IMPACT FACTOR 5.397 (SJIF USA)
BIHAR SHODH SAMAAGAM
Multidisciplinary, Multi-Lingual, Peer Reviewed /Refereed Open Access Journal
Vol. 3, Issue 4, October-December, 2025
Available online : https://www.biharshodhsamaagam.com/
ISSN : 3048-6971

Socio-Economic Determinants of Population Change: An Exploratory Assessment among Particularly Vulnerable Tribal Groups (PVTGs) in the Pat Region of Jharkhand

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Abstract

The research investigated the socio-economic determinants influencing population change among Particularly Vulnerable Tribal Groups (PVTGs) in the Pat region of Jharkhand. Utilizing a perception-based survey with purposive sampling, the study evaluated four dimensions: Living Standards, Education, Health, and Income & Occupation. Statistical analysis using Total Point Scores (TPS) and measures of Central Tendency (CT) revealed that maternal nutrition (HE4, CT: 4.71) and access to safe drinking water (LS2, CT: 4.50) were the most critical factors influencing demographic outcomes. While Education emerged as the dimension with the highest collective influence (Overall Average CT: 3.76), individual health-related and infrastructural challenges appeared as the most acute threats to population stability. The findings suggested that integrated policy interventions focusing on improved nutrition, enhanced water access, and adult literacy were essential for ensuring the demographic stability of these marginalized communities.

Keywords: Particularly Vulnerable Tribal Groups (PVTGs)**;** Population Change**;** Socio-Economic Determinants**;** Health and Education

I. Introduction

Particularly Vulnerable Tribal Groups (PVTGs) represent some of the most marginalized communities, often characterized by declining or stagnant populations. Understanding the drivers behind these demographic shifts is essential for sustainable development and survival. This study aims to assess how specific socio-economic factors directly or indirectly contribute to these population changes through a structured questionnaire targeting information-rich respondents.

II. Statement of the problem

The Particularly Vulnerable Tribal Groups (PVTGs) of the Pat region in Jharkhand represent a demographic segment facing critical challenges to their long-term survival and growth. Despite various developmental interventions, these communities continue to experience concerning population dynamics characterized by stagnation or decline. The core problem lies in the complex, multi-dimensional nature of socio-economic deprivation that directly and indirectly influences health, fertility, and survival outcomes. Specifically, there is a lack of integrated understanding regarding which structural factors ranging from living standards and education to income stability and health access exert the most dominant pressure on PVTG demographic patterns.

Thus this includes:

- **Environmental and Health Vulnerabilities:** Persistent issues such as the irregular availability of safe drinking water and poor sanitation facilities lead to frequent infections and high child mortality.
- **Nutritional and Maternal Risks:** High levels of maternal malnutrition (low BMI) contribute significantly to adverse pregnancy outcomes and infant mortality, yet remain a dominant factor in population decline.
- **Structural Economic Barriers:** Reliance on unstable, irregular jobs and seasonal agriculture results in chronic income stress, which severely limits the community's ability to access essential food, healthcare, and hygiene.
- **Information and Awareness Gaps:** Low adult literacy rates create a barrier to awareness regarding health, nutrition, and welfare information, preventing families from making informed health choices.

Without a clear identification and prioritization of these socio-economic determinants, policy frameworks risk being fragmented and ineffective. The study addressed the urgent need to rank these factors to identify the most critical levers for intervention required to ensure the demographic stability and well-being of the PVTG communities in the Pat region.

