillian I Adynski (gillian.adynski@duke.edu)
Duke University https://orcid.org/0000-0003-0991-8232

Pamela McQuide
IntraHealth: IntraHealth International Inc

George Knafl
University of North Carolina at Chapel Hill School of Nursing

Maria Bock
IntraHealth: IntraHealth International Inc

Ndapewa Hamunime
Namibian Ministry of Health and Social Services

Cheryl B Jones
University of North Carolina at Chapel Hill School of Nursing

Research

Keywords: Nursing Personnel, Workload Indicator of Staffing Needs, Nurse Staffing, HIV services, rural healthcare

Posted Date: May 27th, 2021

DOI: https://doi.org/10.21203/rs.3.rs-531298/v1

Abstract

Background: No study in inpatient or outpatient nurse staffing research have examined nurse staffing using the measure of the World Health Organization's Workload Indicator of Staffing Needs, despite this being a commonly used tool to make staffing decisions across various healthcare settings around the world. This study aimed to understand the relationship between nurse staffing in HIV clinics and the patient outcomes of viral load documentation and viral load suppression in order to better understand the best ways of staffing nurses to provide the best HIV services to clients.

Methods: This study modeled nurse staffing measured as the Workload Indicator of Staffing Needs, with two HIV outcomes of viral load documentation and viral load suppression in remotely located 66 hospitals, health centers and clinics in Northern Namibia. Various control variables were taken into account.

Results: Sufficient nurse staffing based on the Workload Indicator of Staffing Needs was associated with better viral load documentation, however overly sufficient staffing made no difference on viral load documentation. There was no association between sufficient staffing by the Workload Indicator of Staffing Needs and viral load suppression.

Conclusions: Our findings suggest that staffing sufficiently by the Workload Indicator of Staffing Needs was associated with better HIV outcomes of viral load documentation and viral load suppression at the facility level. This suggests that policy makers should continue using the Workload Indicator of Staffing Needs tool to staff their clients in order to have the best HIV outcomes possible at their facilities.

Introduction

The World Health Organizations (WHO)'s Workload Indicator of Staffing Needs (WISN) is a widely used human resource management tool that can be used to determine staffing needs based on the workload of health workers at a particular facility, and is often used to make human resource decisions in low-and middle-income countries (1). However, no prior peer reviewed research has used the WISN to examine the relationship between staffing, as measured by the WISN, and organizational outcomes. This study seeks to model the relationship between sufficient nurse staffing as measured by the WISN in outpatient HIV health services in Namibia, and the HIV organizational outcomes of viral load documentation (VLD) and viral load suppression (VLS).

Past nurse staffing research has not used the WISN as a measure of nurse staffing. However, across other measures, nurse staffing has been associated with chronic disease management (2, 3), quality of care (4–6) and patient satisfaction (7, 8). Specifically, higher numbers of nurses in primary care have been associated with better management of diabetes, hyperlipidemia, and hypertension (9), and higher quality of care (4). Lastly, increasing number of nurse full time equivalents (FTEs) in outpatient facilities was associated with increased patient satisfaction (10). Using the WISN as a staffing measure is key to furthering nurse staffing in outpatient care settings research, as the WISN can be a tool to be used in setting with limited human resources for health where it is critical to staff nurses to the point where they can provide high quality care, but to not waste any nurses to be staffed where it is not needed.

Namibia has a high prevalence of HIV with 11.8% of its national population between the ages of 15–49 reported as living with HIV (11), and some regions having prevalence as high as 22.3% (12). Recent policy changes in Namibia have left nurses as central providers of HIV care by expanding nurses scope of practice to include both initiation and management of antiretroviral therapy (ART) through training and certifying nurses in *Nurse Initiated Management of ART* (13). Namibia is currently working to reach epidemic control through achieving the United Nations' Program on HIV/Acquired Immunodeficiency Syndrome (AIDS) (UNAIDS) 95-95-95 goals, which state that 95% of HIV-positive Namibians know their HIV status, 95% of Namibians who are diagnosed with HIV are on ART, and 95% of individuals on ART have a suppressed viral load (14). Nursing is key to Namibia, amongst other countries in similar situations, achieving epidemic control goals. This paper seeks to further nurse staffing research by modeling sufficient nurse staffing by the WISN with key HIV service outcomes of client's VLD and VLS. A better understanding of this relationship will inform policy makers about the efficacy of staffing by the WISN, and point to the use of the WISN in health services research as a measure of health worker staffing.

