

Artificial Intelligence in Welfare Governance: Assessing the POSHAN Tracker's Role in Beneficiary Identification and Public Service Delivery in India

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ABSTRACT

The Government of India has increasingly turned to digital and artificial intelligence enabled platforms to strengthen the delivery of welfare entitlements to its citizens. The POSHAN Tracker, launched by the Ministry of Women and Child Development on 1 March 2021 under the POSHAN Abhiyaan and subsequently Mission Poshan 2.0, Saksham Anganwadi, is among the largest mobile phone based nutrition surveillance systems in the world, covering over 1.39 million Anganwadi Centres and more than 100 million registered beneficiaries. This paper examines the design, technological architecture, and governance function of the POSHAN Tracker, with particular attention to its use of machine learning, predictive analytics, Aadhaar based authentication, and facial recognition for beneficiary identification and last mile service tracking. Using a descriptive analytical approach grounded in secondary government documentation, peer reviewed literature, and field based journalistic and civil-society reporting, the paper assesses the platform's contribution to reducing leakages, improving real time visibility of Anganwadi services, and enabling evidence-based policymaking. It also critically evaluates persistent implementation challenges, including connectivity gaps, frontline worker burden, digital literacy deficits, authentication related exclusion, and data privacy concerns. The paper concludes that while the POSHAN Tracker represents a significant advance in algorithmic and data-driven welfare administration, its long term effectiveness depends on complementary investments in digital infrastructure, participatory system design, and safeguards against exclusion errors, situating it within the broader global debate on AI enabled welfare governance.

Keywords: Artificial Intelligence, Welfare Governance, POSHAN Tracker, Beneficiary Identification, Digital Governance, Anganwadi, Public Service Delivery

1. Introduction

Welfare governance in large federal democracies confronts a persistent triad of problems correctly identifying intended beneficiaries, minimising leakage of public resources to ineligible recipients, and delivering services in a timely and verifiable manner across vast and heterogeneous geographies. India has

one of the largest social protection architectures in the world, since the mid 2010s pursued a strategy of embedding digital identity, real time data capture, and increasingly artificial intelligence into the machinery of welfare delivery. This strategy, often described under the umbrella of the "India Stack" and Digital India programme, has extended from cash transfer and food subsidy systems to maternal and child nutrition programmes.

The POSHAN Tracker is a paradigmatic instance of this shift. Rolled out by the Ministry of Women and Child Development through the National e-Governance Division on 1 March 2021, the application was designed as an information and communication technology governance tool under the POSHAN Abhiyaan and its successor, Mission Poshan 2.0/Saksham Anganwadi. It digitises the record keeping previously performed through eleven manual registers maintained by Anganwadi Workers, the community level frontline functionaries of the Integrated Child Development Services scheme, and channels this data into a centralised, realtime dashboard architecture.

This paper focused on: to what extent and through what mechanisms, does the POSHAN Tracker's use of AI and allied digital technologies improve beneficiary identification and public service delivery in India's nutrition governance ecosystem, and what limitations condition this contribution? The paper situates the POSHAN Tracker within the broader scholarly and policy literature on algorithmic and data-driven welfare administration, before undertaking a structured assessment of its architecture, functional achievements, and documented implementation challenges.

2. AI in Welfare Governance: Conceptual Background

Scholarship on the digitisation of welfare administration distinguishes between several overlapping functions that technology can perform identity verification and deduplication, eligibility determination and targeting, service delivery tracking and monitoring, and predictive or anticipatory analytics for resource allocation. Artificial intelligence, in this context, typically refers not to a single technology but to a family of techniques rule based automation, machine-learning classification, and increasingly predictive modelling layered onto administrative data systems to support decisions that were previously made manually by frontline staff or supervisory officers.

Comparative research on digital welfare systems has highlighted a recurring tension between two goals that these technologies are asked to serve simultaneously: efficiency and inclusion. Digital identity and biometric authentication systems can reduce "ghost" beneficiaries and duplicate entries, thereby improving fiscal efficiency and programme integrity. At the same time, technology scholars have documented how automated eligibility and verification systems can generate new forms of exclusion when they are layered onto populations with uneven digital access, unstable biometric records, or limited digital literacy. This dual character technology as both an instrument of inclusion and a potential source of new exclusion forms the analytical lens through which this paper examines the POSHAN Tracker.

