Measuring an Anaemia Programme without a Population Yardstick: India's 2026 Surveillance Transition, the Loss of District-Level Estimates, And a Proposed Three-Tier Framework

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Abstract

Background: India's National Family Health Survey (NFHS) recorded a worsening anaemia burden between its fourth (2015–16) and fifth (2019–21) rounds across every monitored population group, despite the Anaemia Mukt Bharat (AMB) programme launched in 2018. Two structural changes have since occurred almost simultaneously: anaemia was removed from NFHS-6 because capillary-blood measurement was judged to overstate prevalence, with estimation transferred to a smaller venous-blood survey designed for national and State reporting; and AMB was relaunched on 29 June 2026 as the Anaemia Mukt Bharat Abhiyaan under an expanded 7×7×7 framework emphasising testing, treatment, tracking and digital case management. The interaction between these two changes has not been analysed.

Methods: We conducted a structured policy analysis synthesising published NFHS-4 and NFHS-5 factsheet and report estimates, the Comprehensive National Nutrition Survey (CNNS) 2016–18, peer-reviewed secondary analyses of both survey series, an independent multicentric venous-blood study, and official statements and reporting on NFHS-6 and the revised AMB Abhiyaan guidelines. Prevalence estimates were tabulated by population group, State and measurement method; programme components were mapped against the data sources available to verify them.

Results: Between NFHS-4 and NFHS-5, anaemia rose by 8.5 percentage points in children aged 6–59 months (58.6% to 67.1%), 5.0 points in adolescent girls (54.1% to 59.1%), 4.0 points in women aged 15–49 years (53.0% to 57.0%) and 1.8 points in pregnant women (50.4% to 52.2%). State prevalence in women ranged from 28.9% to 71.4%. Estimates for young children diverge sharply by method: 67.1% (capillary, NFHS-5) against 40.5% (venous, CNNS) and 49.4% (venous, independent multicentric study), a method-attributable gap of up to 26.6 percentage points. Mapping the seven revised interventions against available data showed that six can be monitored only through service-based programmatic records, and that no district-level population estimate of anaemia now exists anywhere in India.

Conclusion: India has improved measurement accuracy at the cost of geographic resolution, precisely when its anaemia programme has shifted to outcome-based, district-implemented accountability. We propose a three-tier surveillance architecture — a periodic venous-blood reference survey, a district sentinel network, and calibrated programmatic digital records — and a district indicator set to restore verifiable accountability.

Keywords: Anaemia, Public Health Surveillance, National Family Health Survey, Anaemia Mukt Bharat, Health Policy, India.

1. INTRODUCTION

Anaemia is among the most persistent nutritional and public health problems in South Asia, and India carries a disproportionate share of the global burden. The World Health Organization estimated global anaemia prevalence in 2019 at 29.9% among women of reproductive age, 36.5% among pregnant women and 39.8% among children aged 6–59 months; India's corresponding figure for women of reproductive age was 53%, the fifth highest of any country [1,2]. Anaemia contributes to maternal morbidity and mortality,

adverse pregnancy outcomes including preterm birth and low birth weight, impaired cognitive and physical development in children, reduced work capacity, and diminished resistance to infection [3–5].

Recognising this burden, the Government of India launched Anaemia Mukt Bharat (AMB) in 2018 under the National Health Mission as a component of POSHAN Abhiyaan. AMB adopted a life-cycle approach organised as a 6×6×6 framework — six beneficiary groups, six interventions and six institutional mechanisms — with an ambitious stated target of reducing anaemia prevalence by three percentage points annually, against the approximately one percentage point annual reduction India had been achieving [6,7].

The fifth round of the National Family Health Survey (NFHS-5, 2019–21) nevertheless recorded increases in anaemia across every monitored group relative to NFHS-4 (2015–16) [8,9]. This outcome has been widely interpreted as evidence that mass supplementation, as configured, was not working.