Methods

Design

This is a cross sectional study of secondary data originally collected for program evaluation purpose by IntraHealth International (a not for profit global public health organization) and the Namibian Ministry of Health and Social Services (MoHSS).

Setting and Sample

This study utilized 66 health facilities across 5 regions of high HIV burden in northern Namibia as the unit of analysis. Our sample comprised 7 hospitals and 59 health centers and clinics.

Overall, each facility type provides the same level of outpatient HIV services. However, some of the sickest patients are referred to hospitals which are in more populated areas if they are not responding to treatment or if they need in-patient hospitalization. Health centers and clinics, the smaller facility type, are located in community centers and often, but not always, in less populated rural areas.

Variables

Independent Variable. *Nurse Staffing,* the independent variable of interest, was measured using the WISN. The WISN is a ratio of the current number of nurses available in a facility relative to the number of nurses needed. The needed number of health workers is determined from the FTEs need to meet patient care demands based on observations, interviews, service statistics and chart reviews (1). The WISN ratio in this study accounted for the workload of nurses in all HIV services at the facility and outpatient visits over a one-year period. Both types of Namibian nurses, enrolled nurses and registered nurses, who initiate ART therapy were included in our WISN ratio. The WISN ratio was trichotomized into: insufficient staffing (<0.75), sufficient staffing (0.75-2.0), and overly sufficient staffing (>2.0) based on the WISN manual and expert consultation (1).

Dependent Variables. The main dependent variables in this study are US President's Emergency Plan for AIDS Relief (PEPFAR)'s Monitoring, Evaluation and Reporting Indicator guidance variables of VLD and VLS. *VLD* is defined as the number of ART patients with viral load results documented in the medical record in the past 12 months divided by the number of patients on ART for at least twelve months (15). *VLS* is defined as the number of ART patients with suppressed viral load results (<1000 copies/ml), as documented in the medical record or laboratory information system (LIS) in the past 12 months, divided by the number of ART patients with viral load results documented in the medical record or LIS in the past 12 months (15). Patients who died or who had been lost to follow-up were excluded from the denominator.

Covariates. Several other variables were used as covariates in this analysis. The covariates used in this study were skill mix, facility type, HIV burden, patients visit at a facility each year, gender at a facility level, age at a facility level, level of poverty, average household consumption and literacy rate.

Skill Mix was measured as a percentage from the number of RNs out of the total number of ENs and RNs combined. This was included as a covariate because skill mix has been an important variable in previous nurse staffing research, with the ratio of RNs in staffing linked to several positive patient outcomes (16).

Type of facility was also included as a covariate. Type of facility was assessed as either hospital or health center/clinic. A dummy variable was created for each of these two types of facilities, with a reference group for hospitals. Type of facility has also been included in previous nurse staffing research on HIV services (17).

The next covariate is the *HIV Burden* defined as the HIV prevalence in the region of the facility. Previous nurse staffing outpatient research highlighted the importance of controlling for important geographical characteristics in the region of a facility (18, 19).

The number of *patient visits* was included as a covariate because it reflects the amount or volume of work required in a facility over a six-month period as it reflects the busyness of each facility in comparison to other facilities. This covariate did not account for patient uniqueness, meaning that a patient who came to the facility more than once were counted in this number more than once.

Analysis

This study used Poisson regression to explore the relationships between nurse staffing and VLD and VLS at the facility level. Prior to accessing any data, permission was obtained through the Institutional Review Board (IRB) at the University of North Carolina at Chapel Hill (UNC), as well as the Research Division at Ministry of Health in Namibai. The data did not have identifiable health worker or patient information on it.

