

Women's Empowerment Measurement in Quantitative Reproductive Health Studies: From Unidimensional Proxies to a Multidimensional Framework

Waffo Uilrich Inespere^{1,2*}, Samuel Nouetagni^{2,3}, Nguengang Tayou Sariette Agnes^{1,4}

¹Research Evidence and Action on Human Capital in Africa, Yaounde, Cameroon

²Center for Applied Studies and Research in Social Sciences, Yaounde, Cameroon

³United Nations Population Fund, Bujumbura, Burundi

⁴Department of Sociology, University of Yaounde 1, Yaounde, Cameroon

***Correspondence to be addressed:** E-mail - uilrichwaffo@yahoo.fr

Cite this article as: Waffo Uilrich Inespere, Samuel Nouetagni, Nguengang Tayou Sariette Agnes. Women's empowerment measurement in quantitative reproductive health studies: from unidimensional proxies to a multidimensional framework. Texila Int J Acad Res. 2026;13(4).

<https://doi.org/10.21522/TIJAR.2014.13.04.Art026>

Received: 04.06.2026

Accepted: 13.08.2026

Published: 30.10.2026

Article Type: Review Article

Abstract Women's empowerment is among the most studied determinants of reproductive health in low- and middle-income countries, yet quantitative reproductive health research continues to operationalise it through single proxies even though the construct is theoretically established as multidimensional. This reliance on unidimensional measurement misrepresents the construct and produces findings that are often inconsistent across settings. This review develops and defends a transparent, multidimensional framework for measuring women's empowerment from Demographic and Health Survey (DHS) data, grounded in Kabeer's resources, agency, and achievements model, and illustrates it using Cameroon DHS data. A structured narrative review informed the synthesis of six dimensions recurrent in reproductive health studies: economic, educational, sociocultural, reproductive, normative, and digital, each operationalised from standard DHS variables through a standardised additive scoring protocol. Measurement quality was assessed by distinguishing reflective from formative indices and by multicollinearity diagnostics. The framework was constructed on the 2018 Cameroon DHS ($n = 4,449$ partnered women aged 15–49 with a recent birth or pregnancy). The two reflective dimensions (educational, digital) met the $\alpha \geq 0.70$ threshold, the four formative dimensions were validated by construct coverage, and correlation and variance-inflation diagnostics confirmed that all six dimensions are statistically independent. Sub-dimension analysis revealed heterogeneity that a single index conceals, including a substantial digital access-and-use gap. A domain-differentiated additive framework is theoretically necessary, operationally achievable, and internally consistent within existing DHS infrastructure, preserving the dimension-specific effects essential for intervention design.

Keywords Additive Scoring, Demographic and Health Surveys, Digital Empowerment, Multidimensional Measurement, Reproductive Health, Women's Empowerment.

Introduction

Few constructs in global public health carry the normative and analytical weight of women's empowerment. Since the International Conference on Population and Development (1994) and the Beijing Platform for Action (1995), empowerment has been treated simultaneously as a determinant of reproductive health, a development objective in its own right, and a marker of social progress [1, 2]. Associations between empowerment and maternal health, contraceptive uptake, fertility, and child survival have been documented across diverse country settings and three decades of research [3-5]. The direction of these associations is rarely disputed. What remains genuinely unsettled, and is too often left unexamined, is whether the variables routinely used to measure empowerment capture the construct that the introductions of those same studies invoke.

This gap is specific to public health, and within it to reproductive health, where the convenience and reach of Demographic and Health Survey (DHS) data have made single-proxy measurement the working norm even as neighbouring disciplines moved beyond it. Most quantitative reproductive health studies operationalise women's empowerment through a single variable, typically years of schooling, employment status, or participation in three named household decisions [3, 5, 6]. Yet empowerment is a multidimensional and dynamic construct, as Kabeer's foundational framework and subsequent researchers have shown [1, 7]. Kabeer defined empowerment as the capacity to make strategic life choices in contexts where that capacity was previously denied, distinguishing resources (the preconditions for choice), agency (the capacity to exercise it), and achievements (realized outcomes). This tripartite distinction makes explicit what single proxies conceal: possessing an educational or economic resource is not the same as possessing reproductive agency, and a measure that conflates the two is theoretically

uninterpretable. Malhotra and Schuler [7] extended this critique into measurement practice, arguing that empowerment is irreducibly multidimensional.

Building on Kabeer's framework, women's empowerment in reproductive health can be operationalised as a set of distinct dimensions and sub-dimensions that stand in for the commonly used proxies. These dimensions can be constructed either through additive scoring or through factor-analytic methods such as principal component analysis (PCA) and multiple correspondence analysis (MCA). This paper develops the additive scoring approach and applies it illustratively to the 2018 Cameroon DHS.

The difficulty with prevailing measurement practice is structural rather than careless. The DHS programme provides the most comprehensive, nationally representative reproductive health data available in low- and middle-income countries and has become the default source for empowerment research. The DHS was designed, however, to measure fertility, family planning, and health service use, not to operationalise any particular theory of empowerment. The variables adopted as empowerment proxies were included because they correlate with demographic outcomes, not because they represent agency in Kabeer's sense [8]. Researchers borrowing these variables are therefore repurposing an instrument built for a different task.

This repurposing has consequences that accumulate at the level of the field. A study measuring empowerment through education will find that educated women have better reproductive outcomes but cannot determine whether bodily autonomy, financial independence, or digital access contributed independently. When studies using different single proxies are all labelled studies of women's empowerment, their results are not measuring the same construct and cannot be expected to agree [9]. The well-documented inconsistency of empowerment and health

findings across settings is, to a substantial degree, a measurement artefact.

Materials and Methods

Review Design and Search Strategy

This is a structured narrative review of the conceptualisation and operationalisation of women's empowerment in public health research, with an applied methodological focus on constructing empowerment measures from DHS data. PubMed, Google Scholar, and CINAHL were searched using combinations of the terms women's empowerment, empowerment measurement, operationalisation, proxy indicators, composite index, factor analysis, SWPER, digital empowerment, reproductive health, and sub-Saharan Africa. The search was not date-restricted in the first pass, which captured foundational theoretical works (notably Kabeer 1999 and Malhotra and Schuler 2005); a second pass restricted to 2016 to 2025 identified contemporary measurement debates and recent empirical applications. Studies were retained if they addressed empowerment conceptualisation or measurement, validated a measurement instrument, or examined empowerment and reproductive health associations in low- and middle-income settings.