That interpretation has been contested on measurement grounds. NFHS rounds estimate haemoglobin from capillary (finger-prick) blood read on portable digital haemoglobinometers, a method that yields systematically different values from venous blood analysed on an automated haematology analyser, which is the reference approach in current guidance [10,11]. The Comprehensive National Nutrition Survey (CNNS) 2016–18, which used venous blood, reported far lower child anaemia prevalence than the contemporaneous NFHS round [12,13]. A parallel argument holds that the WHO haemoglobin cut-offs applied to Indian populations may themselves be set too high, inflating apparent prevalence [13,14].

These concerns were acted upon. Anaemia was removed from the sixth round of the NFHS; officials indicated that finger-prick estimation was considered unreliable and prone to overstatement, and that the task would pass to a dedicated venous-blood survey [15,16]. That successor instrument — the Survey for Assessment of Markers of Population Health, Activity, Diet and Anthropometry, developed from the Diet and Biomarkers Survey in India (DABS-I) — samples approximately two lakh participants across 183 districts in 35 States and Union Territories, draws venous blood, and is designed to report at national and State level [16]. Within weeks, on 29 June 2026, the Ministry of Health and Family Welfare released revised operational guidelines transforming AMB into the Anaemia Mukt Bharat Abhiyaan, expanding the framework to 7×7×7 and shifting the programme's centre of gravity from prophylactic supplementation to therapeutic management, with testing, treatment, tracking and case-based follow-up recorded on an integrated digital portal [17–19].

Each of these two decisions is defensible on its own terms. Measuring anaemia more accurately is unambiguously desirable; so is managing it therapeutically rather than distributing tablets without follow-up. This paper argues that their interaction has produced a problem that neither decision anticipated. The revised programme places accountability for outcomes at the district and facility level, while the surveillance system that could independently verify those outcomes no longer reports below State level. India has, in effect, made its anaemia programme more accountable and its anaemia statistics less capable of holding it to account, in the same season.

The objectives of this analysis are therefore threefold: to characterise the magnitude, direction and heterogeneity of the anaemia burden documented by the last comparable survey pair; to quantify how much of the apparent burden is attributable to measurement method rather than physiology; and to set out, against the revised 7×7×7 framework, which programme components can and cannot be independently verified under the new surveillance arrangement, together with a proposed remedy.

2. METHODS

2.1 Design and data sources

This is a structured policy analysis based entirely on published, publicly available sources. No primary data were collected and no individual-level records were accessed; accordingly the study did not require institutional ethics committee review or informed consent, and no clinical trial registration applies.

Four categories of source were used. First, published prevalence estimates from NFHS-4 (2015–16) and NFHS-5 (2019–21) factsheets and reports, as reported in the peer-reviewed and documentary literature [8,9,20,21]. Second, comparator estimates from surveys and studies using venous blood: the CNNS 2016–18 and an independent multicentric hospital-based study of apparently healthy children [12,13,22]. Third, peer-reviewed secondary analyses of the NFHS series examining trends, severity distribution,

determinants and sub-national heterogeneity [20,21,23,24]. Fourth, official announcements, operational guidance and contemporaneous reporting describing the exclusion of anaemia from NFHS-6, the design of the successor venous-blood survey, and the revised AMB Abhiyaan guidelines [15–19].

2.2 Analytical approach

Prevalence estimates were extracted and tabulated by population group, by State or Union Territory where reported, and by measurement method. Absolute change between survey rounds is expressed in percentage points (pp) throughout; because NFHS rounds differ in fieldwork period and, in NFHS-5, were conducted in two phases spanning the COVID-19 pandemic, differences are presented descriptively and no significance testing across rounds is attempted.

Method-attributable divergence was estimated as the arithmetic difference between capillary-based and venous-based estimates for comparable child age ranges. This is a first-order comparison only: the surveys differ in sampling frame, age band and fieldwork period as well as in blood-draw method, so the difference bounds rather than isolates the method effect, and is interpreted accordingly.