Power was computed using the Poisson regression procedure of PASS 11 (22), which was based on the following assumptions: predictors are standardized, all predictors other than staffing are at their observed means, a 5% significance level, and an estimated proportion of 0.50 VLD and VLS at the observed mean staffing. A sample size of 73 provided 80% power to identify an increase of about 58% (or an increase of 0.29 units to a viral suppression proportion of 0.79), with an increase of one standard deviation in nurse staffing, in VLD and VLS. Thus, this secondary analysis of existing data was powered by identifying only relatively large effect sizes.

Modeling was conducted first by completing single predictor models; then, if WISN was significant in the single predictor models, by completing two predictor (i.e., WISN and a single covariate) models; and, last, if WISN remained significant in the two predictor models, by completing multiple predictor models (23).

Results

The mean WISN was 1.09, with 38.81% of facilities understaffed, 52.73% sufficiently staffed, and 7.46% overly sufficiently staffed. The WISN for hospitals (0.56) was far lower than that of health centers/ clinics (1.15). Viral loads were documented in 67.39% of patients' charts according to age-related guidelines and to the timing of beginning ART. However, of those patients who had their viral load documented, 90.59% had a suppressed viral load, with 91.88% of females and 86.77% of males having suppressed viral loads. Table 1 outlines descriptive statistics of all variables.

WISN as a predictor of Viral Load Documentations

The WISN had a significant relationship with VLD as a single predictor model. In the two predictor models, the WISN variable remained significant. The following variables were also significant in the two predictor models; skill mix, HIV burden, patient visits, gender, age, average household consumption, and percent literate. Therefore, those variables were all included in the multiple predictor model. When all significant covariates were controlled for, the

category of insufficient staffing was a significant predictor of VLD (estimate of -0.1346, 95%CI: -0.1675, -0.1018, p<0.001). However, the category of overly sufficient staffing did not predict VLD (estimate of 0.0125, 95% CI: -0.0915, 0.1166, p=0.813). These results indicate that, compared to the reference category of sufficiently staffed, facilities in the category of insufficient staffing had poorer VLD; however, a WISN ratio greater than 2 did not improve documentation. Table 3 outlines the relationship between WISN and VLD.

WISN as a predictor of Viral Load Suppression

Variability in VLS was high for low values of WISN and became narrower as WISN increased. But the variability was only consistently high for very high staffing levels of about 2.5 or greater. However, the goal of 90% VLS was achieved for many facilities, in this case 44 of the 66 (66.7%) facilities. Again, it should be noted that the denominator of the VLS is dependent on VLD; thus, VLS is only reflective of the patients for whom viral loads were documented. As a single predictor model there was a significant relationship between WISN and VLS. However, once controlling for covariates in our two predictor models, the WISN variable no longer maintained a significant relationship with VLS as shown in table 4.

Discussion

The purpose of this study was to explore the relationships among nurse staffing in Namibian hospitals, health centers, and clinics in areas with high HIV burdens, and HIV-related organizational outcomes, specifically VLD and VLS. This paper innovatively used the WISN ratio in research as a measure of nurse staffing. Although widely used internationally, this tool has been used only to make staffing decisions; no prior nurse-staffing research was found in which WISN was used as the key measure of nurse staffing. This study's findings indicate that the WISN ratio is a significant predictor of VLD but not of VLS.

The WISN ratio was operationalized as a categorical variable, with the categorical variables assessed at three levels: insufficient nurse staffing (defined as a ratio of < 0.74), sufficient nurse staffing (defined as a ratio of 0.75–1.99), and overly sufficient nurse staffing (defined as a ratio > 2). WISN predicted VLD, even after controlling for covariates. According to the WISN categorical variable, settings with insufficient levels of nurse staffing had lower levels of VLD when compared to settings with sufficient levels of nurse staffing. However, there was no significant relationship between over staffed areas (relative to sufficient nurse staffing) and VLD. These finding reflects the importance of a sufficient level of nurse staffing to improve the outcome of VLD, but staffing beyond that level may not be unnecessary. These findings are also consistent with prior outpatient nurse-staffing research, which reported inverse relationships between nurse FTEs in primary care and hospital admission rates for patients with asthma and COPD (18) and positive relationships between RN FTEs and quality of care scores for patients with COPD, diabetes, and hypothyroidism (24)