Data Source

The construction proposals are based on the DHS programme's Individual Recode (IR) file. Variable references follow the standard DHS-7 questionnaire and are available in most country datasets fielded from 2015 onward, with the digital module available in the most recent rounds. The DHS is cross-sectional, so empowerment status is recorded at interview, contemporaneously with the reproductive history it is used to explain. To demonstrate that the framework is operational, the empowerment dimensions were constructed on the 2018 Cameroon DHS (CDHS-V), comprising 4,449 married or cohabiting women aged 15–49 with

a birth or pregnancy in the three years preceding the survey.

All distributional estimates use the DHS individual sample weight (v005, rescaled by dividing by 1,000,000) to correct for the unequal selection probabilities of the survey's stratified, multistage cluster design. Variance estimation reflects that design by treating the survey strata (region by residence) and the primary sampling units (survey clusters) as the design structure, with standard errors obtained through Taylor-series linearization. All computations were carried out in R using the survey package, applying svydesign and its associated weighted tabulation functions.

One qualification applies to the reproductive empowerment dimension. Several of its healthcare-access items, specifically the questions on barriers to obtaining care such as distance, permission, and not wanting to go alone, were drawn from a survey module that was not administered to the full sample, so approximately half of respondents have no data on those items. Under the rule requiring at least 50% of a dimension's items to be valid, the reproductive dimension is therefore constructed on 1,061 women rather than the full analytical sample. This is a structural feature of the survey instrument rather than ordinary item non-response, and its consequences for interpretation are noted in the Limitations.

Construction and Validation Approach

The empowerment dimensions are built with a standardised additive scoring protocol and are then subjected to measurement validation before interpretation. The construction process and its difficulties are themselves a central object of this paper, since the labour of multidimensional measurement is a principal reason proxies persist. In outline, the protocol recodes all component items to a common ordinal scale, aggregates them into sub-dimension and domain indices as the mean of non-missing items, and assesses measurement quality through two complementary

procedures: an internal-consistency and dimensionality check that distinguishes reflective indices (assessed with Cronbach's alpha) from formative ones (validated by construct coverage), and a multicollinearity assessment (Spearman correlations and generalised variance inflation factors) that tests whether the dimensions are statistically independent.

Analytical and Theoretical Framework

Empowerment dimensions were conceptualised following Kabeer's resources, agency, and achievements model [1] and the multidimensional operationalisation logic of Malhotra and Schuler [7]. Each dimension is treated as analytically independent while acknowledging that dimensions are empirically interlinked. The central methodological question is this: once distinct dimensions are accepted, how should items within each dimension be combined, and how should the dimensions relate to one another analytically? The review first examines SWPER, then compares additive scoring and MCA, and finally presents the six-dimension framework that results.

Results and Synthesis

The Predominance of Unidimensional Proxy Measurement

The empirical literature on women's empowerment and reproductive health is dominated by studies that operationalise empowerment through a single DHS variable. In systematic reviews, Pratley [6] and Vizheh et al. [8] found that most instruments captured only one or two of the domains theory identifies as constitutive of empowerment, and that the domains most consistently omitted were those most proximal to reproductive decision-making: normative safety, bodily autonomy, and reproductive autonomy.

The most common proxies, educational attainment, employment status, and participation in household decisions, share

three convenient properties: they are available in virtually every DHS dataset, they can be operationalised identically across countries, and each is genuinely associated with reproductive outcomes at the population level [3, 10, 11]. These properties explain the persistence of single-proxy measurement far better than any theoretical justification, because no serious theoretical account holds that empowerment is unidimensional.

There is a further, rarely stated reason for the dominance of proxies: multidimensional measurement is genuinely difficult to do well, and the difficulty is methodological rather than merely conceptual. A defensible multidimensional index requires the analyst to specify dimensions on theoretical grounds, assign many DHS items to the correct dimension and sub-dimension, settle on a consistent coding and aggregation scheme, choose between additive and factor-analytic construction, handle missing data and sparse categories, and then validate the result by distinguishing reflective from formative dimensions and testing the dimensions for redundancy. A single proxy sidesteps all of this: one variable, already cleaned and comparable, with a published precedent for its use. Faced with this asymmetry of effort, and with legitimate pressure to produce comparable, publishable results, many researchers reasonably default to the proxy. The construction protocol and validation procedure set out below are intended in part to lower that barrier, so that complexity becomes a reason to standardise the method rather than to abandon the ambition.

Why Unidimensional Approaches are Insufficient

The core problem is that proxies treat a resource as though it were the agency to use that resource. Kabeer's framework is explicit that resources are preconditions for choice, not choice itself [1]. A years-of-schooling variable measures the resource and is silent on the

normative, relational, and institutional conditions that convert it into reproductive agency. Malhotra and Schuler [7] argued that treating economic or educational variables as empowerment proxies assumes resource acquisition produces agency automatically, an assumption that fails systematically in patriarchal settings.

Empirically, Bayissa et al. [12] found that the association between economic empowerment and reproductive health outcomes weakened substantially once normative constraints were controlled. Das [13], using structural equation modelling, showed that adding freedom of movement and household decision-making as independent dimensions changed the entire predictive structure, revealing the conditions under which resources convert into agency. Single proxies cannot detect this conditionality, because the conditioning dimensions are left unmeasured and therefore uncontrolled.

Sharaunga et al. [14] identified a second failure: self-reported household decision-making cannot distinguish genuine negotiating authority from permitted participation. In high-fertility sub-Saharan African settings, this systematically overclassifies women as empowered and biases the proxy towards null associations.

A third failure is temporal misalignment. Because the DHS is cross-sectional, empowerment is recorded at interview, often after the reproductive events under analysis. The causal logic assumes that empowerment shapes subsequent reproductive decisions, yet the data capture a single instant, leaving a substantial share of reported associations vulnerable to reverse causation. This vulnerability is most acute for reproductive autonomy, decision-making participation, and economic control, each plausibly influenced by completed fertility as much as it influences it. No construction method examined in this review resolves this structural limitation of cross-sectional data.