For the programme mapping, each of the seven interventions and seven beneficiary groups in the revised framework was matched against the data sources that would be required to verify its population-level effect, and classified by whether such verification is now possible at national, State or district level. The proposed indicator set and surveillance architecture presented in Section 5 are the authors' synthesis and are offered as recommendations, not findings.

3. RESULTS

3.1 The burden documented by the last comparable survey pair

Anaemia prevalence increased in every monitored population group between NFHS-4 and NFHS-5 (Figure 1, Table 1). The steepest rise was in children aged 6–59 months, from 58.6% to 67.1%, an increase of 8.5 pp that returned child anaemia close to levels recorded in the mid-2000s [8,20]. Adolescent girls aged 15–19 years rose by 5.0 pp to 59.1%, women aged 15–49 years by 4.0 pp to 57.0%, non-pregnant women by 4.0 pp to 57.2%, and pregnant women by 1.8 pp to 52.2% [8,9,21]. Every one of these figures sits above the 40% threshold at which WHO classifies anaemia as a severe public health problem. Men were less affected but not unaffected, with 25.0% of men aged 15–49 years and 31.1% of adolescent boys anaemic in NFHS-5 [19].

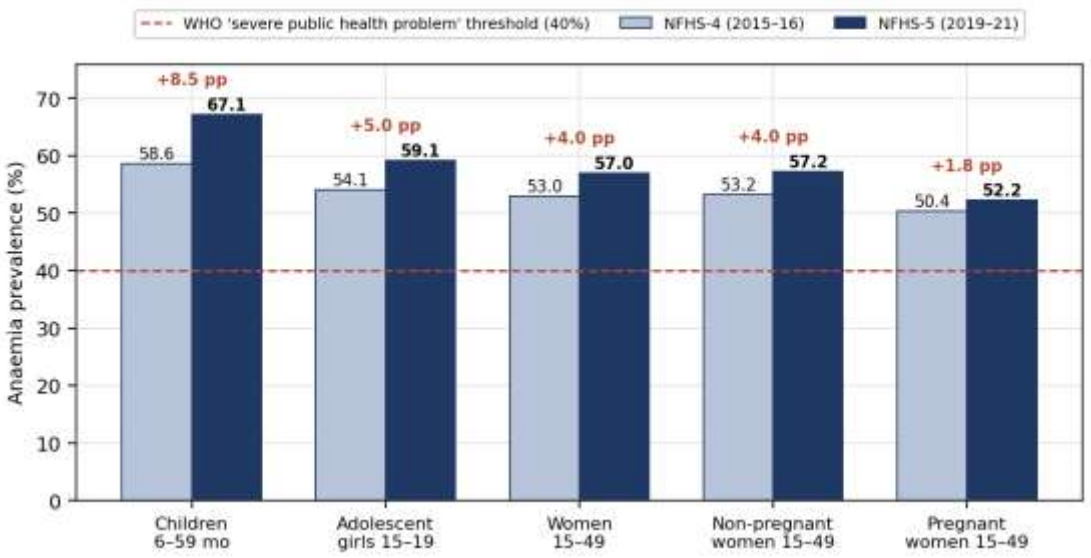

Figure 1. Anaemia prevalence by population group, NFHS-4 (2015–16) versus NFHS-5 (2019–21), India. Absolute change shown in percentage points. Dashed line marks the 40% WHO threshold for a severe public health problem. Data sources: references [8,9,21].

Table 1. Anaemia prevalence by population group between NFHS-4 and NFHS-5, India.

Population group	NFHS-4 (2015–16), %	NFHS-5 (2019–21), %	Change, pp	Direction
Children aged 6–59 months	58.6	67.1	+8.5	Worsened
Adolescent girls aged 15–19 years	54.1	59.1	+5.0	Worsened
Women aged 15–49 years (all)	53.0	57.0	+4.0	Worsened
Non-pregnant women aged 15–49 years	53.2	57.2	+4.0	Worsened
Pregnant women aged 15–49 years	50.4	52.2	+1.8	Worsened
Women aged 15–49 years, Aspirational Districts	58.7	61.1	+2.4	Worsened

pp = percentage points. Aspirational District figures are from a published secondary analysis of NFHS-4 and NFHS-5 microdata covering 114,444 and 108,782 women respectively [23]. Sources: references [8,9,21,23].