WISN was not a significant predictor of VLS once controlling for covariates. In interpretations of these results, it is important to note that VLS is dependent on VLD (i.e., VLS is calculated as the number of viral loads suppressed out of the total number of viral loads documented). Of those patients with viral loads documented 90.3% of our sample had their viral loads suppressed. Therefore, viral load documentation should be a key focus for facilities that wish to improve the patient outcome of VLS and we know that WISN is a significant predictor of viral load documentation.

An initial analysis indicated that significant predictors of VLS were skill mix, number of patient visits in a six-month period, percent of facility patients in certain age categories, percent of poverty, average household consumption, and percent literacy. Although not assessed in this study, VLS may be more sensitive to patient-level factors, such as health behaviors, and country- or regional-level factors, such as medication stockouts, than to nurse staffing. Future research on VLS should incorporate these variables.

Limitations

This research was limited by several factors. First, this research specifically sampled facilities that were a part of a larger IntraHealth intervention, which was specific to areas with high HIV burden. The narrow focus on these facilities could have biased the sampling, and it limits the generalizability of study findings to all Namibian public health facilities. In addition, the unit of analysis in this study was at the facility level. However, patient-level factors, such as age and gender, could be important predictors of VLS. This study accounted only for these factors aggregated to the facility level since individual data was not feasible to collect for this project. Finally, I was unable to access one variable of medication stockouts that is theoretically related to VLS. Medication stockouts would likely decrease VLS of patients, as it would make patients unable to remain adherent to their needed medications. Medication stockout data were also not available at a facility, district, or regional level due to incomplete data, but stockouts are likely a contributor to VLS.

Interpretation and Generalizability

Our results have more generalizable findings that staffing sufficiently based on the WISN could have better patient outcomes. This is especially important results during the COVID-19 pandemic, as workloads of health workers may be rapidly changing and the WISN may be a good tool to determine staffing needs with new workload's of health workers. More research using the WISN as a measure of health worker staffing is needed to best understand the relationships between staffing based on the WISN and organizational, financial and patient outcomes. Since the WISN is used globally as a tool to determine staffing needs on a ward, facility, region or national level it is important to continue using this tool in research to better understand staffing health workers based on the WISN's relationships with organizational outcomes.

Conclusion

Our results indicate that nurse staffing, operationalized by a categorical measure of WISN, was a significant predictor of VLD; however, nurse staffing was not a significant predictor of VLS. These results demonstrate that using the WISN to determine staff sufficiency could help improve VLD of patients on ART in Namibia, and since most patients with viral loads documented had suppressed viral loads it may also indirectly impact VLS. My results also indicate that over-staffing does not have a significant relationship with findings, as there was no significant difference in the relationship between nurse staffing and outcomes at a sufficient level of staffing versus an overly sufficient level. However, VLS may be affected more by factors beyond nurses or nurse staffing. More research is needed to examine other factors that impact VLS. More research needs to continue to use WISN as a measure of nurse staffing, as no prior research has use this measure.

Declarations

Ethical Approval

This study was approved by the University of North Carolina at Chapel Hill's Institutional Review Board (#19-1188) and the Namibian Ministry of Health and Social Services ethical review committee. Namibian Ministry of Health and Social Services also approved this publication.

Consent for publication

No individual details, images or videos were included in this manuscript.

Availability of data and materials

The data that support the findings of this study are available from IntraHealth International but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of IntraHealth International.

Competing interests

The authors declare that they have no competing interests.

Funding

This project was funded by the Alex and Rita Hillman Foundation Advancing Early Research Opportunities Award and the James and Patricia Leak Fund for Nursing Research Award.

Authors' Contributions

GA-Participated in research design, data analysis and writing this paper.

PM, MB, NH- Participanted in data aquiriztion, writing and revisions of this paper.

PM, GK, CJ- participated in data analysis and writing and revisions of this paper.