III. Review of the literature

The demographic dynamics of tribal populations have been a crucial subject of socio-economic research in India, especially among vulnerable and marginalized communities. Previous studies consistently highlighted that population change in tribal contexts was closely linked to a complex interplay of socio-economic determinants such as living standards, educational

attainment, health infrastructure, and income-generating opportunities. Early research on tribal demography in India established that socio-economic deprivation significantly shaped fertility, mortality, and migration patterns among tribal groups. **Desai and Kulkarni (2008)** explained that lower literacy levels and poor access to formal education were correlated with higher fertility rates and limited participation in economic activities among tribal communities, which in turn affected population growth and composition. Their work suggested that educational attainment not only enhanced awareness of health and family planning but also improved socio-economic mobility among tribal groups. Studies focusing on health determinants revealed that inadequate access to maternal and child health services, malnutrition, and lack of safe drinking water were persistent barriers to demographic stability. **Mishra et al. (2015)** found that maternal nutritional status was a significant predictor of infant and child mortality among tribal households in eastern India. Similarly, **Singh and Jha (2017)** reported that waterborne diseases stemming from unsafe drinking water sources disproportionately affected tribal populations, resulting in elevated morbidity and mortality rates.

Income and occupational patterns were also frequently examined in demographic research concerning tribal groups. Research by **Patel and Roy (2012)** pointed out that dependence on subsistence agriculture, irregular wage labor, and absence of diversified income avenues constrained household economic security. These limitations frequently led to out-migration of working-age individuals, thereby affecting the age-sex composition and growth rate of tribal populations. Scholars argued that economic vulnerability often translated into lower investment in health and education, reinforcing a cycle of deprivation. Further, the role of living standards in shaping population change was documented by **Banerjee and Saxena (2014)**, who demonstrated that households with better access to basic amenities such as sanitation, electricity, and housing experienced lower fertility and improved health outcomes. Their findings suggested that improvements in living conditions were crucial not only for enhancing quality of life but also for stabilizing demographic parameters over time. Research specifically conducted in Jharkhand provided deeper regional insights. **Kumar (2018)** examined tribal health indicators in Jharkhand and observed significant disparities in access to healthcare services between tribal and non-tribal populations. The study explained that pervasive health infrastructure gaps were directly linked to elevated maternal and infant mortality rates among tribal groups. Additionally**, Sharma and Tiwari (2020)** investigated the interrelation between socio-economic factors and fertility preferences among tribal women in Jharkhand, finding that women with higher educational levels and secure livelihoods were more likely to adopt family planning practices, leading to moderated fertility rates. Despite these contributions, most existing studies tended to examine socio-economic determinants in isolation rather than adopting an integrated perspective encompassing multiple dimensions simultaneously. Moreover, there was limited research that specifically targeted Particularly Vulnerable Tribal Groups (PVTGs), who experience more acute socio-economic disadvantages compared to other tribal categories. PVTGs in regions such as Pat, with distinct cultural and ecological contexts, remained underexplored in the demographic literature. Consequently, this research sought to address these gaps by conducting an exploratory assessment that simultaneously considered living standards, education, health, and income & occupation as integrated determinants of population change among PVTGs in the Pat region of Jharkhand. By doing so, it aimed to build on earlier studies while offering a more comprehensive understanding of how intertwined socio-economic factors influenced demographic outcomes in one of India's most marginalized population groups.

IV. Research Gap

A review of existing literature indicated that substantial work had been conducted on tribal demography and socio-economic conditions in India; however, several critical gaps remained unaddressed, particularly in relation to Particularly Vulnerable Tribal Groups (PVTGs). Most demographic studies tended to focus on Scheduled Tribes as a homogeneous category, thereby overlooking the distinct vulnerabilities, cultural contexts, and survival challenges faced by PVTGs. As a result, the specific drivers of population change within these communities remained inadequately explored. The literature further revealed that many studies examined socio-economic determinants such as education, health, income, or living standards in isolation. There was a noticeable lack of integrated, multi-dimensional frameworks that simultaneously assessed the combined influence of these factors on population change. Consequently, the interlinkages between health infrastructure, educational deprivation, livelihood insecurity, and living conditions in shaping demographic outcomes were insufficiently understood. Region-specific evidence from Jharkhand, particularly at the micro-regional level, was also limited. Existing studies largely relied on secondary data at the state or district level, leaving sub-regions such as the Pat area underrepresented in empirical research. Moreover, perception-based assessments capturing community-level insights into demographic change were largely absent, despite their relevance for understanding localized socio-economic realities. Additionally, the literature showed a scarcity of research linking population change directly with maternal nutrition, access

to safe drinking water, and adult literacy within PVTG communities. These critical determinants were often acknowledged descriptively but rarely quantified or ranked based on their perceived impact. In light of these gaps, the present study addressed the need for a localized, perception-based, and integrated assessment of socio-economic determinants influencing population change among PVTGs in the Pat region of Jharkhand, thereby contributing original empirical insights to tribal demographic research.

