As of September 26, 2014
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Identifying the Structure and Multiple Dimensions of Women's Empowerment: Methodological Considerations in Examining Empowerment and Reproductive Health

Background. Theory and evidence indicate that women's empowerment positively influences reproductive health, and the examination of this relationship has been an important research agenda. Women's empowerment defined by Kabeer (2011) identifies three inter-rerated dimensions – resources (as pre-conditions), agency (as process), and achievement (as outcomes). Sociology theories on gender also suggest the various forms of women's power (Blumberg, 1984; Connell, 1987). Yet the multiple dimensions of power are often neglected in empirical studies, and empowerment has been often operationalized and measured using one composite index and/or proxy measure. In general, women's participation in household decision-making, and access to, or control over household resources (e.g., income) are examined (Malhotra, et al, 2002; Upahdyay, et al. 2014) that represent "agency" and "resources". Additionally, perceptions of gender norms that represent the relationship of women with their partners and perceived equity in power and resources are examined, as well as early marriage and childbearing that are life strategic events for women.

Methodological critique persists with literature on empowerment, due to inconsistency with conceptualization, operationalization, and measurement. Few studies conducted factor analysis to assess the structure and multiple dimensions of empowerment (Agarwala&Lynch, 2006), yet in all the identified studies factor analysis was used only to check the loading of selected indicators for the pre-defined measure/construct for empowerment. The synthesis of evidence has been challenged, because scholars use different methodologies even using the same dataset (e.g., Demographic and Health Surveys - DHS). Several scholars used a summative index

by summing up the number/score of related indicators, and then recoded into a binary measure (e.g., high versus low decision-making participation). Few studies examined a difference by the modality of operationalization (Allendorf, 2007), and none of the identified study using DHS compared the different types of empowerment variables (e.g., summative continuous, binary, each indicator, or latent constructs) as they relate to reproductive health behaviors and/or outcomes.

Aim and Hypothesis. This study aims to 1) identify the structure and multiple dimensions of empowerment in different African settings – Senegal and Tanzania; and 2) compare different operationalization of empowerment as they relate to Skilled Birth Attendant (SBA) use. Study hypotheses include: 1) women's empowerment comprises multiple dimensions; and 2) the different structure of empowerment variables, using different variable types, leads to varied estimates of the influence of empowerment dimensions on SBA use.

Data and Method. This study employs the 2010 Demographic and Health Survey in Senegal (SN) and Tanzania (TZ). The study sample consists of currently married women of age 15-49 who gave birth(s) in the five years preceding the survey (weighted women n=7,033 in SN and n=4,445 in TZ). In multivariate logistic regression, all births that occurred to these women in the given period are included (weighted births n=10,668 in SN and n=6,748 in TZ).

This study has first conducted Exploratory Factor Analysis (EFA) to explore the structure and multiple dimensions of women's empowerment, and then Confirmatory Factor Analysis (CFA) to examine the appropriateness and generalizability of the identified factor structure. Frequently used 10 indicators related to gender-relation between couples are assessed. Also, age at first marriage is included in the factor analysis. Internal consistency for each of the identified factor/dimension is also checked using cronbach alpha.

Second, based on the identified structure and dimensions by factor analysis, this study has conducted multivariate logistic regression analysis on SBA use, employing different operationalization. Various variable types are employed for each of the identified dimension. In particular, regression models are fit separately that include: 1) continuous variables (e.g., the number of household decisions that women participated); 2) binary variables (e.g., if women participated in all decisions or not); and 3) all individual indicators (e.g., if women participated in decisions on own health care, household purchase, or visits to family/relatives).

Results. *Women's empowerment comprises multiple dimensions*, four dimensions identically in the two study settings. The results from EFA and CFA show that there are three factors: 1) household decision-making power (3 indicators); 2) perceptions of gender norms against violence (5 indicators); and 3) perceptions for sex negotiation (2 indicators). The factor loadings of all indicators are high (> 0.69). The correlations among the factors are low, suggesting that each of them is distinct. Also, age at first marriage is shown as a different dimension, because this does not load highly on any of the identified factors.

The varied structure of empowerment variables, using the different variable types, leads to disperse estimates of the influence of empowerment dimensions on SBA use. For example, a continuous variable on household decision-making power (scored 0-3) is significantly and positively related to SBA use in Tanzania (OR=1.129), while only joint-decision making on visits to family/relatives is positively significant (OR=1.291) in the model including all the indicators. Also, conclusions from the model with continuous variables and those with binary variables differ. Age at first marriage, a continuous variable, is significantly and positively associated with SBA use (OR=1.027) in Senegal, while early marriage below age 18, a binary variable, is not significantly related to SBA use.

Discussion. The results suggest that women's empowerment is a multidimensional construct, which comprises distinct dimensions that differently explain the variance of skilled birth attendant use, and possibly other reproductive health service use, behaviors, and outcomes The results with internal consistency using alpha are not consistent with the results from EFA and CFA. Thus the study highlights the usefulness of factor analysis in deciding the operationalization for empowerment. Although the structure and dimensions for empowerment are identical in the selected two countries in this study, it should be cautioned that the structure and dimensions may vary across other settings.