SWPER: The Field's Attempt to Move Beyond Proxies

The most influential attempt to move beyond single proxies is the Survey-based Women's Empowerment Index for Africa (SWPER). Developed by Ewerling et al. [15] using DHS data from 34 sub-Saharan African countries, SWPER applies PCA to standard DHS items and retains three components: attitude to violence, social independence, and decision-making. It represents a genuine methodological advance, validated on a large, representative, multi-country dataset, standardised for cross-national comparison, and preserving a degree of domain differentiation.

SWPER nonetheless carries three residual limitations. Its three sub-scores aggregate conceptually distinct dimensions, folding much of the remaining content into social independence; its PCA-derived weights are optimized for cross-national structure, which supports comparability but obscures the dimension-specific effects essential for intervention design; and the digital dimension is absent entirely, because the relevant items did not exist in the DHS rounds on which SWPER was built. A high social-independence score, for instance, may reflect strong educational attainment with weak normative safety, or the reverse, and the two carry different implications for programming. SWPER and the domain-differentiated framework developed here are best understood as complementary instruments: SWPER for cross-national comparison and trend monitoring, the domain-differentiated framework for identifying which specific empowerment pathway to target in a given programme.

Empowerment Index Construction Approaches

Two strategies dominate the applied literature: additive scoring and, for categorical data, multiple correspondence analysis. Each rests on different assumptions and carries distinct strengths and limitations.

Additive scoring: This method assigns an ordinal value to each item, combines items within a dimension by summation or by the mean of non-missing items, and categorises continuous scores into ordered empowerment levels. Its strengths are full transparency, replicability, theory-led item assignment, natural handling of ordinal categorical items, and policy-legible categories. The equal-weighting assumption is a limitation, but it is mitigated when the index is accompanied by an internal-consistency check for reflective dimensions and can be validated further against factor-analytic solutions.

Multiple correspondence analysis: MCA is the categorical-data analogue of PCA, identifying latent axes that account for maximum inertia and yielding empirically derived weights. Its strengths are empirical weighting and the capacity to reveal dimensional structure. Its limitations are sample-dependent weights that undermine cross-national comparability, axes that may not align with theoretically meaningful dimensions, and reduced transparency for non-specialist audiences.

A pragmatic synthesis: Where the goal is theory-led, cross-nationally comparable, policy-legible measurement that preserves the independence of conceptually defined dimensions, additive scoring is preferable, with a factor-analytic check used to confirm dimensional coherence where the measurement model is reflective. The protocol adopted here employs additive scoring with a measurement-validation step that distinguishes reflective indices (assessed by Cronbach's alpha) from formative ones (validated by construct coverage), tests the dimensions for statistical independence, and allows category collapsing when sparse cells are encountered. This protocol was applied to the Cameroon DHS, with results reported below.

Main Empowerment Dimensions in Reproductive Health Studies

Applying this construction logic across the empowerment approaches used in reproductive health studies yields a six-dimension synthesis. Five dimensions (economic, educational, sociocultural, reproductive, and normative) are well established in the literature [7, 12]; the framework's contribution is to assemble them coherently, add the digital dimension, and specify their operationalisation from DHS variables. The six dimensions, their sub-dimensions, pathways, and principal measurement limitations are summarised in Table 1.

Economic empowerment encompasses employment agency, asset ownership, and financial inclusion, operating through household bargaining power [3, 11]; the DHS captures employment better than control over earnings.

Educational empowerment combines formal attainment and functional literacy. It delays marriage, raises the opportunity cost of childbearing, and expands knowledge [10, 16], but attainment is acquired years before reproductive decisions and is silent on the conditions of its deployment.

Sociocultural empowerment combines household decision-making autonomy and mass media exposure, operating through decision authority and informational exposure [14, 17, 18]; its decision-making items cannot separate genuine authority from conditioned compliance.

Reproductive empowerment is the dimension most proximal to fertility outcomes, encompassing contraceptive knowledge, autonomy over contraceptive decisions, unmet need, and permission to seek care. It consistently predicts modern contraceptive use [19, 20], and women's autonomy is linked to high-risk fertility behaviour in DHS-based analyses [21]; social desirability bias in patriarchal settings is its main measurement limitation.

Normative empowerment captures rejection of gender-based violence (GBV) justification, bodily autonomy, and freedom of movement, the structural conditions that enable the conversion of resources into agency [1, 22]; exposure to sexual violence is itself associated with elevated unmet need for contraception across sub-Saharan Africa [23]. Its attitudinal items capture acceptance of violence rather than experienced safety, and the behavioural intimate partner violence module is administered to a sub-sample only.

Digital empowerment is a substantive contribution of this framework. It encompasses mobile phone ownership and exposure to family planning information online (digital access) together with frequency of internet use and use for health information (digital use and engagement). The access-and-use distinction is

critical: active, purposeful digital engagement, not mere ownership, carries the agency-relevant signal [24], and digital tools are increasingly used to deliver sexual and reproductive health information across sub-Saharan Africa [25].

The six dimensions are organized around Kabeer's resource-and-agency distinction: four are primarily resource dimensions (economic, educational, sociocultural, and digital), and two concern the proximate exercise of agency and its structural conditions (reproductive and normative). This echoes early multidimensional autonomy frameworks that treated decision-making, mobility, and economic autonomy as separable axes [26]. The number six is a hypothesis, and the internal-consistency and separability checks built into the protocol are designed to test it empirically.