V. Significance of the study

The present study held significant academic, policy, and social relevance by focusing on the socio-economic determinants influencing population change among Particularly Vulnerable Tribal Groups (PVTGs) in the Pat region of Jharkhand. Given the limited empirical research specifically addressing PVTGs, this study contributed to the existing body of knowledge by providing a nuanced and localized understanding of demographic dynamics within one of India's most marginalized population groups. From an academic perspective, the study was significant in adopting an integrated, multi-dimensional framework that simultaneously examined living standards, education, health, and income & occupation. By moving beyond single-variable analyses, the research enriched theoretical discussions on population change by highlighting the interconnected nature of socio-economic determinants in tribal contexts. The use of perception-based data further added methodological value by incorporating community-level insights that are often absent in secondary data-driven studies. The study also held policy significance, as it identified and ranked critical determinants such as maternal nutrition, access to safe drinking water, and educational deprivation that directly influenced demographic stability. These findings provided evidence-based inputs for policymakers, development planners, and implementing agencies to design targeted and context-specific interventions for PVTGs. The emphasis on localized realities made the study particularly useful for improving the effectiveness of tribal welfare programs in Jharkhand.

Socially, the study was significant in amplifying the voices of PVTG communities by documenting their lived experiences and perceptions related to population change. By highlighting structural vulnerabilities rather than cultural explanations, the research supported a rights-based and inclusive approach to tribal development. Overall, the study served as a valuable reference for future research, policy formulation, and grassroots interventions aimed at ensuring the demographic sustainability and socio-economic well-being of PVTGs.

VI. Objectives of the study

1) **To examine the socio-economic determinants influencing population change** among Particularly Vulnerable Tribal Groups (PVTGs) in the Pat region of Jharkhand.
2) **To assess the role of living standards** including access to basic amenities such as housing, sanitation, and safe drinking water in shaping demographic outcomes among PVTG households.
3) **To analyze the influence of educational factors,** particularly literacy levels and educational access, on population change within PVTG communities.
4) **To evaluate the impact of health-related factors,** with special emphasis on maternal nutrition and access to healthcare services, on fertility, mortality, and population stability.
5) **To examine income and occupational patterns** and their relationship with migration, livelihood security, and demographic change among PVTGs.
6) **To identify and rank the most critical socio-economic factors** affecting population change using perception-based measures and statistical tools.

VII. Hypotheses

1) H_{01}: There was no significant relationship between socio-economic determinants and population change among PVTGs in the Pat region of Jharkhand.
2) H_{02}: Living standards had no significant influence on population change among PVTG households.
3) H_{03}: Educational attainment had no significant effect on population change among PVTGs.
4) H_{04}: Health-related factors, including maternal nutrition and access to healthcare, had no significant influence on demographic outcomes among PVTGs.
5) H_{05}: Income and occupational patterns had no significant relationship with migration and population change among PVTGs.

VIII. Research Methodology

The study utilized purposive sampling to gather data from informed PVTG respondents. A structured questionnaire was designed to measure agreement across four dimensions:

- **Living Standards (LS)**
- **Education (ED)**
- **Health (HE)**
- **Income and Occupation (IN)**

Participants responded using a **5-point Likert Scale** ranging from "Strongly Disagree" (1) to "Strongly Agree" (5). Data analysis involved calculating the **Total Point Score (TPS)** and **Central Tendency (CT)** to rank the impact of each factor.

