

A Cross-State Analysis to Establish Relationship between Secondary Education and Women's Well-being in India using NFHS-5 Data

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Abstract

This research paper examines the relationship between attainment of secondary education and the well-being of women across states of India. Three specific dimensions of women's well-being are considered: (1) Reproductive Well-being, (2) Personal well-being, and (3) Economic Well-being. Along these three dimensions, several key indicators of women's well-being are computed from the country-level datasets of National Family Health Survey (NFHS-5) and Periodic Labour Force Survey (PLFS). For the purpose of key indicator computation from the corresponding sub-indicators, we use dendrogram techniques and/or standardization followed by averaging of constituent datapoints. The cross-correlations between attainment of secondary education and the key indicators are computed across states of India and their relationships are established by validating their respective statistical significance. The results in this paper provide empirical evidence from NFHS-5 data on the strong association between secondary education and multiple aspects of women's well-being.

Keywords: Women's Well-Being, Secondary Education, NFHS-5, PLFS, Cross-State Analysis.

1. Introduction

Women's well-being is widely recognized as a central objective of contemporary social development policy. It is conceptualized as a multidimensional state of holistic health encompassing physical, psychological, social, economic, and environmental dimensions. Women's education plays a pivotal role in shaping their well-being. Education enhances awareness, builds self-confidence, challenges entrenched gender stereotypes, expands economic opportunities, and strengthens decision-making capacity. Secondary education, in particular, marks a critical threshold that can significantly influence women's life choices and opportunities and thereby impact their long-term well-being. In this research paper, we investigate the associations between attainment of secondary education in India and three key dimensions of women's well-being, namely, (1) Reproductive Well-being, (2) Personal well-being, and (3) Economic Well-being.

1.1. Literature Survey

Women's well-being is defined by Lips and Gordon (2010) as a holistic state of physical, emotional, social and economic health. Given the multi-dimensional nature of women's well-being, it has been studied in the literature since 1980s along specific dimensions. Glenn and Weaver (1981) studied the impact of education on the psychological well-being of women. Hill and King (1995) studied the impact of education on economic well-being. Blau (1997) analysed the trends (1970-1995) in women's well-being and noticed that different levels of education led to differentiated well-being outcomes. Mead et al.

(2001) observed a relationship between low education and poorer physical health outcomes. Gokhale et al. (2002) observed strong association between low literacy rate and high infant mortality rate in India. Klumb and Lampert (2004) summarised 161 measures of impact of employment on women's well-being where they commented on potential role of education as a driver of women's employment. Breierova and Duflo (2004) noticed the prominent role of education in controlling fertility and reducing child mortality in Indonesia. Johansson et al. (2007) used the data from Sweden to examine how a combination of education, occupation and family involvement impacts the health and well-being outcomes in women. Desjardins (2008) researched links between education and well-being in OECD countries and noticed challenges related to data limitations and measuring education and its impact.

Chen and Li (2009) found mother's education to be an important determinant of the health of adopted children in China, noting the importance of post-natal nurturing. Jones et al. (2010) argued that women's health and education are mutually reinforcing foundations of family and societal well-being, with improvements in both leading to broader social and intergenerational health benefits. Graff et al. (2010) studied the pathways between child growth and fertility rate in Guatemala and commented on the critical role of education in influencing the same. Ross and Mirwowsky (2010) argued that education impacts women's health more than men's health. Beaman et al. (2012) found that female leadership influences adolescent girls career aspirations and educational attainment. Saurabh et al (2013) demonstrated that female literacy rate is a stronger predictor of reduced birth rates and lower infant mortality in India than other socio-demographic factors. Muralidharan and Prakash (2013) recognized that the targeted government scheme 'Cycle to School' in the poor Indian state of Bihar increased girls' enrolment in secondary education by 30%. Illakiya and Kanchana Ratnam (2018) identified women's education in India as a foundational driver of improvements in health, economic development, and social outcomes.

Maas (2020) argues that educating and empowering women within healthcare systems is essential to advancing women's health outcomes. Reshi et al. (2022) observed that access to education has significant impact on women's empowerment. Hemamalini (2023) highlighted the importance of targeted educational interventions such as vocational training and sex specific curricula to fully mobilize the potential of education as a vehicle for women empowerment. Singh et al. (2023) found education to be one of the determinants of age of first marriage in India. Almgren et al. (2024) found substantial association between secondary education and women empowerment in the MENA region. Banerjee and Kayal (2024) recommended female education, along with reduction in income disparities and improved health care provisioning, for reducing inequality in women's health. Bhuwania et al. (2024) analyzed the impact of Mahila Samakhya (MS) scheme on the educational outcomes for women in selected districts of India. In five distinct contributions, UN Women and UNDP (2023), Vignitha et al. (2024), Vemireddy (2024), Mukhopadhyay (2025), and Sehgal et al. (2025) proposed indices to measure women empowerment and woman health. In a meta-analysis work, Jain and Mathur (2025) found education to be a statistically significant contributor to women empowerment in nine publications on the subject, thereby cementing its central role in women's well-being.