Table 1. A Six-Dimension Framework for Women's Empowerment Measurement using DHS Data

Dimension	Sub-Dimensions	Pathway to Reproductive Health	Principal Measurement Limitation
Economic	Employment agency; asset ownership; financial inclusion	Household bargaining power; capacity to access services [3, 11]	Captures employment, not earnings control; wealth index is household-level [7]
Educational	Formal attainment; literacy	Delays marriage and first birth; raises opportunity cost [10, 16]	Resource acquired long before reproductive decision; silent on deployment
Sociocultural	Household decision-making; media exposure	Decision authority and informational exposure [14, 17, 18]	Cannot separate authority from conditioned compliance [14]
Reproductive	Contraceptive knowledge; decision-maker; unmet need; permission to seek care	Most proximal to fertility outcomes; contraceptive agency [19, 20]	Social desirability bias; autonomy over-reported in patriarchal settings [8, 9]
Normative	GBV-justification rejection; bodily autonomy; freedom of movement	Structural enabler of resource-to-agency conversion [1, 22]	Attitudinal, not experiential, safety; behavioural IPV module sub-sample only
Digital	Digital access; digital use and engagement	Informational exposure and active service navigation [24]	Newest dimension; access-and-use gap; absent from older DHS rounds and from SWPER

DHS = Demographic and Health Surveys; GBV = gender-based violence; IPV = intimate partner violence;

SWPER = Survey-based Women's Empowerment Index for Africa.

An Illustrative Construction of the Six Dimensions with Cameroon DHS Data

Applying the protocol to the 2018 Cameroon DHS demonstrates that the full multidimensional construction runs end to end on real data. The analytical sample comprised 4,449 married or cohabiting women aged 15–49 with a birth or pregnancy in the three years preceding the survey, a restriction that narrows the temporal gap between empowerment measurement and the relevant reproductive behaviour. The resulting distributions, reliability, and independence of the six dimensions are reported below.

The Construction Protocol

Specifying the framework is only half the task; turning it into usable indices requires a construction protocol whose every step involves a judgement that a single proxy avoids. The protocol standardises construction across all six dimensions so that the indices are comparable and the procedure is replicable from the published scheme alone.

All component items are recoded to a consistent 0 to 3 scale on which higher values indicate greater empowerment; for items with fewer than four response categories, values are assigned to preserve relative distance (binary items, for example, are coded 0 and 3). Domain and sub-dimension scores are calculated as the arithmetic mean of non-missing component items, with a minimum of 50% of a domain's

items required for a score to be computed. For descriptive use, continuous scores are categorised as not empowered (0.00), poorly empowered (0.01 to 1.50), empowered (1.51 to 2.50), and highly empowered (2.51 to 3.00). Each domain is initially coded as this four-category ordinal variable; where a category contains fewer than 2% of respondents, adjacent sparse categories are collapsed to ensure cell sizes adequate for stable estimation. The full coding scheme, item sources, scoring, and resulting final categories for every dimension are set out in Table 2.

Two challenges in this process deserve emphasis, because they are where multidimensional construction most often falters. The first is aggregation across heterogeneous items: a domain such as economic empowerment combines employment, asset ownership, and financial inclusion, components measured on different instruments and not interchangeable, so the mean-of-items rule must be defended as a deliberate formative aggregation rather than assumed. The second is the validation that must follow construction and that determines whether the indices can bear interpretive weight at all. Both are addressed in the validation results below, and both illustrate why a transparent, shared protocol is preferable to the bespoke, study-specific constructions that make multidimensional measures hard to compare and easy to contest.

Table 2. Index Construction Protocol: Variables, Coding, Score Calculation, and Final Categories

Sub-Dimension	DHS Variables	Item Coding (0–3)	Score Calculation	Final Categories
Economic Empowerment				
Employment agency	Occupation; employer type; earnings type; decision on earnings	0 = not working or not paid → 3 = professional or cash	Mean of non-missing items (min. 50%)	3 categories: Not/Poorly (≤ 1.50), Empowered (1.51–2.50), Highly (2.51–3.00)
Asset ownership	Owns land alone/jointly;	0 = does not own; 3 = owns alone or jointly		

	owns house alone/jointly			
Financial inclusion	Bank account; mobile money	0 = no; 3 = yes		
Educational Empowerment				
Formal schooling	Highest educational level; years of education	0 = no education → 3 = higher	Mean of non-missing items	4 categories: Not (0.00), Poorly (0.01–1.50), Empowered (1.51–2.50), Highly (2.51–3.00)
Literacy	Literacy test	0 = cannot read → 3 = reads multiple languages		
Sociocultural Empowerment				
Household decision-making	Decisions on healthcare, large purchases, family visits, partner's earnings	0 = husband alone → 3 = respondent alone	Mean of non-missing items (min. 50%)	4 categories: Not (0.00), Poorly (0.01–1.50), Empowered (1.51–2.50), Highly (2.51–3.00)
Media exposure	Frequency of newspaper, radio, TV	0 = not at all → 3 = almost every day		
Reproductive Empowerment				
Reproductive knowledge	Knowledge of contraceptive methods; ovulatory cycle	Methods: 0 = none → 3 = modern + traditional; cycle: 0 = no, 3 = yes	Mean of non-missing items (min. 50%)	Overall domain 2 categories: Not/Poorly/Empowered (≤ 2.50), Highly (2.51–3.00)
Reproductive autonomy	Contraceptive decision-maker; barriers (permission, distance)	Decision: 0 = partner → 3 = respondent + provider; barriers: 0 = major problem → 3 = not a problem		
Normative Empowerment				
Rejection of GBV justification	Beating justified if goes out, neglects children, argues, refuses sex, burns food	0 = yes (justified); 3 = no (not justified)	Mean of non-missing items (min. 50%)	Overall domain 2 categories: Not/Poorly/Empowered (≤ 2.50), Highly (2.51–3.00)
Bodily autonomy	Age at first cohabitation; age at first sex; spousal age difference	Age: 0 = <15 → 3 = 21+; spousal diff: 0 = 10 + yrs older → 3 = wife older or equal		

Digital Empowerment				
Digital access	Mobile phone ownership; FP information on internet/social media	0 = no; 3 = yes	Mean of non-missing items (min. 50%)	3 categories: Not/Poorly (≤ 1.50), Empowered (1.51–2.50), Highly (2.51–3.00)
Digital use and engagement	Internet frequency past month; used internet for health information	Frequency: 0 = not at all → 3 = almost daily; health info: 0 = no, 3 = yes		

FP = family planning; GBV = gender-based violence. Reliability and dimensionality of each index are reported in Table 3.

Source: author compilation from CDHS-V 2018.