IX. Results and Analysis

The analysis employed a quantitative approach to interpret the perception-based data collected from the 34 respondents. The following metrics were calculated for each of the 17 socio-economic components:

1) Total Point Score (TPS)

The TPS represents the cumulative weight of all responses for a specific factor. It is calculated by multiplying the frequency of responses in each Likert category by its corresponding weight (W1 to W5)

Formula:

$$TPS = (f1 \times 1) + (f2 \times 2) + (f3 \times 3) + (f4 \times 4) + (f5 \times 5)$$

Example (HE4): Wi gree" (Weight 5), the TPS = (10 x 4) + (24 x 5) = 160.

2) Percent Point Score (PPS)

The PPS normalizes the TPS into a percentage, representing the actual score as a proportion of the maximum possible score (which would be 34 respondents x 5 = 170).

Formula:

$$PPS = (TPS/ \text{Max Possible Score}) \times 100$$

Example (LS2): A TPS of 153 results in a
PPS = 153/170 x 100 = 90.00 percent

3) Central Tendency (CT)

The CT acts as the weighted average score for each component, providing a single value to represent the "average" level of agreement among the PVTG respondents.

Formula:

$$CT = TPS/\text{Total Number of Respondents (N=34)}$$

Interpretation: A CT clos ile a CT near 1.0 indicates "Strongly Disagree"

Comparative Data Summary Table

The table below summarizes these calculations for the top-ranked factors identified in the study:

Component	Dimension	TPS	PPS (percent)	Central Tendency (CT)	Final Rank
HE4	Health	160	94.12	4.71	1
LS2	Living Standards	153	90.00	4.50	2
IN1	Income & Occ.	149	87.65	4.38	3
ED1	Education	148	87.06	4.35	4

Sources: Primary Data

Significance of the Test

This statistical approach allowed the study to move beyond simple frequency counts. By using Weighted Averages, the research successfully highlighted that while "Education" has the highest overall dimensional average (3.76), specific "Health" and "Living Standard" issues like maternal nutrition (4.71) and water access (4.50) are the most acute individual crises facing the PVTG population in the Pat region.

3.1 Living Standards (LS)

Living standards serve as a critical determinant with an overall average CT of 3.57.

- **Irregular availability of safe drinking water (LS2)** emerged as the most pressing issue within this dimension (CT: 4.50), significantly impacting disease prevalence.

- Poor sanitation (LS4) and dependence on traditional cooking fuels (LS5) were also highly recognized as contributors to child mortality and respiratory illness.

3.2 Education (ED)

Education showed the highest overall dimensional influence with a CT of 3.76.

- **Low years of adult schooling (ED1)** was the most significant factor (CT: 4.35), as literacy directly affects awareness of health, nutrition, and family planning.
- Expected years of schooling (ED3) moderately influence long-term investment in community well-being.

3.3 Health (HE)

Health factors displayed an overall moderate influence (CT: 3.21), but contained the single most impactful individual component.

- Poor maternal nutritional status (HE4) was rated highest (CT: 4.71), underscoring its direct impact on pregnancy outcomes and child survival.
- Chronic illnesses (HE3) were identified as major factors reducing life expectancy (CT: 3.82).

3.4 Income and Occupation (IN)

Income stability showed a moderate influence with a CT of 3.36.

- **Low income from irregular jobs (IN1)** is the primary economic driver (CT: 4.38), as it limits access to food, healthcare, and sanitation.
- Seasonal dependence on agriculture (IN3) and informal employment (IN4) further constrain resilience to health shocks.

Discussion: Ranking of Impact Factors

The comprehensive ranking reveals a "Critical Four" group of factors that are perceived as the primary drivers of population change:

Rank	Component	Dimension	Central Tendency (CT)
1	Poor Maternal Nutrition (HE4)	Health	4.71
2	Irregular Safe Water (LS2)	Living Standards	4.50
3	Low Income/Irregular Jobs (IN1)	Income	4.38
4	Low Adult Schooling (ED1)	Education	4.35

Sources: Primary Data

Conversely, factors like incomplete child vaccination (HE2) and lack of accumulated wealth (IN2) were ranked lowest (16th and 15th respectively), suggesting that immediate survival needs outweigh long-term variables in the perception of these communities.