1.2. Motivation for this work

The central role of education in improving women's well-being is well-recognized. Given this central role, the government of India has launched numerous large scale initiatives such as 'Sukanya Samriddhi Scheme' and 'Beti Bachao Beti Padhao' (see Government of India (2015)) over the last 10-15 years to improve educational attainment of women in India.

Further, the government continues to devote sizable investments towards improvement of women's well-being, as highlighted in its Union Budget published by the Ministry of Finance (2026), which places Women along with Poor, Young and Farmers at the centre of all development measures. Given the ongoing scale and investments committed by the government of India to enhance women's well-being through education, it is important to frequently reassess the relationship between educational attainment of women and the measurable indicators of women's well-being. To this end, with the publication of India's two largest countrywide survey programs, namely, the National Family Health Survey (NFHS-5) and the Periodic Labour Force Survey (PLFS), it is now possible to freshly estimate relationships between education and several old and new indicators of women's well-being. Both the surveys have a wide coverage where NFHS-5 (2019–21) covers 636,699 households across 28 states and 8 union territories (altogether 707 districts) of India and the PLFS surveys approximately 80,000–100,000 households each quarter. Leveraging the richness of these new datasets, the key motivation behind this research paper is to examine the cross-state statistical relationships between women's education—specifically secondary education—and key indicators of women's well-being.

2. Aims and Objectives of this Study

In this study, we focus on statistical relationships between attainment of secondary education and three specific dimensions of women's well-being, namely, (i) Reproductive Well-being, (ii) Personal Well-being, and (iii) Economic Well-being. Across these three dimensions, we focus on eight key indicators of women's well-being:

Reproductive Well-being

- 1) Mean Age at Marriage
- 2) Reduction in Fertility rate
- 3) Maternal and child health

Personal Well-being

- 4) Freedom from violence
- 5) Information Connectivity and Awareness

Economic Health

- 6) Household Quality of Life
- 7) Participation in Financial Decision-Making
- 8) Workforce participation

We leverage the publicly available government survey data sets of NFHS-5 and PLFS to compute these eight indicators. While a few of these indicators such as mean age at marriage and fertility rate are available directly in the data sets, the other indicator are computed from survey data points using statistical and dendrogram techniques.

3. Data Description

3.1. NFHS-5 Data

The National Family Health Survey (NFHS-5) (2019-21) data is a large-scale household survey data covering all 28 states and 8 Union Territories of India. It is conducted by the International Institute For Population Sciences (IIPS), a research institute under the Ministry of Health and Family Welfare, Government of India. NFHS-5 provides district and state-level estimates for a wide range of demographic, health, and socio-economic indicators. The survey collected information from approximately 636,000 households and interviewed over 724,000 women (aged 15–49) and 101,000 men (aged 15–54). It includes data on fertility, maternal and child health, nutrition, mortality, immunization, anaemia, women's empowerment, domestic violence, sanitation, housing conditions, and health insurance

coverage. The survey follows a stratified two-stage sampling design. NFHS-5 is being widely used for policy evaluation, program design, and academic research in public health, gender studies, and development economics.

3.2. PLFS Data

The Periodic Labour Force Survey (PLFS) is a countrywide labour market survey conducted by the National Statistical Office (NSO) under the Ministry of Statistics and Programme Implementation (MoSPI), Government of India. Launched in 2017–18, the PLFS provides annual estimates of key labour market indicators such as labour force participation rate (LFPR), worker population ratio (WPR), and unemployment rate (UR) for individuals aged 15 years and above. The survey uses a stratified multi-stage sampling design covering both rural and urban areas across all states and union territories. PLFS also collects detailed information on employment type, industry, occupation, education, and wages, making it an important source for analysing employment trends and workforce participation in India.