Measurement Validation Results

Reflective and Formative Dimensions

Two measurement models must be distinguished, because they call for different validation criteria [27, 28]. In a reflective model the sub-dimensions are interchangeable manifestations of a single latent trait and are therefore expected to correlate strongly, so Cronbach's alpha is the appropriate reliability index. In a formative model the sub-dimensions are distinct, non-substitutable constituents that jointly define the construct and are not expected to correlate, so a low alpha reflects the formative structure rather than poor reliability, and validity rests instead on the theoretical completeness with which the sub-dimensions cover the construct. Each dimension was assigned to a measurement model a priori, from the theoretical relationship among its sub-dimensions, and the alpha coefficients were then used to confirm the reflective assignments rather than to determine the classification.

Internal consistency and the mean inter-sub-dimension correlation are reported in Table 3. The two dimensions specified as reflective exceed the conventional threshold: educational ($\alpha = 0.887$) and digital ($\alpha = 0.814$), confirming that their sub-dimensions measure a common

latent construct and that alpha is the appropriate reliability index for them. The four dimensions specified as formative, sociocultural ($\alpha = 0.440$), normative ($\alpha = 0.146$), economic ($\alpha = 0.135$), and reproductive ($\alpha = 0.061$), show the low internal consistency that a formative structure predicts. Their sub-dimensions are distinct and non-substitutable: a woman may own assets without holding a bank account or reject the justification of gender-based violence without exercising bodily autonomy. The low inter-sub-dimension correlations ($r = 0.032$ to 0.282) are precisely the expected signature of formative measurement, not evidence of unreliability. For these dimensions, validity was assessed against construct coverage: the sub-dimensions were specified from theory to span the domain (for economic empowerment, employment, assets, and financial inclusion; for reproductive empowerment, knowledge, autonomy, and access), and their weak correlations confirm that each carries non-redundant information. The two reflective dimensions are therefore retained on their internal consistency and the four formative dimensions on their theoretical grounding and component coverage, consistent with established practice in empowerment measurement [1, 7].

Table 3. Internal Consistency and Dimensionality of the Empowerment Indices, CDHS-V 2018

Dimension	Sub-Dimensions	n	Inter-item r	Raw α	Std. α	Index type
Educational	Schooling, literacy	4,434	0.796	0.884	0.887	Reflective
Digital	Access, use	4,449	0.687	0.701	0.814	Reflective

Sociocultural	Decision-making, media	4,449	0.282	0.431	0.440	Formative
Normative	GBV rejection, bodily autonomy	4,433	0.079	0.105	0.146	Formative
Economic	Employment, assets, finance	3,393	0.049	0.096	0.135	Formative
Reproductive	Knowledge, autonomy, access	1,061	0.032	0.045	0.061	Formative

Std. α = standardised alpha; inter-item r = mean inter-sub-dimension correlation. Reflective dimensions meet $\alpha \geq 0.70$ and are retained on internal consistency; formative dimensions are validated by construct coverage. The reduced reproductive n reflects structural missingness in the healthcare-access sub-dimension.

Source: author construction from CDHS-V 2018.

Statistical Independence of the Dimensions

The distinctness on which the framework rests is testable, and it is supported by two multicollinearity diagnostics (Tables 4 and 5). In the Spearman rank correlation matrix, no dimension pair reached the $|\rho| = 0.70$ flag; the strongest associations were educational and sociocultural (0.605) and educational and digital (0.603), both well below the threshold,

while economic empowerment correlated only weakly with every other dimension (0.151 to 0.290). The generalised variance inflation factors reinforce this: every variance-inflation equivalent fell between 1.24 and 1.44, far below the value of 5 that would indicate problematic collinearity. The six dimensions are therefore not merely conceptually distinct but statistically independent, each contributing non-redundant information.

Table 4. Spearman Rank Correlation Matrix among the Empowerment Dimensions, CDHS-V 2018

Dimension	Econ.	Educ.	Socio.	Repro.	Norm.	Digital
Economic	1.000	0.234	0.290	0.223	0.151	0.191
Educational	0.234	1.000	0.605	0.494	0.499	0.603
Sociocultural	0.290	0.605	1.000	0.473	0.442	0.478
Reproductive	0.223	0.494	0.473	1.000	0.530	0.386
Normative	0.151	0.499	0.442	0.530	1.000	0.415
Digital	0.191	0.603	0.478	0.386	0.415	1.000

Flag threshold $|\rho| > 0.70$ (none observed).

Source: author construction from CDHS-V 2018.

Table 5. Generalised Variance Inflation Factors for the Empowerment Dimensions, CDHS-V 2018

Empowerment Dimension	GVIF	df	VIF-equivalent	Assessment
Economic	1.907	3	1.240	No multicollinearity
Educational	2.868	3	1.421	No multicollinearity
Sociocultural	2.361	3	1.332	No multicollinearity
Reproductive	2.997	3	1.442	No multicollinearity
Normative	2.304	3	1.321	No multicollinearity
Digital	2.037	2	1.427	No multicollinearity

Rule: VIF-equivalent < 5 = none; 5–10 = moderate; > 10 = severe. VIF-equivalent = $(GVIF^{1/(2 \cdot df)})^2$.

Source: author construction from CDHS-V 2018.

Taken together, these diagnostics provide convergent evidence that the six-dimension structure is empirically defensible on these data: the reflective dimensions cohere internally, the formative dimensions carry non-redundant components, no dimension pair is collinear, and, as shown next, the sub-dimension distributions diverge sharply from their domain scores. This evidence is drawn from a single national dataset. Full confirmatory validation, including item-level factor analysis and measurement-invariance testing across multiple country settings, is the necessary next step and lies beyond the scope of this illustrative construction.

Distribution Across Dimensions and Sub-Dimensions

The constructed dimensions reveal substantial and policy-relevant unevenness (Table 6). Economic empowerment is the most polarized: 29.3% of women are not empowered, 25.8% poorly empowered, 21.7% empowered, and 23.2% highly empowered. Sub-dimension analysis shows that this overall profile conceals severe asset deprivation (83.6% low asset ownership) and limited financial inclusion (75.1% low), signals that a single economic score would average away.