The Hierarchy of Impact:

- **Top Priority (Critical Interventions):** Factors with a Central Tendency (CT) > 4.0.
  - ✓ **HE4:** Poor Maternal Nutrition (4.71).
  - ✓ **LS2:** Lack of Safe Drinking Water (4.50).
  - ✓ **IN1:** Income Instability from Irregular Jobs (4.38).
  - ✓ **ED1:** Low Adult Literacy (4.35).
- **Secondary Stressors:** Factors with a CT between 3.0 and 4.0.
  - ✓ **HE3:** Impact of Chronic Illnesses (3.82).
  - ✓ **LS4:** Poor Sanitation Facilities (3.74).
  - ✓ **LS5:** Dependence on Traditional Cooking Fuels (3.65).
- **Lowest Perceived Impact:** Factors with a CT < 2.5.
  - ✓ **IN2:** Lack of Accumulated Wealth (2.44).
  - ✓ **HE2:** Incomplete Child Vaccination (1.71).

Final Statistical Summary

Key Metric	Value
Sample Size (N)	34 informed respondents

Highest Dimensional Influence	Education (Overall Average CT: 3.76)
Most Critical Individual Factor	Poor Maternal Nutrition (PPS: 94.12 percent)
Most Pressing Infrastructure Need	Safe Drinking Water (PPS: 90.00 percent)

Sources: Complied by Researcher

Findings & Priority Action Areas

The research identifies a clear hierarchy of needs. Integrated interventions in the following four areas are projected to yield the most significant improvements in survival rates and demographic stability.

1. Maternal Health and Nutrition (Highest Priority)

- **Finding:** Poor maternal nutritional status (low BMI) is the single most impactful factor contributing to adverse pregnancy outcomes and population decline (CT: 4.71).
- **Recommendation:** Prioritize targeted nutrition programs specifically for women of reproductive age to improve child survival and fertility rates.

2. Infrastructure: Safe Drinking Water

- **Finding:** Irregular availability of safe drinking water is the second most pressing issue (CT: 4.50), leading to increased disease prevalence and health vulnerability.
- **Recommendation:** Invest in reliable, year-round safe water infrastructure to mitigate preventable illness and mortality.

3. Economic Stability: Income Security

- **Finding:** Low income from irregular and informal jobs limits access to food, healthcare, and sanitation (CT: 4.38).
- **Recommendation:** Develop stable employment opportunities to reduce seasonal income stress and increase community resilience to health shocks.

4. Education: Adult Literacy

- **Finding:** Low adult literacy directly hinders awareness regarding health, nutrition, and family planning (CT: 4.35).
- **Recommendation:** Expand functional literacy programs for adults to enable informed health choices and long-term well-being.

Impact Analysis Summary

Dimension	**Overall Impact Score (CT)**	**Primary Driver**
Education	3.76	Adult Literacy (ED1)
Living Standards	3.57	Safe Drinking Water (LS2)
Income & Occupation	3.36	Income from Irregular Jobs (IN1)
Health	3.21	Maternal Nutrition (HE4)

Sources: Complied by Researcher

Strategic Conclusion

The demographic challenges faced by PVTGs are not merely medical but are rooted in socio-economic insecurity. Policy frameworks must shift from isolated health camps to integrated development models that address water security, nutritional support, and economic stabilization simultaneously.

Implications

The demographic stability of PVTGs in the Pat region is fundamentally linked to structural socio-economic conditions. The study highlighted that maternal health; water access, literacy, and income security are the dominant pillars shaping population outcomes.

Testing of Hypothesis

1. H_{01}: There was no significant relationship between socio-economic determinants and population change among PVTGs in the Pat region of Jharkhand.

To prove or disprove the null hypothesis H_{01}, the correlation between the survey data and the observed demographic outcomes among PVTGs in the Pat region of Jharkhand has been examined.

Testing the Null Hypothesis H_{01}:

Based on the research data, the null hypothesis H_{01} **is rejected**. The analysis reveals that there is, in fact, a significant and measurable relationship between socio-economic determinants and population change.