4. Methods

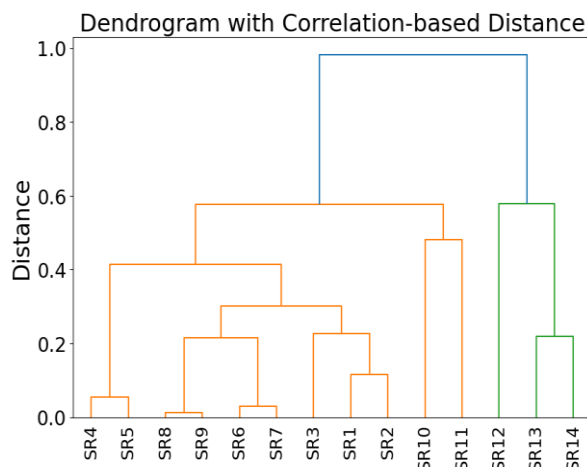
The computation of key indicators and estimation of statistical relationships with attainment of secondary education are described below:

Key indicators of Reproductive Well-being:

1. *Mean age at Marriage:* This is a simple indicator, directly available in the NFHS-5 data. A higher mean age at marriage is indicative of freedom from child marriage as well as from patriarchal mindset of treating young unmarried women as 'paraya dhan' in traditional Indian families.
2. *Reduction in Fertility Rate:* This is a again a simple indicator available in the NFHS-5 data. Given the historically high fertility rates in the country, a lower fertility rate is indicative of better reproductive well-being.
3. *Maternal & Child Health:* We compute this indicator from the following fourteen relevant Survey Responses (SRs) catalogued in the NFHS-5 data:
 - SR 1: % receiving ANC (ante-natal care) from a skilled provider
 - SR 2: % who had four or more ANC visit
 - SR 3: % with an ANC visit in the first trimester during pregnancy
 - SR 4: % who took IFA (iron and folic acid) for at least 180 days
 - SR 5: % who received all recommended types of antenatal care
 - SR 6: % of deliveries with a postnatal health check for the mother
 - SR 7: % of deliveries with a postnatal mother health check in 2 days of birth
 - SR 8: % births delivered in a healthcare facility
 - SR 9: % deliveries assisted by a skilled provider
 - SR10: % births delivered by a C-section
 - SR11: All age-appropriate vaccinations of child
 - SR 12: % mothers with child <2yrs with stool disposed-off properly
 - SR 13: Anaemia in Children (<11.0g/dl)
 - SR 14: Anaemia in Women (<12.0 g/dl)

We combine these multiple (sometimes overlapping) survey responses or SRs into meaningful sub-indicators of Maternal & Child health by doing hierarchical clustering using dendrograms. We first compute cross-correlation matrices of all SRs where correlation coefficients are computed across the SR data for the 28 states and 8 union territories of India. We then use '1-correlation coefficients' as distances to build dendrograms of the 14 SRs, resulting in two meaningful groups of SRs. Each SR in a group is significantly correlated (correlation coefficient > 0.4 or distance < 0.6) with the rest of the SRs in that group while

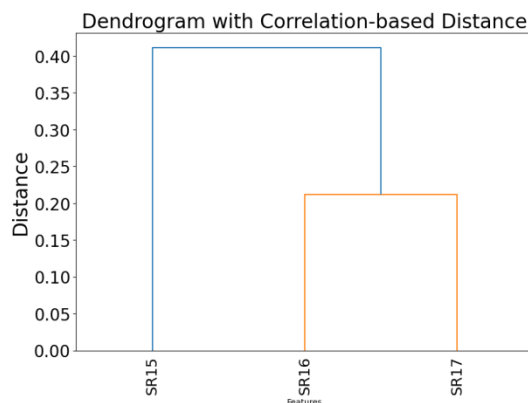
having much lower correlations with SRs in the other two groups. The dendrogram is visually shown as below:



A single sub-indicator for each group is computed by standardizing all SRs in that group using $(X - X_{min}) / (X_{max} - X_{min})$ standardization and taking the averages of standardized SRs. This results in two sub-indicators of Maternal & Child Health. We call these as Sub-Indicator 1 and Sub-Indicator 2.

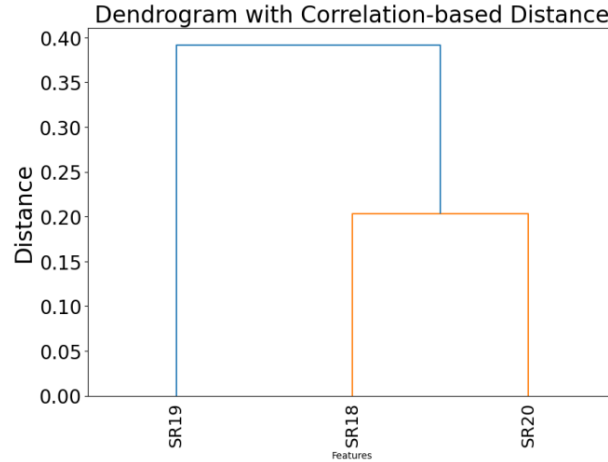
Key Indicators of Personal Well-Being:

4. *Freedom from violence*: We compute a single composite indicator by combining three fundamental SRs in NFHS-5:
SR 15: Freedom from Physical Violence
SR 16: Freedom from Emotional Violence
SR 17: Freedom from Sexual Violence



Since the above dendrogram indicates a reasonably high correlation (>0.6) among the three SRs, These three SRs are combined into a single indicator using the same technique as used in indicator 3, namely, average of standardized values of these SRs.