Educational empowerment is more favourable (35.6% empowered, 14.1% highly empowered), but literacy remains a constraint for 37.9% of women, and 26.1% have no formal education. Sociocultural empowerment shows 44.1% of women in the empowered category for household decision-making, yet only 9.2%

at the highest level, while 44.7% are not empowered on media exposure, two distinct pathways that a combined sociocultural score would blur.

Reproductive empowerment, collapsed to a two-category variable because of sparse intermediate cells, shows 26.2% of women highly empowered. Sub-dimension analysis locates the binding constraint precisely: 47.5% have high contraceptive knowledge and 39.0% report high reproductive autonomy, but 59.8% are in the low category for contraceptive access and use. The gap is in access, not in knowledge or autonomous decision-making, a distinction with direct programmatic implications.

Normative empowerment, also collapsed to two categories, shows 26.3% of women highly empowered. Rejection of gender-based violence justification is relatively widespread (69.8% moderate or high rejection), but bodily autonomy remains less consolidated, with a quarter of women not empowered. Digital empowerment is distributed across three categories: 41.4% not or poorly empowered, 36.3% empowered, and 22.3% highly empowered. The digital-use sub-dimension is striking: 83.1% of women exhibit low digital use, compared with 41.4% with low digital access, directly quantifying the access-and-use gap and confirming that mobile ownership alone is an insufficient indicator of digital agency. Across all dimensions, sub-dimension distributions diverge sharply from overall domain scores, which is the empirical justification for retaining them as separate analytical entities.

Table 6. Distribution of Women Across Empowerment Categories for the Six Dimensions and Sub-Dimensions, CDHS-V 2018 (N = 4,449)

Dimension / Sub-Dimension	Category	%
Economic Empowerment		
Overall index	Not empowered	29.3
	Poorly empowered	25.8
	Empowered	21.7
	Highly empowered	23.2
Employment agency	Not/poorly	44.5

	Empowered	28.0
	Highly	27.5
Asset ownership	Low	83.6
	Moderate/high	16.4
Financial inclusion	Low	75.1
	Moderate/high	24.9
Educational Empowerment		
Overall index	Not empowered	25.1
	Poorly empowered	25.3
	Empowered	35.6
	Highly empowered	14.1
Schooling	Not empowered	26.1
	Poorly empowered	18.2
	Empowered	41.7
	Highly empowered	14.0
Literacy	Not empowered	37.9
	Poorly empowered	11.9
	Empowered/highly	50.2
Sociocultural Empowerment		
Overall index	Not empowered	25.0
	Poorly empowered	22.7
	Empowered	30.1
	Highly empowered	22.2
Household decision-making	Not empowered	30.9
	Poorly empowered	15.7
	Empowered	44.1
	Highly empowered	9.2
Media exposure	Not empowered	44.7
	Poorly empowered	7.6
	Empowered	22.0
	Highly empowered	25.7
Reproductive Empowerment		
Overall index (collapsed)	Not/Poorly/Empowered	73.8
	Highly empowered	26.2
Contraceptive knowledge	Moderate	52.5
	High	47.5
Reproductive autonomy	Not empowered	25.2
	Poorly empowered	26.1
	Empowered	9.6
	Highly empowered	39.0
Contraceptive access/use	Low	59.8
	Moderate/high	40.2
Normative Empowerment		
Overall index (collapsed)	Not/Poorly/Empowered	73.7

	Highly empowered	26.3
GBV-rejection attitudes	Low rejection	30.2
	Moderate/high rejection	69.8
Bodily autonomy	Not empowered	25.1
	Poorly empowered	22.7
	Empowered	27.2
	Highly empowered	25.1
Digital Empowerment		
Overall index	Not/poorly empowered	41.4
	Empowered	36.3
	Highly empowered	22.3
Digital access	Not/poorly	41.4
	Empowered	36.6
	Highly	22.1
Digital use	Low	83.1
	Moderate/high	16.9

Categories were collapsed per protocol when a category held fewer than 2% of cases: the reproductive and normative overall indices to two categories, the economic and digital to three, and the educational and sociocultural retained four.

Percentages are weighted.

Source: author construction from CDHS-V 2018.

Discussion

The trajectory this review traces, from single-proxy measurement, through SWPER's partial multidimensional solution, to a fully domain-differentiated framework with a transparent construction protocol, converges on a conclusion that is at once obvious and routinely neglected: women's empowerment cannot be adequately measured by any single DHS variable. Evidence from single-proxy studies should be read as evidence about that specific dimension, not about empowerment. The move towards multidimensional measurement is both theoretically necessary and practically achievable within existing DHS infrastructure, as the Cameroon illustration demonstrates.

Kabeer's framework [1] and Malhotra and Schuler's operationalisation critique [7] explain why. Resources are preconditions for choice, not choice itself, and the conditions that allow resources to convert into agency are an essential part of what empowerment means. The additive scoring protocol makes this theoretical

commitment transparent: items are assigned to dimensions on conceptual grounds, equal weighting is explicit, and the indices are fully replicable from published coding schemes. The measurement-validation step is more discriminating than a blanket reliability rule: it recognises that two dimensions (educational and digital) are reflective and cohere internally, while the other four are formative, their sub-dimensions distinct and non-substitutable by design, so that a low alpha is expected and construct coverage is the proper criterion. The correlation and variance-inflation diagnostics then show the six dimensions to be statistically independent, supplying the empirical separability evidence that the distinctness claim requires and that aggregated indices cannot offer.

The comparison between additive and factor-analytic construction speaks directly to the most honest explanation for the persistence of single proxies: that multidimensional construction is hard. Reliance on proxies is not simply intellectual inertia but a rational response to the real effort that defensible

multidimensional measurement demands. The contribution of a standardised, transparent protocol is to convert that effort from a bespoke undertaking, repeated and contested in every study, into a replicable procedure that offers a pragmatic middle path of theory-led construction with empirical discipline.