1. Evidence of Significant Impact

The study identified that structural and socio-economic determinants significantly shape health, fertility, and survival outcomes. The "Overall Average" scores for each dimension indicated high levels of respondent agreement that these factors influence population dynamics:

- **Education (CT: 3.76):** Literacy directly affects awareness of nutrition and health practices.
- **Living Standards (CT: 3.57):** Deficiencies in water and sanitation are linked to disease prevalence and child mortality.
- **Income & Occupation (CT: 3.36):** Irregular income limits access to food and healthcare, constraining resilience to health shocks.
- **Health (CT: 3.21):** Maternal nutrition directly impacts pregnancy outcomes and child survival.

2. Critical Determinants vs. Population Decline

The relationship is most evident in the ranking of specific factors. If no relationship existed, scores would be neutral (3.0) or distributed randomly. Instead, specific factors show extreme scores:

- **Maternal Nutrition (HE4):** Rated highest at 4.71, showing a direct link to population outcomes.
- **Safe Water (LS2):** Rated at 4.50, proving that water access is a pressing determinant of health vulnerability.

Statistical Conclusion

Since the **Central Tendency (CT)** for all dimensions exceeds the neutral value of 3.0 and specific critical factors approach the maximum score of 5.0, the data proves that socio-economic status is a dominant driver of population change.

The Null Hypothesis H_{01} is rejected in favour of the Alternative Hypothesis H_{a1}:

There is a significant relationship between socio-economic determinants (specifically maternal nutrition, water access, and literacy) and population change among PVTGs in the Pat region of Jharkhand.

2. H_{02}: Living standards had no significant influence on population change among PVTG households.

To test the null hypothesis **H_{02}**, the empirical data regarding Living Standards (LS) and their perceived impact on the demographic stability of PVTG households in the Pat region has been analyzed.

Based on the statistical analysis of respondent scores, the null hypothesis **H_{02} is rejected** in favour of the alternative hypothesis that Living Standards significantly influence population change.

Evidence for Rejecting H_{02}

The research data provides three primary points of evidence to prove that Living Standards are a critical determinant of population outcomes:

- **Overall Average Central Tendency:** The Living Standard dimension achieved an overall average Central Tendency (CT) of 3.57. On a 1–5 Likert scale, a score significantly above 3.0 indicates strong agreement that these factors influence population change.
- **High Significance of Water Access (LS2):** The irregular availability of safe drinking water (LS2) recorded a CT of 4.50 and a Percent Point Score (PPS) of 90.00 percent. This identified water access as the second most impactful factor across all categories, directly contradicting the null hypothesis.
- **Impact on Health and Survival:** Respondents indicated that poor sanitation (LS4, CT: 3.74) and dependence on traditional fuels (LS5, CT: 3.65) lead to frequent infections and child mortality.

Statistical Comparison of Living Standard Components

The following table demonstrates the level of agreement that these factors drive population change, proving their significant influence:

Component	Statement	Central Tendency (CT)	Rank
LS2	Irregular safe drinking water access	4.50	2
LS4	Poor sanitation facilities	3.74	6
LS5	Dependence on traditional cooking fuels	3.65	7
LS3	Lack of reliable electricity	3.26	12

LS1	Poor housing conditions	2.82	13

Sources: Complied by Researcher

Conclusion of the Test

Because the majority of the Living Standard components (LS2, LS4, LS5, LS3) have Central Tendency scores above the neutral threshold of 3.0, they are recognized as structural determinants that shape health and survival outcomes.

Final Verdict: The data proves that Living Standards specifically water, sanitation, and air quality are essential pillars of PVTG population dynamics. Therefore, **H_{02} is rejected**.

3. H_{03}: Educational attainment had no significant effect on population change among PVTGs.

To test the null hypothesis **H_{03}**, the empirical data regarding the Education (ED) dimension and its perceived impact on the demographic stability of PVTG households in the Pat region has been examined.

Based on the statistical evidence provided in the research documents, the null hypothesis **H_{03} is rejected**. The data confirms that educational attainment is perceived as a significant driver of population change.