5. *Information Connectivity & Awareness*: A single indicator is computed by combining the following SRs:
SR 18: % females who have phones that they use themselves
SR 19: % females who use messaging services
SR 20: % females who use internet



Once again, given the high correlations among three indicators, they are combined into a single composite indicator.

Key Indicators of Economic Well-Being:

6. *Household Quality of Life:* We consider the following five SRs to assess household quality of life in Indian context:

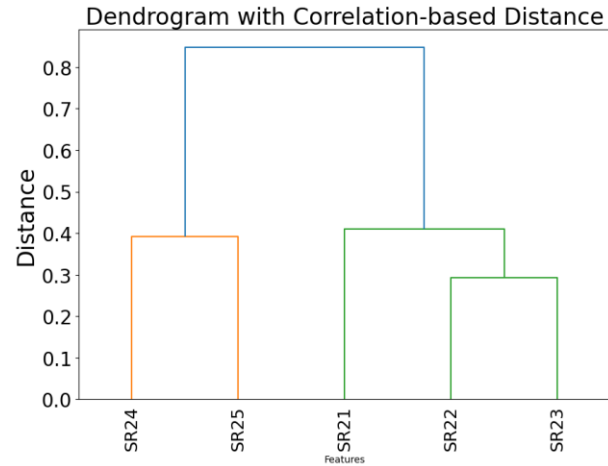
SR 21: % households with electricity

SR 22: % households living in a pucca house (made of bricks and cement)

SR 23: % households uplifted from solid fuel to gas etc. for cooking

SR 24: % households with toilet facility

SR 25: % households with improved toilet facility



The two groups are individually combined into two sub-indicators, which we label Sub-Indicator 3 and Sub-Indicator 4.

7. *Participation in Financial Decision-Making:* For this indicator, we consider the following SRs:

SR 26: % who alone or jointly with husband decide how her earnings are used

SR 27: % who alone or jointly with husband decide how husband's earnings are used

SR 28: % who earn more or about the same as their husband

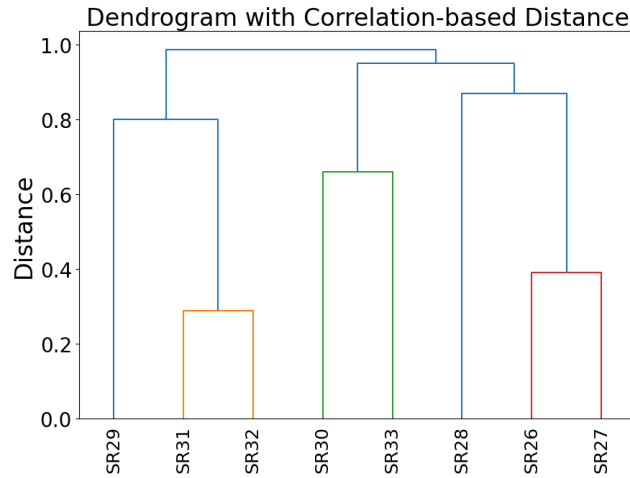
SR 29: % who have money that they can decide how to use

SR 30: % who have a bank or savings account that they themselves use

SR 31: % who have knowledge of a microcredit programme

SR 32: % who have taken a loan from a microcredit programme

SR 33: % who use mobile phone for financial transactions



The key challenge in this indicator is that the constituent SRs do not exhibit much correlation with each other. Consequently, it is difficult to come up with neat groups or corresponding sub-indicators. We therefore combine the eight SRs into a single indicator by averaging the standardized SRs.

8. *Workforce Participation*: We consider two specific metrics available in the PLFS data for workforce participation of women, namely:

SR 34: Female Labour Force Participation Rate (FLFPR); and

SR 35: Ratio of Female LFPR to Male LFPR (as used by the Niti Aayog (2024) of India in its sustainable development goals).

As it turns out, the correlation among the two metrics is 0.7, and hence we combine the two metrics into a single indicator by post standardization averaging.