Acknowledgements

Thanks to IntraHealth International and the Namibian Ministry of Health and Social Services for their support in facilitating data access and collection.

References

1. WHO. Workload indicators of staffing need: User's manual. Geneva: World Health Organization. 2010.
2. Jackson GL, Lee SY, Edelman D, Weinberger M, Yano EM. Employment of mid-level providers in primary care and control of diabetes. Prim Care Diabetes. 2011;5(1):25-31.
3. Lukewich J, Mann E, VanDenKerkhof E, Tranmer J. Self-management support for chronic pain in primary care: a cross-sectional study of patient experiences and nursing roles. J Adv Nurs. 2015;71(11):2551-62.
4. Barber SL, Gertler PJ, Harimurti P. The contribution of human resources for health to the quality of care in Indonesia. Health Aff (Millwood). 2007;26(3):w367-79.
5. Lamkin L, Rosiak J, Buerhaus P, Mallory G, Williams M. Oncology Nursing Society Workforce Survey. Part I: Perceptions of the nursing workforce environment and adequacy of nurse staffing in outpatient and inpatient oncology settings. Oncol Nurs Forum. 2001;28(10):1545-52.
6. Lamkin L, Rosiak J, Buerhaus P, Mallory G, Williams M. Oncology Nursing Society Workforce Survey Part II: perceptions of the nursing workforce environment and adequacy of nurse staffing in outpatient and inpatient oncology setting. Oncology Nursing Forum. 2002;29(1):93-100.
7. Graveley EA, Littlefield JH. A cost-effectiveness analysis of three staffing models for the delivery of low-risk prenatal care. Am J Public Health. 1992;82(2):180-4.

8. Vortherms J, Spoden B, Wilcken J. From evidence to practice: developing an outpatient acuity-based staffing model. Clin J Oncol Nurs. 2015;19(3):332-7.
9. Lukewich J, Edge DS, VanDenKerkhof E, Williamson T, Tranmer J. Association between registered nurse staffing and management outcomes of patients with type 2 diabetes within primary care: a cross-sectional linkage study. CMAJ Open. 2016;4(2):E264-70.
10. Ammi M, Ambrose S, Hogg B, Wong S. The influence of registered nurses and nurse practitioners on patient experience with primary care: results from the Canadian QUALICO-PC study. Health Policy. 2017;121(12):1215-24.
11. World Health Organization. Namibia HIV Country Profile 2019. 2019.
12. Phia Project. Namibia Population-Based HIV Impact Assessment-Namphia 2017. Summary Sheet: Preliminary Findings2018.
13. Mdala JF, Wabomba S, Kalimugogo P, McQuide P, Nummunime H, Indongo R. National Policy on Nurse-Initiated Management of ART Supports Decentralization of HIV Services in Namibia 2018.
14. UNAIDS. Fast-Track; Ending the AIDS Epidemic by 2030. 2015.
15. PEPFAR. PEPFAR Monitoring, Evaluation, and Reporting (MER 2.0) Indicator Reference Guide. 2017.
16. Spetz J, Donaldson N, Aydin C, Brown DS. How many nurses per patient? Measurements of nurse staffing in health services research. Health Services Research. 2008;43(5p1):1674-92.
17. Aiken LH, Sloane DM, Lake ET, Sochalski J, Weber AL. Organization and outcomes of inpatient AIDS care. Medical care. 1999;37(8):760-72.
18. Griffiths, Murrells T, Dawoud D, Jones S. Hospital admissions for asthma, diabetes and COPD: is there an association with practice nurse staffing? A cross sectional study using routinely collected data. BMC health services research. 2010;10(1):276.
19. Okunji PO, Daniel J, Frough S, Hill M. The Relationship between Registered Nurse Staffing and Inpatients HIV/AIDS Clinical Outcome: Severity of Illness. Journal of Family and Community Medicine. 2015:1045.
20. Namibian Statistics Agency. Namibia Household Income and Expenditure Survey (NHIES) 2015/16 Report. Namibian Statistical Agency. 2017.
21. Titus M, McQuide P, Bock R. USAID HIV Clinical Services Technical Assistance Project (UTAP) HIV WISN Analysis for UTAP-Supported Sites. PEPFAR, IntraHealth International, USAID; 2018.
22. Signorini DF. Sample size for Poisson regression. Biometrika. 1991;78(2):446-50.
23. Gonzalez MP, Teran C, Saiz-Urra L, Teijeira M. Variable selection methods in QSAR: an overview. Current topics in medicinal chemistry. 2008;8(18):1606-27.
24. Griffiths P, Maben J, Murrells T. Organisational quality, nurse staffing and the quality of chronic disease management in primary care: observational study using routinely collected data. Int J Nurs Stud. 2011;48(10):1199-210.