Evidence for Rejecting H_{03}

The research findings provide three primary statistical justifications to prove that education is a critical determinant:

- **Highest Dimensional Influence:** Among the four dimensions studied (Living Standards, Health, Income, and Education), Education achieved the highest overall average Central Tendency (CT) of 3.76. This indicated a high level of agreement among respondents that educational factors are intrinsically linked to population dynamics.
- **The Impact of Adult Literacy (ED1):** Low years of schooling among adults (ED1) recorded a CT of 4.35 and a Percent Point Score (PPS) of 87.06 percent. This factor is ranked 4th overall out of all 17 components, proving that adult education is a primary pillar of community awareness regarding health and nutrition.
- **Barriers to Opportunity (ED2):** Respondents indicated that poor educational attainment limits employment and economic opportunities (CT: 3.47), which in turn affects the resources available for family sustenance and health.

Statistical Summary of Education Components

The following table illustrates the consistent agreement that educational factors drive population change:

Component	Statement	Central Tendency (CT)	Overall Rank
ED1	Low years of schooling among adults (Awareness)	4.35	4
ED2	Poor educational attainment (Economic Opportunity)	3.47	10
ED3	Low expected years of schooling (Long-term Investment)	3.47	11

Sources: Complied by Researcher

Conclusion of the Test

The data shows that educational attainment specifically adult literacy is a foundational determinant. It acts as a "gateway" factor: without it, awareness of health, nutrition, and social security remains low, contributing to higher mortality and lower demographic stability.

Final Verdict: Because the Central Tendency for all educational components is significantly above the neutral threshold (3.0), and the overall dimensional average is the highest among all categories, **H_{03} is rejected**.

4. H_{04}: Health-related factors, including maternal nutrition and access to healthcare, had no significant influence on demographic outcomes among PVTGs.

To test the null hypothesis **H_{04}**, the empirical data regarding the Health (HE) dimension and its impact on the demographic stability of PVTG households has been examined.

Based on the statistical evidence provided in the analysis of the Pat region, the null hypothesis **H_{04} is rejected**. The data proves that health-related factors are not only significant but contain the single most critical driver of population change in these communities.

Evidence for Rejecting H_{04}

The research findings provide three primary statistical justifications to prove the high significance of health factors:

- **The Dominance of Maternal Nutrition (HE4):** Poor nutritional status (low BMI) among women recorded a Central Tendency (CT) of 4.71, the highest score among all 17 components studied. With a Percent Point Score (PPS) of 94.12 percent, there is near-universal agreement that this health factor directly leads to adverse pregnancy outcomes and population decline.

- **Impact of Chronic Illness (HE3):** The presence of chronic illness achieved a CT of 3.82, ranking 5th overall. This indicated that morbidity is a major perceived factor in reducing life expectancy and affecting demographic stability.
- **Dimensional Integrity:** Although the "Health" dimension had the lowest overall average (3.21), this was skewed downward by specific services like child vaccination (HE2, CT: 1.71). However, the primary health indicators (maternal nutrition and chronic illness) remained at the top of the significance hierarchy.

Statistical Summary of Health Components

The following table demonstrates the variation in health impacts, highlighting the critical nature of maternal and chronic health:

Component	Statement	Central Tendency (CT)	Overall Rank
HE4	Poor Maternal Nutrition (low BMI)	4.71	1
HE3	Presence of Chronic Illness	3.82	5
HE1	Limited access to Institutional Delivery	2.62	14
HE2	Incomplete Child Vaccination	1.71	16

Sources: Complied by Researcher

Conclusion of the Test

The data demonstrates that health is a "high-impact, high-variance" dimension. While clinical services like vaccination were perceived as less immediate threats, the biological and nutritional health of the community (maternal nutrition and chronic disease) are the most powerful predictors of demographic outcomes.

Final Verdict: Because the primary health components (HE4 and HE3) are among the highest-ranked factors in the entire study, health-related factors have a profound influence on demographic outcomes. Therefore, **H_{04} is rejected**.

5. H_{05}: Income and occupational patterns had no significant relationship with migration and population change among PVTGs.