In the Indian context specifically, the integration of Aadhaar into welfare platforms has been a defining and contested feature of this digitisation drive. Proponents argue that Aadhaar linked authentication improves targeting accuracy and reduces leakage, critics point to documented instances of authentication failure, particularly among elderly, manual labouring, or malnourished populations whose biometric readings are less reliable, resulting in exclusion from entitlements. The POSHAN Tracker's own architecture, which layers Aadhaar based verification and facial recognition onto its beneficiary database, makes it a useful case for examining how this tension plays out in a nutrition specific programme aimed

substantially at children under six years of age, a population for whom biometric capture is technically more difficult.

3. The POSHAN Tracker: Architecture and AI-Enabled Features

The POSHAN Tracker functions as a mobile and web based application built on a centralised, client server data architecture designed to remain operable, through offline data caching, in areas of intermittent internet connectivity. It is available in 24 languages, including Hindi and English, and is used by Anganwadi Workers to record centre-level activity, beneficiary registration, growth measurements, and service disbursement across the country's 1,396,946 Anganwadi Centres, serving over 101 million registered beneficiaries pregnant women, lactating mothers, children aged 0-6 years, and in select geographies, adolescent girls.

Three technological components are central to its claim to be an AI-enabled governance tool. First, the application incorporates machine learning based predictive analytics that the platform's own documentation describes as being used to forecast nutritional trends, flag at-risk populations, and support resource allocation decisions by supervisory officers and policy makers. Growth-monitoring data, height and weight measurements recorded at Anganwadi Centres feeds into automated classification of children by nutritional status like normal, moderate acute malnutrition, or severe acute malnutrition, enabling what the Ministry describes as "dynamic identification" of stunting, wasting, and underweight prevalence, rather than periodic survey based estimation .

Second, beneficiary identification is anchored in Aadhaar based verification, intended to prevent duplicate or "ghost" entries and to ensure that supplementary nutrition and other entitlements reach verified individuals. This is complemented by an integrated Facial Recognition System, used for last mile authentication of service delivery and attendance, and designed to substitute for or supplement fingerprint based biometric authentication, which is often less reliable for young children and manual labourers. The system is also designed to be Local Government Directory compliant, aligning beneficiary and facility records with standard administrative geography used across Indian government data systems, which supports inter-departmental data integration.

Third, the application automates what were previously eleven separate manual registers into structured digital workflows, including a home visit scheduler that generates alerts for twenty-three defined home visits across the reproductive maternal child continuum as during pregnancy, four in the first postpartum month, seven between two months and one year, five between one and two years, and three between two and three years of age, each accompanied by age appropriate counselling prompts. An Early Childhood Care and Education content delivery module further supplies pre-loaded videos, voice notes, and activity materials based on the Aadharshila curriculum for children aged three to six years.

Taken together, these features position the POSHAN Tracker not merely as a digitised register but as a data infrastructure through which supervisory and policy decisions resource targeting, risk flagging, and performance monitoring of frontline worker are increasingly mediated by algorithmic classification and dashboard based visibility, rather than solely by field supervision.

4. Methodology

This paper adopts a qualitative, descriptive analytical research design based on secondary sources. Data were drawn from three categories of material

- official government documentation, including material published by the Ministry of Women and Child Development, the Digital India Corporation, the National e-Governance Division, and the POSHAN Tracker platform itself
- peer-reviewed and grey academic literature examining the platform's implementation and its effects on frontline workers and beneficiaries
- field based journalistic and civil-society reporting documenting on the ground implementation experience across states such as Assam and Andhra Pradesh.

5. Findings and Discussion

5.1 Beneficiary Identification and Reduction of Leakage

The most consistently documented achievement of the POSHAN Tracker relates to the visibility and verification of the beneficiary base itself. Prior to the platform's introduction, the ICDS relied on paper registers that were vulnerable to duplication, delayed consolidation, and limited cross-verification with other welfare databases. Aadhaar based verification, layered onto the beneficiary database, is explicitly designed to eliminate duplicate and "ghost" entries and to ensure that supplementary nutrition entitlements are delivered only to verified, registered individuals. Complemented by facial recognition for last mile service authentication, this represents a marked shift from a self-reported, largely unverifiable registration process to one anchored in a unique national identity credential.