The inclusion of digital empowerment is a substantive contribution. As mobile connectivity expands rapidly across sub-Saharan Africa, the youngest cohort of women is forming reproductive preferences in an informational environment no previous generation experienced. The Cameroon data reveal a striking access-and-use gap: 83.1% of women show low digital use even though only 41.4% lack digital access. This confirms that mobile phone ownership is a necessary but insufficient condition for digital agency, and that active, purposeful engagement is what matters for reproductive health information and service navigation. Omitting this dimension from standard instruments, including SWPER, leaves a potentially protective influence on reproductive outcomes unmeasured.

The temporal-misalignment finding carries the broadest implication of the review, reaching well beyond women's empowerment. Any determinant of health measured at the same interview as the outcome it is meant to explain, which describes much of the social-determinants-of-health literature built on DHS and comparable cross-sectional surveys, faces the same threat to causal interpretation. Future research should treat temporal alignment as a design question: favouring longitudinal designs where feasible, dating the determinant relative to the outcome and restricting analysis to determinants that demonstrably precede it, or, at minimum, stating plainly that directionality is unestablished. The dimensions most exposed to reverse causation, namely reproductive autonomy, decision-making participation, and economic control, warrant the most caution. Better measurement of empowerment, the central argument of this review, does not by

itself resolve when empowerment is measured; both must be addressed for the evidence base to support the causal claims it routinely makes.

Limitations

Several limitations bound the strength of these claims. First, the empirical demonstration rests on a single dataset, the 2018 Cameroon DHS. The reliability, independence, and distributional evidence reported here establish that the framework is operational and internally coherent in this setting, but they do not amount to full psychometric validation; item-level confirmatory factor analysis and cross-country measurement-invariance testing remain to be carried out, and the six-dimension structure should be regarded as empirically supported rather than definitively confirmed. Second, the reproductive empowerment dimension is constructed on a reduced sample ($n = 1,061$), because its healthcare-access items were not administered to all respondents, so its distribution is measured less precisely than the other dimensions and should be read with corresponding caution. Third, the analytical sample is restricted to married or cohabiting women with a recent birth or pregnancy, a restriction chosen to narrow the temporal gap between empowerment and reproductive behaviour; the resulting distributions therefore describe partnered, recently childbearing women and should not be generalised to never-married or formerly partnered women, whose empowerment profiles may differ. Finally, as the review itself emphasises, the cross-sectional DHS design cannot establish that empowerment precedes the outcomes it is used to explain; better measurement addresses what is measured, not when.

SWPER moved the field decisively beyond single proxies, and the framework proposed here builds on that achievement. The remaining difference is one of analytical purpose: SWPER's aggregation serves comparability and trend monitoring, while the domain-differentiated framework serves the

identification of which specific empowerment pathway is the binding constraint in a given setting. Researchers should choose their instrument according to their question and should be explicit about which dimension of empowerment they actually measured.

Conclusion

The dominance of unidimensional proxy measurement in reproductive health empowerment research is an inheritance from the DHS tradition rather than a considered methodological choice. It has produced a large and valuable body of comparative evidence that is nonetheless insufficient for the theoretical claims it is used to support. Kabeer's resources, agency, and achievements framework and Malhotra and Schuler's operationalisation critique provide the conceptual tools to understand why, and the six-dimension framework set out here demonstrates that rigorous, internally coherent multidimensional measurement is achievable within DHS data using a transparent additive protocol. Constructed illustratively on Cameroon DHS data, the framework produced six distinct and interpretable empowerment distributions, including a digital dimension no existing index captures; its reflective dimensions met the $\alpha \geq 0.70$ threshold, its formative dimensions were validated by construct coverage, and correlation and variance-inflation diagnostics confirmed that the six dimensions are statistically independent. The central conclusion is simple: no single dimension, and no single aggregated score, adequately represents women's empowerment. Multidimensional, domain-specific measurement is closer to the reality of women's lived experience of power and constraint, and it is essential for designing public health interventions that address the right mechanisms in the right contexts. Measuring the right

dimensions, and measuring them in the right temporal order, are both necessary if the field is to support the causal claims it routinely makes.

Conflict of Interest

The authors declare no conflict of interest.

Ethical Approval

Not applicable. This is a narrative review of published literature combined with secondary analysis of the publicly available, de-identified 2018 Cameroon DHS dataset. Ethical clearance for the parent survey was granted by the Cameroon National Ethics Committee for Human Health Research.

Author Contributions

Waffo Uilrich Inespere: conceptualisation, literature review, methodology, formal analysis, writing (original draft). Samuel Nouetagni: supervision, methodology, review and editing. Nguengang Tayou Sariette Agnes: empowerment-measurement analysis, writing (review and editing). All authors read and approved the final manuscript.

Data Availability

The DHS datasets analysed in this review are publicly available through the DHS Programme data repository at <https://dhsprogram.com> upon registration and completion of the standard data-access request. No new datasets were generated.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Acknowledgements

The authors acknowledge the support of the Texila American University doctoral programme.