Furthermore, the study compared the different empowerment operationalization, and consequently conclusions in regression analysis differ across the models. This cautions the decision on the operationalization in terms of variable types (e.g., summative continuous/binary, or each indicator). Despite the fact that previous examinations on empowerment and reproductive health generally employ a summative binary measure, the relevance of other variable characteristics (e.g., summative continuous) should not be ruled out. This finding sheds light on the general critique on any summative variables. As far as the structure and dimensions of empowerment are statistically defined, summative variables are at least more efficient in estimation relative to individual indicators. Additionally, separate analyses using Structural Equation Modeling suggest the relevance of summative continuous variables, as well as latent constructs.

It is important to identify the structure and dimensions of empowerment in each context in future studies, because empowerment is a contextually and culturally defined construct. Given that it also entails complex and multi-dimensional nature, methodological decisions on the

operationalization of empowerment should be informed by rationalizing evidence from preliminary analysis of multiple models.

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Table 1: Exploratory Factor Analysis for indicators of women's power (weighted women n=7,033 in Senegal), Demographic and Health Survey (DHS) 2010

Latent construct	*Indicator*	*Aspects that survey asked*	*Factor loadings per iteration*		
			1	*2*	*3*
Household decision-making	health care	Decision on own health care	0.916*	0.007	-0.016
	Purchase	Decision on major household purchases	0.869*	0.001	0.052
	Visits	Decision on visits to family or relatives	0.851*	-0.011	-0.002
Gender norms against violence	go out	Violence if going out without telling her husband	-0.009	0.917*	0.018
	Neglect	Violence if neglects the children	-0.025	0.933*	-0.003
	Argue	Violence if argues with him	0.044*	0.963*	-0.030
	refuse sex	Violence if refuses to have sex with him	0.020	0.911*	0.004
	burn food	Violence if burns the food	-0.022	0.822*	0.022
Gender norms for sex negotiation	negotiate sex	Perceived ability in refusing sex	-0.020	-0.017	0.803*
	negotiate condom	Perceived ability in asking condom use	0.045	0.016	0.771*

Note: Model fit statistics. RMSEA=0.034, CFI=0.996, TLI=0.989, SRMS=0.013. p<.05*.

Table 2: Exploratory Factor Analysis for indicators of women's power (weighted women n=4,445 in Tanzania), Demographic and Health Survey (DHS) 2010

Latent construct	*Indicator*	*Aspects that survey asked*	*Factor loadings per iteration*		
			1	*2*	*3*
Household decision-making	health care	Decision on own health care	0.795*	-0.013	0.034
	Purchase	Decision on major household purchases	0.865*	0.010	0.006
	Visits	Decision on visits to family or relatives	0.939*	0.006	-0.029
Gender norms against violence	go out	Violence if going out without telling her husband	0.039	0.890*	0.007
	Neglect	Violence if neglects the children	0.028	0.922*	-0.014
	Argue	Violence if argues with him	0.016	0.929*	0.007
	refuse sex	Violence if refuses to have sex with him	-0.015	0.883*	-0.093*
	burn food	Violence if burns the food	-0.014	0.863*	0.098*
Gender norms for sex negotiation	negotiate sex	Perceived ability in refusing sex	-0.006	0.101*	0.844*
	negotiate condom	Perceived ability in asking condom use	0.102*	-0.012*	0.693*

Note: Model fit statistics. RMSEA=0.036, CFI=0.996, TLI=0.989, SRMS=0.018. p<.05*.

Table 3: Bivariate and multivariate logistic regression analyses on skilled birth attendant use for births occurring in last 5 years (weighted n=10,668 in Senegal), Demographic and Health Survey (DHS) 2010

