



Human Capital Formation in India: Pathways, Progress, and Persistent Gaps

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Abstract

Human capital—the stock of knowledge, skills, health, and habits embodied in people—is a central driver of productivity and long-run growth. India, home to the world’s largest cohort of young people, has made notable advances in schooling access, skills initiatives, and health coverage. Yet challenges in learning quality, nutrition, employability, gender disparities, and underinvestment in public health continue to constrain the pace at which India converts its demographic potential into durable economic dividends. This paper synthesizes theory, long-run trends, and the latest evidence on education, health and nutrition, and workforce skills to assess India’s human capital formation. It reviews key policies (e.g., the National Education Policy 2020, Samagra Shiksha, PM POSHAN, Mission POSHAN 2.0, Ayushman Bharat, PMKVY/Skill India), documents achievements and shortfalls using nationally representative data (NFHS, PLFS, National Health Accounts, ASER), and proposes a reform agenda focused on foundational learning, early childhood development, health financing, skills-industry alignment, and gender-inclusive strategies. The analysis concludes that sustained improvements in state capacity and public investment—complemented by accountable delivery, rigorous measurement, and public-private collaboration—are essential to accelerate human capital accumulation and inclusive growth in India.

1. Introduction

Human capital formation is defined as the accumulation of knowledge, skills, competencies, and health. It has been a central concern in both classical and modern economic thought. Adam Smith recognized the productive capacity of “acquired and useful abilities” more than two centuries ago, while modern theorists such as Theodore W. Schultz (1961) and Gary S.



Becker (1964) formalized the idea of education, training, and health as investments yielding measurable returns over time. The human capital paradigm places people, not just machines, infrastructure, or natural resources, at the core of economic growth, innovation, and social well-being. In the Indian context, the concept has acquired critical policy salience due to the country's unique demographic trajectory. With a median age under 30 and a working-age population projected to remain dominant through the 2030s, India holds what is often called a "demographic dividend." Yet, as international experience shows, demographic advantage is not self-fulfilling, it must be converted into economic growth through rapid and equitable human capital accumulation. Without parallel improvements in education quality, health outcomes, and labor market readiness, the dividend can quickly turn into a liability, marked by underemployment, inequality, and social tension.

Post-independence India's efforts to build human capital have spanned mass literacy campaigns, expansion of primary and higher education, public health drives, skill development missions, and social protection programs. Early planning documents, such as the First Five-Year Plan (1951–56), framed education and health primarily as welfare goals. Over time, however, economic reforms and global integration have underscored their role as productive investments. The 1986 National Policy on Education and its 1992 revision, the Sarva Shiksha Abhiyan (2001), the Right of Children to Free and Compulsory Education Act (2009), and the National Education Policy (2020) each reflect a deepening recognition of quality, equity, and employability. Similarly, in health, milestones such as the National Rural Health Mission (2005), the National Health Policy (2017), and Ayushman Bharat (2018) reveal a policy shift toward universal access, primary care strengthening, and financial risk protection.

Despite these advances, challenges remain acute. The Annual Status of Education Report (ASER) continues to document gaps in foundational literacy and numeracy. National Family Health Survey (NFHS) data point to stubbornly high rates of stunting, wasting, and anemia—conditions that compromise cognitive development and future productivity. Periodic Labour Force Survey (PLFS) results reveal low levels of formal vocational training, and a persistent skills mismatch in the labor market. Public expenditure on education



remains below the often-cited 6% of GDP benchmark, and public health spending—although rising—has yet to reach the 2.5% target set by the National Health Policy 2017.

In this context, the present paper pursues four main objectives:

- 1) To synthesize theoretical and empirical insights on human capital formation, linking them to the Indian policy landscape;
- 2) To analyze trends and disparities in education, health, and skills using recent national data;
- 3) To evaluate the design and implementation of flagship programs in light of international best practices; and
- 4) To propose a forward-looking reform agenda to maximize the returns to India's demographic window.

The discussion is anchored in economic theory, enriched by historical and comparative perspectives, and grounded in empirical evidence from official surveys and peer-reviewed literature. In doing so, it aims to contribute to both policy formulation and academic understanding of human capital formation as a driver of inclusive growth in India.