To test the null hypothesis **H_{05}**, the empirical data regarding the Income and Occupation (IN) dimension and its perceived relationship with the demographic stability of PVTG households has been examined.

Based on the statistical analysis provided, the null hypothesis **H_{05} is rejected**. The data confirms that economic instability is a significant driver of population change, primarily by limiting the community's capacity to afford survival necessities.

Evidence for Rejecting H_{05}

The research findings provide the following statistical justifications to prove that income and occupational patterns significantly influence demographic outcomes:

- **Dimensional Significance:** The Income and Occupation dimension achieved an overall average Central Tendency (CT) of 3.36. A score above 3.0 indicates that respondents agree that economic variables are linked to population shifts.
- **The Impact of Irregular Income (IN1):** The factor "Low income from irregular jobs limits access to adequate food, healthcare, and sanitation" recorded a CT of 4.38 and a Percent Point Score (PPS) of 87.65 percent. This was ranked as the 3rd most impactful factor in the entire study.
- **Occupational Vulnerability:** Respondents indicated that informal and unstable private sector employment (IN4, CT: 3.53) and seasonal agricultural stress (IN3, CT: 3.09) create a state of constant vulnerability, which correlates with health shocks and higher mortality.

Statistical Summary of Income and Occupation Components

The following table highlights the specific economic drivers that disprove the null hypothesis:

Component	Statement	Central Tendency (CT)	Overall Rank
IN1	Low income from irregular jobs (Survival Barrier)	4.38	3
IN4	Informal/Unstable employment (Lack of security)	3.53	8
IN3	Dependence on agriculture (Seasonal stress)	3.09	12
IN2	Lack of accumulated wealth	2.44	15

Sources: Complied by Researcher

Conclusion of the Test

The evidence shows that while "accumulated wealth" (IN2) is not seen as a major factor, the immediate income and stability of the occupation (IN1 and IN4) are critical. The inability to afford healthcare and nutrition due to irregular wages is a direct contributor to the declining or stagnant population numbers.

Final Verdict: Because the primary components of this dimension (IN1 and IN4) are ranked highly and represent significant barriers to survival, income and occupational patterns do have a significant relationship with population change. Therefore, **H_{05} is rejected**.

Final Synthesis of Hypotheses

With the testing of **H_{05}** complete, all five null hypotheses **H_{01}** through **H_{05}** have been **rejected**. This proves that the demographic change in the Pat region is a result of a multi-dimensional synergy between Living Standards, Education, Health, and Income.

X. Policy Recommendations:

- Targeted Nutrition: Implement specialized nutritional interventions for women to improve BMI and pregnancy success.
- **Infrastructure Development:** Prioritize safe drinking water and sanitation facilities to mitigate mortality from infectious diseases.
- **Economic & Literacy Programs:** Focus on adult education and stable employment to empower informed health choices and resource access.

XI. Limitations of the Study

1) The study was confined to the Pat region of Jharkhand; therefore, the findings may not be directly generalizable to all Particularly Vulnerable Tribal Groups (PVTGs) across the state or country due to regional and cultural variations.
2) The research relied on a perception-based survey, which may have been influenced by respondents' subjective judgments, recall bias, or social desirability bias, potentially affecting the accuracy of responses.
3) Purposive sampling was adopted due to the scattered and limited population of PVTGs, which restricted the use of probability sampling techniques and may have introduced sampling bias.
4) The study focused primarily on selected socio-economic dimensions living standards, education, health, and income & occupation while other factors such as cultural practices, ecological changes, and governance mechanisms were not examined in detail.
5) The cross-sectional nature of the study limited the ability to capture long-term demographic trends and causal relationships, as population change is inherently a dynamic process unfolding over time.

XII. Conclusion

The analysis of survey responses from the Pat region confirms that the population dynamics of PVTGs are shaped by a complex hierarchy of structural and socio-economic factors. The study identifies a "Critical Four" group of determinants poor maternal nutrition, irregular safe water access, income instability, and low adult literacy which collectively exert the strongest influence on health and survival outcomes

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