References

- [1]. Kabeer N. Resources, agency, achievements: reflections on the measurement of women's empowerment. *Dev Change*. 1999;30(3):435-64. <https://doi.org/10.1111/1467-7660.00125>
- [2]. United Nations. Beijing Declaration and Platform for Action. Fourth World Conference on Women; 1995 Sep; Beijing. New York: United Nations; 1995. <https://www.un.org/womenwatch/daw/beijing/pdf/BDPfA%20E.pdf>
- [3]. Ahmed S, Creanga AA, Gillespie DG, Tsui AO. Economic status, education and empowerment: implications for maternal health service utilization in developing countries. *PLoS One*. 2010;5(6):e11190. <https://doi.org/10.1371/journal.pone.0011190>
- [4]. Doku DT, Bhutta ZA, Neupane S. Associations of women's empowerment with neonatal, infant and under-5 mortality in low- and middle-income countries. *BMJ Glob Health*. 2020;5(1):e001558. <https://doi.org/10.1136/bmjgh-2019-001558>
- [5]. Prata N, Fraser A, Huchko MJ, Gipson JD, Withers M, Lewis S, et al. Women's empowerment and family planning: a review of the literature. *J Biosoc Sci*. 2017;49(6):713-43. <https://doi.org/10.1017/S0021932016000663>
- [6]. Pratley P. Associations between quantitative measures of women's empowerment and access to care and health status for mothers and their children: a systematic review. *Soc Sci Med*. 2016;169:119-31. <https://doi.org/10.1016/j.socscimed.2016.08.001>
- [7]. Malhotra A, Schuler SR. Women's empowerment as a variable in international development. In: Narayan D, editor. *Measuring empowerment: cross-disciplinary perspectives*. Washington (DC): World Bank; 2005. p. 71-88. <https://doi.org/10.1037/e597202012-004>
- [8]. Vizheh M, Muhidin S, Behboodi Moghadam Z, Zareiyan A. Women empowerment in reproductive health: a systematic review of measurement properties. *BMC Womens Health*. 2021;21(1):424. <https://doi.org/10.1186/s12905-021-01566-0>
- [9]. Yount KM, Peterman A, Cheong YF. Measuring women's empowerment: a need for context and caution. *Lancet Glob Health*. 2018;6(1):e29. [https://doi.org/10.1016/S2214-109X\(17\)30459-X](https://doi.org/10.1016/S2214-109X(17)30459-X)
- [10]. Chowdhury S, Rahman MM, Haque MA. Role of women's empowerment in determining fertility and reproductive health in Bangladesh: a systematic literature review. *AJOG Glob Rep*. 2023;3(3):100239. <https://doi.org/10.1016/j.xagr.2023.100239>
- [11]. Atake EH, Ali PG. Women's empowerment and fertility preferences in high fertility countries in sub-Saharan Africa: evidence from Cameroon. *BMC Womens Health*. 2019;19(1):54. <https://doi.org/10.1186/s12905-019-0729-7>
- [12]. Bayissa FW, Smits J, Ruben R. The multidimensional nature of women's empowerment: beyond the economic approach. *J Int Dev*. 2018;30(4):661-90. <https://doi.org/10.1002/jid.3268>
- [13]. Das P. Dimensions of women empowerment: a structural equation modelling approach. *J Stat Manag Syst*. 2022;25(5):1059-72. <https://doi.org/10.1080/09720510.2022.2040858>
- [14]. Sharaunga S, Mudhara M, Bogale A. Conceptualisation and measurement of women's empowerment revisited. *J Hum Dev Capab*. 2019;20(1):1-25. <https://doi.org/10.1080/19452829.2018.1546280>
- [15]. Ewerling F, Lynch JW, Victora CG, van Eerdewijk A, Tyszler M, Barros AJD. The SWPER index for women's empowerment in Africa: development and validation of an index based on survey data. *Lancet Glob Health*. 2017;5(9):e916-23. [https://doi.org/10.1016/S2214-109X\(17\)30292-9](https://doi.org/10.1016/S2214-109X(17)30292-9)
- [16]. Omariba DWR. Women's educational attainment and intergenerational patterns of fertility behaviour in Kenya. *J Biosoc Sci*. 2006;38(4):449-79. <https://doi.org/10.1017/S0021932005026489>
- [17]. Fotso JC, Cleland JG, Adje EO. Cameroon's slow fertility transition: a gender perspective. *Popul Stud (Camb)*. 2024;78(1):79-91. <https://doi.org/10.1080/00324728.2023.2297687>
- [18]. Mokam B, Akono CZ. The association between women's empowerment and reproductive health care utilization in Cameroon. *Int J Qual Health Care*. 2022;34(2):mzac032. <https://doi.org/10.1093/intqhc/mzac032>

- [19]. Upadhyay UD, Gipson JD, Withers M, Lewis S, Ciaraldi EJ, Fraser A, et al. Women's empowerment and fertility: a review of the literature. *Soc Sci Med*. 2014;115:111-20. <https://doi.org/10.1016/j.socscimed.2014.06.014>
- [20]. Okyere J, Dadzie LK, Agbaglo E, Arthur-Holmes F, Aboagye RG, Seidu AA, et al. Women's sexual autonomy and short birth interval in sub-Saharan Africa. *Arch Sex Behav*. 2024;53(1):413-22. <https://doi.org/10.1007/s10508-023-02713-4>
- [21]. Abedin S, Arunachalam D. How does autonomy of women influence maternal high-risk fertility? Evidence from Bangladesh demographic and health survey. *Biodemography Soc Biol*. 2022;67(2):89-106. <https://doi.org/10.1080/19485565.2021.2016367>
- [22]. Habte A, Tamene A, Bogale B. Women empowerment domains and unmet need for contraception among married and cohabiting fecund women in sub-Saharan Africa. *PLoS One*. 2023;18(9):e0291110. <https://doi.org/10.1371/journal.pone.0291110>
- [23]. Ahinkorah BO, Ameyaw EK, Seidu AA, Agbaglo E, Budu E, Mensah F, et al. Sexual violence and unmet need for contraception among married and cohabiting women in sub-Saharan Africa: evidence from demographic and health surveys. *PLoS One*. 2020;15(11):e0240556. <https://doi.org/10.1371/journal.pone.0240556>
- [24]. Goh K, Contractor S, Van Belle S. A realist-informed review of digital empowerment strategies for adolescents to improve their sexual and reproductive health and well-being. *J Urban Health*. 2022;99(4):1-13. <https://doi.org/10.1007/s11524-022-00678-8>
- [25]. Alhassan RH, Haggerty CL, Fapohunda A, Affan NJ, Anto-Ocrah M. Exploring the use of digital educational tools for sexual and reproductive health in sub-Saharan Africa: systematic review. *JMIR Public Health Surveill*. 2025;11:e63309. <https://doi.org/10.2196/63309>
- [26]. Jejeebhoy SJ. Women's autonomy in rural India: its dimensions, determinants, and the influence of context. In: Presser HB, Sen G, editors. *Women's empowerment and demographic processes: moving beyond Cairo*. Oxford: Oxford University Press; 2000. p. 204-38.
- [27]. Bollen K, Lennox R. Conventional wisdom on measurement: a structural equation perspective. *Psychol Bull*. 1991;110(2):305-14. <https://doi.org/10.1037/0033-2909.110.2.305>
- [28]. Diamantopoulos A, Winklhofer HM. Index construction with formative indicators: an alternative to scale development. *J Mark Res*. 2001;38(2):269-77. <https://doi.org/10.1509/jmkr.38.2.269.18845>