2. Conceptual Underpinnings and Measurement

The human capital framework encompasses (i) education—years of schooling, learning outcomes, and higher education quality; (ii) skills—cognitive, socio-emotional, and job-specific competencies; and (iii) health and nutrition—which influence both the capacity to learn and to work productively. Cross-country indices attempt to summarize these dimensions. The World Bank's Human Capital Index (HCI) combines survival, schooling, and learning into a forward-looking productivity metric; India's HCI value around 0.49 (2020) implies that a child born in India would be only about half as productive as she could be with complete education and full health—highlighting headroom for gains.

Alongside composite indices, India relies on large-scale microdata: NFHS-5 (2019–21) for health and nutrition; ASER for foundational learning in rural areas; PLFS for labor



market and training statistics; National Health Accounts (NHA) for health spending; and administrative datasets for program coverage. These allow granular diagnosis and monitoring of human capital formation.

3. India's Human Capital Landscape: A Brief Overview

3.1 Demography and the Window of Opportunity

India's median age remains relatively low compared to advanced economies, and the working-age share is sizeable—creating a potential growth impulse conditional on sufficient job creation and human capital deepening. United Nations demographic projections underscore the time-bound nature of this opportunity through the 2030s.

3.2 Education Access vs. Learning Outcomes

India has achieved near-universal enrollment in primary grades, but learning outcomes—particularly foundational reading and arithmetic—have lagged. Recent ASER rounds highlight persistent deficits in grade-level competencies, with modest improvements in some states post-pandemic. Foundational gaps compound over the schooling cycle and depress returns to later-stage investments.

3.3 Health and Nutrition

NFHS-5 documents progress (e.g., higher institutional deliveries, expanded insurance coverage) alongside enduring challenges: stunting and anemia remain elevated in many states, undermining cognitive development and productivity. Health financing has risen but still falls short of policy targets; public health spending as a share of GDP remains below the 2.5% by 2025 goal in the National Health Policy 2017, and out-of-pocket spending, though declining, is still substantial.

3.4 Skills and Employability

On the skills front, formal vocational/technical training among youth remains low (roughly 3–5% depending on age band and measure), even as employability indicators vary across



disciplines and regions. Despite gains in digital and AI/ML skills among a subset of graduates, a significant skills mismatch persists between academic preparation and industry demand.

4. Education: Policies, Spending, and Outcomes

4.1 Policy Architecture

NEP 2020 reorients schooling to a 5+3+3+4 structure aligned with child development stages; emphasizes foundational literacy and numeracy (FLN), mother-tongue instruction in early years, flexible curricular pathways, and a four-year multidisciplinary undergraduate degree with multiple exit options. Implementation spans curricula, teacher education (four-year B.Ed. by 2030), assessment reforms (PARAKH), and digital resources (DIKSHA, PM eVidya). Samagra Shiksha (2021–26) consolidates central support across pre-school to Grade 12 and is explicitly aligned with NEP 2020.

4.2 Public Spending on Education

International databases place public expenditure on education for India at around 4% of GDP in recent years, though estimates vary by definition (central, state, and local combined; current vs. total). Regardless of the precise figure, spending remains below the 6% of GDP ambition referenced in policy debates. The key challenge is not only quantum but composition and efficiency—adequate allocations for early childhood, teacher professional development, and learning recovery.

4.3 Foundational Learning and the FLN Mission

Evidence is unequivocal that strong early literacy and numeracy predict later success. Post-COVID, states have launched FLN initiatives and diagnostic assessments, but ASER continues to report gaps in grade-appropriate reading and arithmetic in many districts, pointing to a need for targeted tutoring, structured pedagogy, and continuous teacher support at scale. PM POSHAN (formerly Mid-Day Meal) remains a critical complementary input for child nutrition and school participation, now integrated with early grades (Bal Vatika).