Tables

Table 1

Descriptive Statistics for Predictor Variables of Viral Load Suppression and Viral Load Documentation by Facility Type

	Full Sample N=66		Health Centers/Clinics N=59		Hospitals N = 7	
	% or Mean	Standard Deviation	% or Mean	Standard Deviation	% or Mean	Standard Deviation
WISN*	1.09	0.76	1.15	0.78	0.56	0.25
WISN categories*						
Insufficient (WISN<0.75)	38.81%	-	35.00%	-	71.43%	-
Sufficient (.75-2)	53.73%	-	56.67%	-	28.57%	-
Overly sufficient (>2)	7.46%	-	8.33%	-	0%	-
Skill mix*	0.55	0.25	0.52	0.24	0.80	0.20
HIV burden	16.34	1.86	16.47	1.62	15.19	3.21
Patient visits*	5736.41	5253.86	4593.15	3129.47	15372.43	9120.34
Gender (proportion at facility)						
Female	0.69	0.05	0.69	0.04	0.65	0.05
Age (% at facility)						
0-14	6.83	3.14	6.95	3.24	5.86	1.93
15-24	10.06	2.89	10.27	2.88	8.34	2.49
25-49	61.81	7.38	61.31	7.46	65.98	5.38
50+	21.30	6.88	21.47	7.00	19.83	6.03
Level of poverty						
1.1-2.2%	0	-	0	-	0	-
2.3-11.4%	76.12%	-	76.67%	-	71.43%	-
11.5-17.6%	0	-	0	-	0	-
17.7-33.4%	23.88%	-	23.33%	-	28.57%	-
Average household consumption	80885.61	11614.62	80700.56	11557.24	82445.29	12925.14
Percent literate	84.12	3.70	84.23	3.67	83.24	4.11
Percent viral load documented out of total on ART	67.55	18.63	66.16	18.25	79.50	18.97
Female	68.36	19.75	66.90	19.42	80.79	19.57
Male	65.95	18.20	64.64	17.75	77.23	19.50
Percent viral load suppressed out of viral load documented	90.30	5.49	90.35	5.52	89.93	5.61
Female	91.88	5.31	92.02	5.39	90.72	4.82
Male	86.77	9.00	86.61	8.94	88.17	10.12

**Indicates that this variable had significantly different means based on t or chi squared tests at the 0.05 significance level between facility types. For t tests, when the p-value for the F test for equal variances was >0.05, the pooled t-test was used, but otherwise the Satterthwaite t test was used.*

Table 2

Overview of Models Discussed

Outcome Measure	Independent Variable	Single Predictor Model	Two Predictor Model	Multiple Predictor Model
Viral Load Documentation	Categorical WISN	*	*	*
Viral Load Suppression	Categorical WISN	*	X	-

* = WISN was significant at <0.05. For two predictor and multiple predictor models, this symbol implies that the WISN stayed significant for all covariates. Categorical WISN indicates that the F test for the model for the composite predictor was significant.

X = WISN was not significant at <0.05. For two predictor and multiple predictor models, this X implies that the WISN was insignificant for at least one covariate. Categorical WISN indicates that the F test for the model for the composite predictor was significant.

- = Model was not completed due to insignificance at an earlier phase of modeling.