Scale figures reported by the Ministry in excess of 1.39 million Anganwadi Centres and over 100 million registered beneficiaries indicate that this identification architecture now operates at a scale that makes the POSHAN Tracker one of the largest mobile-based nutrition surveillance systems in the world. Independent analysis of platform data covering July 2022 to September 2023 found substantial increases in verified service coverage over that period: the number of beneficiaries receiving take-home rations for at least twenty one days rose from roughly 4.1 million in July 2022 to 20.9 million in September 2023, while the number of children aged 0–6 years whose height and weight were measured and recorded rose from 40.1 million to 83.55 million, representing ninety four percent of registered children by the later date as reported in publicly available Poshan Tracker data analysed in health-policy literature. This trend is consistent with the interpretation that centralised, verifiable digital recording increases both the completeness of service records and, plausibly, the underlying regularity of service delivery, though the extent to which increased recorded coverage reflects improved service delivery as opposed to improved reporting compliance cannot be fully disentangled from administrative data alone.

5.2 Real-Time Monitoring and Service-Delivery Visibility

The shift from periodic, paper-based reporting to real time dashboard architecture is the second major contribution documented in the literature. The platform is designed to give administrators at block, district, state, and national levels a "360-degree view" of Anganwadi Centre activity, worker service delivery, and beneficiary status on defined indicators. This addresses a structural weakness identified in pre-digitisation ICDS administration, where supervisors had limited visibility into individual centre performance and where home visits depended heavily on the individual knowledge and initiative of frontline workers rather than a systematised, auditable schedule. The structured home visit scheduler which auto generates alerts for twenty three defined visits keyed to specific stages of pregnancy and early childhood exemplifies how the platform converts a previously discretionary practice into a monitorable, standardised workflow. This is consistent with the broader logic of AI enabled governance identified in the literature, automation does

not merely digitise existing practice but reconfigures it into forms that are simultaneously more standardised and more visible to supervisory authority.

5.3 Predictive Analytics and Evidence-Based Targeting

The Ministry and platform documentation describe the integration of machine learning algorithms and predictive analytics as enabling forecasting of nutritional trends, identification of at-risk populations, and optimisation of resource allocation. In principle, this allows policymakers to move from reactive, survey cycle based identification of malnutrition hotspots historically reliant on periodic instruments such as the National Family Health Survey, conducted at multi-year intervals toward near real time, facility level identification of stunting, wasting, and underweight prevalence. This is a meaningful methodological shift, it substitutes continuous administrative data streams for episodic survey sampling as the primary evidentiary basis for nutrition policy, at least at the level of programme monitoring.

However, the paper notes an important caveat that runs through the broader literature on administrative data systems the predictive validity of such analytics is bounded by the quality and completeness of the underlying data entered by frontline workers under variable field conditions.

5.4 Implementation Challenges

Despite these documented gains, a substantial and growing body of field-based research identifies significant implementation challenges that qualify the platform's contribution to inclusive welfare governance. Connectivity and infrastructure gaps remain the most frequently cited constraint. Field reporting from tribal Anganwadi centres in Andhra Pradesh documented poor or absent network connectivity, limited access to mobile phones, and low digital literacy among Anganwadi Workers and helpers as recurring obstacles to consistent use of the application. Similarly, an account from Bodoland Territorial Region in Assam described a "slow digital shift," in which workers required sustained supervisory support before gaining confidence in digital data entry, with scaling remaining an ongoing challenge in areas of poor connectivity. In partial response, the central government provides an annual internet allowance reported at approximately 2,000 to Anganwadi Workers, alongside performance linked incentives for consistent data entry approximately 500 for workers and 250 for helpers in some states, and the application has been engineered with offline data caching capability to function despite connectivity interruptions.