4.4 Higher Education and Research



NEP's reconfiguration of undergraduate programs and proposed regulatory architecture (HECI) aim to reduce fragmentation and encourage multidisciplinary research. To translate into human capital gains, reforms must be paired with autonomy with accountability, performance-linked research financing, and strong industry linkages (apprenticeships, co-op models).

5. Health, Nutrition, and Early Childhood Development

5.1 Health Outcomes and Financing

NFHS-5 shows progress on several maternal and child health indicators but underscores persistent malnutrition and anemia—both productivity-impairing. Meanwhile, National Health Accounts indicate total health expenditure around 3.7–3.8% of GDP (2020–22) with government health expenditure rising to roughly 1.8% of GDP (2021–22), and out-of-pocket shares declining compared to a decade earlier. The National Health Policy 2017 target of 2.5% of GDP for public spending by 2025 remains a stretch without accelerated budgetary growth at union and state levels.

5.2 Financial Protection and Service Delivery

Ayushman Bharat (PM-JAY and Health & Wellness Centres) expands financial risk protection and primary care. Yet supply-side constraints (workforce shortages, quality assurance, and referral systems) limit realized gains. Digital health infrastructure under the Ayushman Bharat Digital Mission (ABDM) aims to improve continuity of care and data flows, but its human-capital payoff hinges on adoption, data quality, and privacy-aware governance.

5.3 Nutrition as a Human Capital Foundation

Mission POSHAN 2.0 consolidates nutrition interventions (POSHAN Abhiyaan, Anganwadi Services, Adolescent Girls' Scheme) and emphasizes monitoring via POSHAN Tracker, while PM POSHAN provides school meals with caloric and protein norms. Impact literature associates school feeding with improved attendance and learning, particularly for disadvantaged groups. Ensuring diet diversity (iron-folate, fortification where appropriate) and high-fidelity delivery at the last mile is crucial for cognitive development.



6. Skills, Training, and the Labor Market

6.1 Vocational Education and PLFS Evidence

PLFS and independent syntheses show low formal vocational training coverage among youth, on the order of 3–4% (ages 15–29) with sizeable gender gaps and rural-urban disparities. Informal/on-the-job training remains more prevalent but variable in quality. This constrains school-to-work transitions and limits sectoral mobility.

6.2 Skill India, PMKVY, and Employability

Pradhan Mantri Kaushal Vikas Yojana (PMKVY) and the broader Skill India architecture (NSDC, Sector Skill Councils, apprenticeship reforms) seek to scale short-term skilling. Evaluations point to heterogeneity in placement and wage outcomes; aligning courses with local demand, embedding apprenticeships, and stronger outcome-based funding can improve impact. Recent India Skills Reports indicate mixed trends, e.g., rising employability in AI/ML roles but uneven outcomes elsewhere—reinforcing the need for deeper industry partnerships and modular, stackable credentials.

6.3 Higher Education–Industry Linkages

Bridging the skills mismatch requires curriculum co-design with employers, credit-bearing apprenticeships, and assessment of transversal skills (communication, problem-solving). University innovation ecosystems (incubators, co-op terms) and Recognition of Prior Learning (RPL) within the National Skills Qualification Framework can ease mobility across informal and formal sectors.

7. Equity: Gender, Poverty, and Regional Disparities

Human capital returns are attenuated by inequities across gender, caste, income, and region. Female labor force participation has risen in recent PLFS data but remains low by international standards; social norms, child-care constraints, safety, and skilling access all matter. Health and learning outcomes vary sharply by state: Southern and some Western states typically outperform on stunting, schooling completion, and learning metrics relative



to parts of Central and Northern India. Targeted, state-specific strategies—especially for aspirational districts—are necessary to compress these gaps.

8. Digital Public Infrastructure (DPI) and Human Capital

India's DPI—Aadhaar, UPI, and sectoral stacks—underpins education and health initiatives: DIKSHA content repositories and PM eVidya channels expanded access during school closures; ABDM aims to enable longitudinal health records. The human-capital payoff from DPI depends on last-mile connectivity, teacher and health-worker digital capacity, and careful design to avoid exacerbating exclusion for low-connectivity households.