Estimating relationships with attainment of secondary education

For each of these indicators, we check whether the feature is normally distributed or not using Shapiro Wilk Test. For a normally distributed feature group, we find its correlation with female secondary education (which is normally distributed) using Pearson's correlation coefficient. For a non-normal single feature group, we find its correlation with female secondary education using Spearman's rank correlation. All cross correlations are computed across states and union-territories of India.

5. Results and Analysis

Our results related to the multi-faceted relationships between attainment of secondary education and the three pertinent dimensions of women's well-being, as measured through the eight indicators computed from the NHFS-5 and PLFS data, are summarized in the table below:

Table 1: Eight indicators computed from the NHFS-5 and PLFS data

Well-Being Dimension	Indicator of Well-Being	Type of Indicator	Correlation with Secondary Education	p-value
Reproductive Well-being	Mean Age of Marriage	Simple	0.5116	0.01494
	Reduction in Fertility Rate	Simple	0.5683	0.00030
	Maternal & Child Health	Composite	0.5770	0.00023

	<ul style="list-style-type: none"> • Sub-Indicator 1 • Sub-Indicator 2 	Composite	0.5602	0.00038
Personal Well-being	Freedom from Violence	Composite	0.5295	0.00089
	Information Connectivity and awareness	Composite	0.8114	0.00001
Economic Well-being	Household Quality			
	<ul style="list-style-type: none"> • Sub-Indicator 3 • Sub-Indicator 4 	Composite	0.6940	0.00001
		Composite	0.5989	0.00011
	Participation in Financial Decision-Making	Composite	0.2207	0.19590
	Workforce Participation	Composite	0.08192	0.6348

We observe that for six of the eight indicators considered (namely, mean age of marriage, reduction in fertility rate, maternal & child health, freedom from violence, information connectivity and awareness and household quality of life), the correlation with attainment of secondary education is more than 0.5 with the highest being 0.81 for information connectivity and awareness and the lowest being 0.51 for mean age of marriage. This clean evidence obtained from such large scale surveys and computed using cross-correlations across states and union territories of India, strengthens the widespread findings in the literature related to strong relationship between education and women's well-being.

The importance of using secondary education rather than any specific variant of tertiary education obviates the challenge stated by Desjardins (2008) for OECD data where it was noted that measuring education can be complex. In the case of India, unlike OECD, the standards for secondary education are fairly uniform across states and union territories even though tertiary education and economic strength (GDP/capita) can be quite different across states.

The relationship between secondary education and two key indicators of economic well-being (namely, participation in financial decision making and workforce participation) were found to be low at 0.22 and 0.08, respectively. With regard to participation in financial decision making, the low correlation may not necessarily imply that secondary education is not empowering women along this indicator. On the other hand, this is one of the indicators where SRs themselves are quite uncorrelated (in the dendrogram) and hence the consolidated indicator computed from these SRs may or may not be a good measure of autonomy in financial decision making. Further, the low correlation of secondary education with workforce participation may be indicative that economic opportunities and other factors may play a more dominant role in workforce participation than education alone.

6. Concluding remarks

Women's well-being is a key objective of contemporary social development policy. A number of works in the literature point to relationship between education and women's well-being. In light of the large survey datasets of NFHS-5 and PLFS made available by the government of India, we reassessed the relationships between attainment of secondary education among women in India and their reproductive, personal and economic well-being. We specifically focused on eight indicators, including certain composite indicators and sub-indicators, which could be estimated using NFHS-5 and PLFS datasets. We found evidence of the strong relationships between secondary education and six of the eight indicators, while

little evidence of relationship with the remaining two indicators. The strong correlation may not necessarily indicate that secondary education is the driver of all these six indicators. For instance, a family with high household quality of life is likely to be richer and hence more likely to get access to secondary education for its girl child. At an aggregate level, however, the high correlations with such diverse set of indicators is indicative of the central role of secondary education in well-being of women in India. While the above results were obtained through cross-correlations for 36 states and union territories in India, the relationships obtained through cross-correlations at district levels provide a similar picture (albeit district data is available for far fewer SRs) and skipped here for brevity. The government of India is consistently increasing the granularity and richness of its survey datasets. For example, NFHS-5 is significantly richer in both content and coverage compared to NFHS-4 data. Further, the frequency of PLFS has increased from annually to quarterly. These survey datasets with vast coverage enable better assessment of social issues than what was feasible till a few years back. While the data is not currently rich enough to assess other aspects of well-being, specially psychological and environmental well-being of women, such an analysis might be feasible with future datasets. Further, with richer datasets of future, it may be possible to study impact of tertiary education on workforce participation of women, a topic which was out of scope for this paper.

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