Frontline worker burden is a second, closely related concern. Qualitative research on Anganwadi Workers' experience of "health digitalisation" found that, alongside official platforms, workers have informally adopted messaging applications such as WhatsApp to maintain contact with beneficiaries, reflecting gaps between the formal digital architecture and workers' actual communication practices. Civil-society commentary has been more critical still, arguing that the cumulative data-entry burden imposed by the POSHAN Tracker layered onto already demanding care responsibilities risks reducing Anganwadi Workers to "data clerks," with gendered disparities in household control over smartphones and mobile data compounding the burden for many women workers. This critique frames the platform as an instance of "techno-centric governance" whose surveillance and reporting demands can, without careful redesign, deepen rather than relieve frontline exclusion and workload.

Data accuracy, privacy, and Aadhaar linkage concerns constitute a third cluster of challenges. Commentary in the Social Innovations Journal (2024) highlights concerns regarding data accuracy, privacy, and the risks associated with mandatory Aadhaar linkage for a programme that serves highly vulnerable populations, including undocumented or migrant families whose Aadhaar records may be incomplete or mismatched. Because facial recognition and Aadhaar authentication are being used as gatekeeping mechanisms for

entitlement delivery, authentication failure whether due to poor network quality, camera hardware limitations, or biometric mismatch carries a direct risk of temporarily or permanently excluding eligible beneficiaries, echoing exclusion patterns documented in other Aadhaar linked welfare systems in India. Finally, accountability and grievance redress concerns have been raised in the context of comparable digital monitoring applications used across rural development programmes, where workers have reported that escalating digital oversight has not been accompanied by proportionate improvements in grievance redress mechanisms, with decision-making authority perceived as migrating away from local administrative units toward centralised systems.

6. Policy Implications and Recommendations

Four policy implications follow from this assessment. First, continued expansion of last-mile digital infrastructure including broadband connectivity under initiatives such as BharatNet and the Digital India Fund is a necessary, though not sufficient, condition for the POSHAN Tracker to deliver on its inclusion objectives, without reliable connectivity, offline-mode functionality can mitigate but not eliminate reporting delays and data gaps.

Second, authentication design should incorporate calibrated fallback mechanisms for cases of biometric or facial recognition failure, ensuring that verification difficulties experienced by young children, elderly caregivers, or migrant families do not translate into denial or delay of nutrition entitlements. This is consistent with broader recommendations in the literature on digital identity systems regarding the need for non-biometric exception-handling pathways.

Third, the redesign of frontline data entry workflows should be undertaken through participatory processes that directly involve Anganwadi Workers, in order to rebalance the platform's current emphasis on upward reporting and supervisory visibility with attention to reducing the net time burden on frontline staff. This could include simplifying data entry interfaces, expanding voice-based or low literacy friendly input modes, and ensuring that performance linked incentives adequately compensate for the additional labour that digitisation entails.

Fourth, independent, methodologically rigorous impact evaluation distinct from the platform's own administrative dashboards is needed to assess the extent to which increases in recorded service coverage reflect genuine improvements in nutritional outcomes, as opposed to improvements in reporting compliance alone. Strengthening linkages between POSHAN Tracker data and independent nutrition surveys would help distinguish these two possibilities and provide a more robust evidentiary basis for future scaling decisions.

7. Conclusion

The POSHAN Tracker illustrates both the promise and the limitations of embedding artificial intelligence and allied digital identity technologies into large-scale welfare administration. By centralising beneficiary registration, automating growth monitoring and classification, structuring home-visit scheduling, and layering Aadhaar based and facial recognition authentication onto a real-time dashboard architecture, the platform has measurably improved the visibility, verifiability, and reported coverage of India's nutrition service delivery system, operating at a scale over 1.39 million Anganwadi Centres and more than 100 million beneficiaries that makes it a globally significant case of AI-enabled welfare governance. At the same time, field based research consistently identifies connectivity gaps, frontline worker burden, digital literacy deficits, and authentication related exclusion risks as unresolved implementation challenges that

qualify the platform's contribution to genuinely inclusive service delivery. The POSHAN Tracker therefore exemplifies a wider global pattern in which digital and algorithmic tools simultaneously strengthen administrative capacity and introduce new forms of technologically mediated exclusion a tension that will require sustained infrastructural investment, participatory redesign, and independent evaluation to resolve.

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