Table 3

Multiple Predictor Model for WISN Predictor and Viral Load Documentation

	Single Predictor			
Predictors	**Estimate**	**SE**	**95% CI**	**p-value**
WISN categories*				
Insufficient (WISN<0.75)	-0.1135	0.0156	-0.1441–0.0829	<.001
Overly sufficient (>2)	-0.0044	0.0529	-0.1080–0.0993	0.9341
Skill mix*	-0.3039	0.0281	-0.3590–0.2487	<.001
HIV burden*	-0.0268	0.0040	-0.0346–0.0190	<.001
Patient visits*	0.0000	0.0000	0.0000–0.0000	<.001
Gender				
Percent female*	-3.1869	0.1728	-3.5255–2.8483	<.001
Age				
0–14	0.0346	0.0028	0.0291–0.0401	<.001
15–24	0.0378	0.0037	0.0306–0.0450	<.001
25–49	0.0059	0.0014	0.0031–0.0087	<.001
50+	0.0000	0.0000	0.0000–0.0000	.
Average household consumption	0.0000	0.0000	-0.000–0.0000	0.736
Percent literate	0.0013	0.0039	-0.0057–0.0083	0.721

**Indicates that the F test for the model was significant at the p<0.05.*

Table 4

Two Predictor Models of WISN and Viral Load Suppression

	WISN Insufficiently Staffed				WISN Over sufficiently Staffed				Variable of Interest[1]			
	Estimate	**SE**	**95% CI**	**p-value**	**Estimate**	**SE**	**95% CI**	**p-value**	**Estimate**	**SE**	**95% CI**	**p-value**
Skill mix*	0.0353	0.0115	0.0127–0.0579	0.002	0.0469	0.0542	0.0542–0.1530	0.3872	-0.0847	0.0254	-0.1344–0.0349	0.001
Facility type												
Health center/clinic*	0.0367	0.0120	0.0131–0.0602	0.002	0.0357	0.0542	-0.0706–0.1419	0.511	0.0066	0.0119	-0.0167–0.0299	0.580
HIV burden*	0.0358	0.0116	0.0132–0.0585	0.002	0.0356	0.0541	-0.0704–0.1417	0.510	0.0039	0.0027	-0.0014–0.0092	0.150
Patient visits	0.0223	0.0125	-0.0022–0.0467	0.074	0.0508	0.0543	-0.0556–0.1572	0.350	0.0000	0.0000	0.0000-0.0000	0.007
Gender												
Percent female*	0.0317	0.0121	0.0080–0.0554	0.009	0.0376	0.0541	-0.0684–0.1436	0.487	-0.1161	0.1365	-0.3636–0.1514	0.395
Age												
0–14	0.0274	0.0127	0.0025–0.0523	0.031	0.0354	0.0541	-0.0707–0.1414	0.513	-0.0031	0.0023	-0.0076–0.0013	0.170
15–24	0.0185	0.0123	-0.0056–0.0425	0.133	0.0266	0.0542	-0.0796–0.1327	0.635	-0.0106	0.0027	-0.0159–0.0052	0.001
25–49*	0.0373	0.0118	0.0141–0.0605	0.002	0.0389	0.0541	-0.0671–0.1450	0.472	-0.0010	0.0011	-0.0031–0.0011	0.355
50+*	0.0298	0.0116	0.0070–0.0526	0.012	0.0355	0.0541	-0.0705–0.1415	0.512	0.0035	0.0011	0.0014–0.0057	0.001
Percent level of poverty												
17.7–33.4%*	0.0310	0.0116	0.0084–0.0537	0.007	0.0258	0.0541	-0.0803–0.1319	0.633	-0.0945	0.0191	-0.1320–0.0570	<0.001
Average household consumption	0.0181	0.0137	-0.0088–0.0450	0.187	0.0274	0.0543	-0.0790–0.1337	0.614	0.0000	0.0000	0.0000–0.0000	0.027
Percent literate*	0.0344	0.0115	0.0118–0.0570	0.003	0.0260	0.0541	-0.0801–0.1321	0.631	0.0098	0.0021	0.0056–0.0139	<0.001

**Indicates that the F test for the model was significant at the p<0.05.*

[1] Variable of Interest refers to the covariate on the left-hand column.