9. What Has Worked and What Hasn't?

➤ Gains

- Access and coverage: Near-universal primary enrollment; expansion of school meals to pre-primary in many settings; insurance coverage through PM-JAY; growing primary care network.
- Financing trajectory: Government health spending share and NHA-measured financial protection indicators have improved relative to 2014–15, with declining out-of-pocket shares.
- Policy coherence: NEP 2020 and Samagra Shiksha create a more integrated education strategy with a focus on FLN and assessment reform (PARAKH).
- Constraints
- Learning crisis: Foundational skill deficits persist, particularly in rural and disadvantaged communities.
- Health underinvestment: Public health expenditure remains below NHP's 2.5% target; primary care and public-health functions need sustained funding and staffing.
- Skills mismatch: Low formal vocational training coverage and uneven placement outcomes from short-term skilling; limited apprenticeship intensity.
- Inequities: Gender and state-level disparities in nutrition, learning, and labor force participation remain substantial.



10. Policy Priorities and Recommendations

i) Double down on foundational learning (FLN).

- Scale structured pedagogy with daily practice in reading and numeracy for Grades 1–3; set clear term-wise benchmarks; deploy high-dosage tutoring for lagging students; and use periodic low-stakes assessments via PARAKH-aligned tools to inform instruction.
- Expand teacher professional development with coaching and communities of practice; prioritize multi-grade, multi-level teaching aids for small/rural schools.

ii) Invest early: Pre-primary and early childhood development.

- Integrate Bal Vatika/pre-school quality standards with Anganwadi upgradation (Saksham Anganwadi), focusing on age-appropriate play-based learning, early screening, and responsive caregiving.
- Strengthen Mission POSHAN 2.0 with diversified menus, micronutrient-rich foods, and growth monitoring linked to timely counseling and referrals.

iii) Meet—and exceed—public health financing targets.

- Chart a medium-term fiscal path to $\geq 2.5\%$ of GDP in public health spending with ring-fenced allocations for primary care, health workforce, and public-health surveillance; align state health budgets to at least 8% of general government expenditure.
- Reduce out-of-pocket expenditures further through medicines and diagnostics policies (free essential drugs/diagnostics at point of care) and strategic purchasing under PM-JAY tied to quality outcomes.

iv) Rewire skills for employability.

- Expand apprenticeships and dual training models (learn-and-earn) with tax incentives and performance-linked stipends; embed industry micro-credentials in university curricula and recognize prior learning (RPL) for informal workers.



- Use outcome-based funding for training providers tied to sustained placements and earnings growth, not just course completions; publish placement and wage dashboards by provider and course to drive accountability.

v) Target gender-inclusive human capital.

- Scale safe transport, campus creches, and flexible apprenticeships; incentivize firms to hire and retain women via wage subsidies in tradable sectors; expand STEM mentoring and role-model programs.
- Tackle anemia with adolescent girls' supplementation and school-based screening; link PM POSHAN menus and health check-ups to anemia control protocols.

vi) Strengthen data systems and research.

- Institutionalize learning-adjusted years of schooling (LAYS) tracking combining ASER/NAS with administrative data; expand NHA granularity on sub-state health spending; and integrate ABDM data standards with privacy and research access for policy evaluation.

vii) State-specific pathways.

- Support lagging states with technical assistance compacts focused on FLN, nutrition, and primary healthcare staffing; create competitive grants for innovations that show measurable gains in learning or health outcomes within two academic/financial years.

11. Conclusion

India's human capital story is one of high aspirations, meaningful policy innovations, and measurable yet uneven progress. The foundations are universal access to schooling, integrated nutrition programs, and expanding financial protection in health and are in place. The next frontier is quality at scale: ensuring that every child reads and computes by Grade 3, every adolescent attains market-relevant skills, and every household can access affordable, high-quality health and nutrition services. That requires more and smarter public investment, rigorous measurement, and partnerships that align the incentives of governments, providers, and employers with the long-term returns to human capital. If India



can convert its demographic scale into a deep reservoir of healthy, skilled, and adaptive workers, the payoff will be felt in productivity, innovation, and inclusive prosperity for decades to come.

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