		Model 1 unadjusted			Model 2 adjusted			Model 3 final adjusted		
		OR	CI		OR	CI		OR	CI	
Independent variable										
Women's education	No education	0.355 ***	0.303	0.415	0.888	0.741	1.064	0.972	0.809	1.167
(Ref.=Primary edu)	Secondary or above	2.064***	1.457	2.922	0.994	0.659	1.501	0.937	0.616	1.423
Control variables										
Age		1.003	0.995	1.011	1.029 ***	1.018	1.041	1.017 *	1.004	1.031
Household wealth	Poorer	2.476***	2.165	2.833	2.275 ***	1.982	2.612	2.183 ***	1.9	2.508
(Ref.=Poorest)	Middle	6.927***	5.927	8.097	4.547 ***	3.84	5.384	4.273 ***	3.604	5.067
	Richer	17.985	14.295	22.627	7.584 ***	5.89	9.765	6.740 ***	5.22	8.702
	Richest	52.422***	36.208	75.896	18.721 ***	12.88	27.22	15.978 ***	10.944	23.327
Parity	First birth	2.666***	2.330	3.050	2.256 ***	1.797	2.832	1.993 ***	1.566	2.537
(Ref.= 4th or more)	Second or third	1.535	1.370	1.719	1.274 **	1.091	1.489	1.153	0.977	1.36
Employment for payment	(Ref.=not employed)	1.095	0.978	1.225	0.788 ***	0.694	0.894	0.797 ***	0.703	0.904
Household head	(Ref.=not head)	1.693***	1.261	2.274	1.166	0.835	1.627	1.154	0.821	1.624
Urban residence	(Ref.=rural)	10.066***	8.594	11.790	3.032 ***	2.526	3.64	2.854 ***	2.377	3.426
Marital relationship	Polygamous as 1st wife	0.630**	0.533	0.744	0.772 **	0.641	0.929	0.814 *	0.676	0.98
(Ref.=monogamous)	2nd or lower	0.648**	0.567	0.741	0.733 ***	0.63	0.853	0.764 ***	0.656	0.889
Having son(s)	(Ref.=no living son)	0.565***	0.509	0.627	0.858	0.736	1.000	0.868	0.743	1.012
Perceived difficulty in accessing health care (0-4)		0.655***	0.625	0.687	0.864 ***	0.825	0.905	0.865 ***	0.825	0.907
Women's empowerment proxy measures										
Household decision-making power (0-3)		1.229***	1.169	1.293				1.025	0.969	1.084
Perception against violence (0-5)		1.306***	1.271	1.342				1.091 ***	1.059	1.124
Perception for sex negotiation (0-2)		1.508***	1.397	1.627				1.161 ***	1.064	1.267
Age at first marriage		1.131***	1.115	1.146				1.027 **	1.010	1.044
Intercept (coefficient)					-1.2674***			-1.704***		
Model statistics										
LR (Chi-square)					3670.2785			3762.405		
Wald (Chi-square)					1303.6847			1325.9176		
DF					16			20		
P					***			***		

Note: p<.001 ***, p<.01**, p<.05*. Model 1 (simple regression model) was assessed by each explanatory variable, and the model statistics of each model are not reported in the table.

Table 4: Bivariate and multivariate logistic regression analyses on skilled birth attendant use for births occurring in last 5 years (weighted n=6,748 in Tanzania), Demographic and Health Survey (DHS) 2010

Variables		Model 1 unadjusted			Model 2 adjusted			Model 3 final adjusted		
		OR	CI		OR	CI		OR	CI	
Independent variable										
Highest education	No education	0.457***	0.386	0.542	0.667 ***	0.546	0.814	0.702 ***	0.574	0.858
(Ref.=Primary education)	Secondary or above	5.564***	4.088	7.573	1.515 **	1.111	2.066	1.428 *	1.047	1.946
Control variables										
Age		0.986**	0.976	0.996	1.049 ***	1.032	1.067	1.040 ***	1.021	1.06
Household wealth	Poorer	1.169***	0.942	1.451	1.024	0.816	1.286	1.013	0.805	1.274
(Ref.=Poorest)	Middle	1.844***	1.487	2.286	1.531 ***	1.217	1.925	1.528 ***	1.214	1.923
	Richer	3.612**	2.862	4.557	2.140 ***	1.659	2.759	2.170 ***	1.68	2.803
	Richest	21.612***	15.681	29.787	6.72***	4.033	9.141	5.836 ***	3.895	8.744
Parity	First birth	2.757***	2.315	3.283	3.134 ***	2.297	4.274	2.936 ***	2.12	4.066
(Ref.=4th or more)	Second or third	1.731	1.502	1.996	1.901 ***	1.537	2.35	1.778 ***	1.422	2.223
Employment for payment	(Ref.= not employed)	2.163***	1.867	2.506	1.230 *	1.038	1.457	1.197 *	1.009	1.42
Household head	(Ref.= not head)	0.836	0.622	1.124	1.196	0.845	1.693	1.114	0.785	1.583
Urban residence	(Ref.=Rural)	7.305***	5.617	9.499	2.182***	1.582	3.011	2.183 ***	1.589	2.999
Marital relationship	Polygamous as 1st wife	0.401***	0.314	0.513	0.541 ***	0.414	0.707	0.566 ***	0.433	0.739
(Ref.=monogamous)	2nd or lower	0.560	0.449	0.699	0.639 ***	0.494	0.827	0.672 **	0.519	0.87
Having son(s)	(Ref.=No living son)	0.550***	0.482	0.627	0.849	0.699	1.031	0.852	0.701	1.034
Perceived difficulty in accessing health care (scored 0-4)		0.607 ***	0.561	0.657	0.732*	0.672	0.798	0.739 ***	0.678	0.805
Women's empowerment proxy measures										
Household decision-making power (0-3)		1.208***	1.140	1.280				1.129 ***	1.056	1.206
Perceptions against violence (0-5)		1.112***	1.072	1.153				1.018	0.975	1.062
Perceptions for sex negotiation (0-2)		1.376***	1.256	1.507				1.108	0.999	1.230
Age at first marriage		1.102***	1.075	1.130				1.022	0.994	1.05
Intercept (coefficient)					-1.983***			-2.477***		
Model statistics										
LR (Chi-square)					1635.0332			1683.3702		
Wald (Chi-square)					751.1497			755.8300		
DF					16			20		
P					***			***		

Note: p<.001 ***, p<.01**, p<.05*. Model 1 (simple regression model) was assessed by each explanatory variable, and the model statistics of each model are not reported in the table.