3.2 Severity composition, not only prevalence, deteriorated

An increase in headline prevalence could in principle reflect a shift of mildly affected individuals across a threshold, which would be of limited clinical consequence. The severity distribution in children shows that this is not a complete explanation (Figure 2). Moderate anaemia among children aged 6–59 months fell from approximately 40% in NFHS-2 to 28.7% in NFHS-4 and then rose again to 36.3% in NFHS-5; severe anaemia fell from 4.1% to 1.6% and then rose to 2.2% [24]. Mild anaemia increased across the whole period, from 23.3% in NFHS-2 to 28.7% in NFHS-5 [24].

Two observations follow. The long-run achievement is real: severe anaemia in 2019–21 remained roughly half its late-1990s level. But the reversal between NFHS-4 and NFHS-5 was not confined to the mild category, which weakens the argument that the increase is a threshold artefact alone and strengthens the case that something changed in either the underlying condition or the way it was measured — the question Section 3.4 addresses.

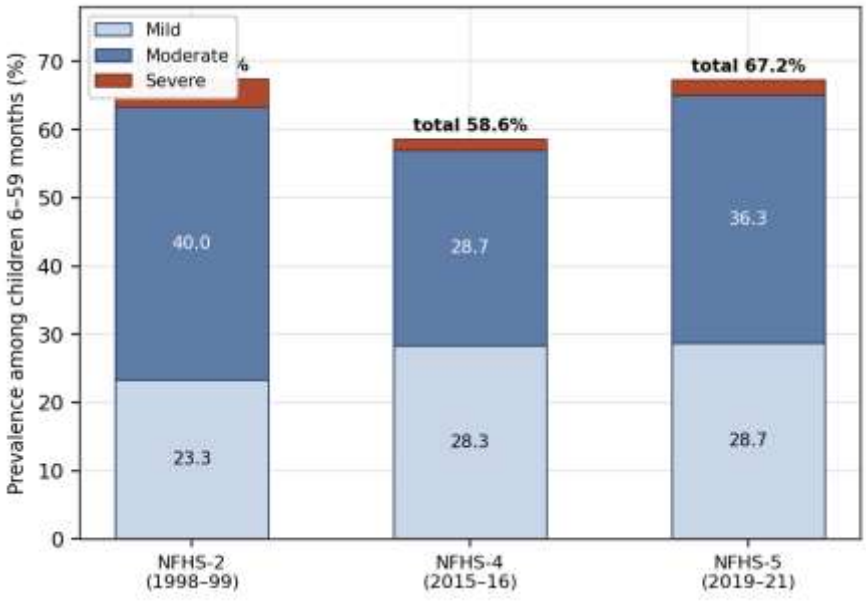

Figure 2. Severity distribution of anaemia among children aged 6–59 months across three NFHS rounds. Moderate and severe categories both reversed direction between NFHS-4 and NFHS-5. Data source: reference [24].

3.3 Sub-national heterogeneity is larger than the national change

National averages conceal a range that dwarfs the national movement (Figure 3, Table 2). Among women aged 15–49 years in NFHS-5, prevalence ranged from 28.9% in Nagaland, 29.4% in Manipur, 34.8% in Mizoram and 36.3% in Kerala, to 65.9% in Assam, 67.2% in Tripura and 71.4% in West Bengal; Jharkhand

and Gujarat also exceeded 65% [9,20]. Only six States or Union Territories recorded prevalence below 40%, and Kerala was the only large State among them; thirteen States or Union Territories recorded an improvement relative to NFHS-4 [20,25].

Direction of travel also varied widely. Assam recorded an increase of 19.9 pp among women aged 15–49 years and 32.7 pp among children aged 6–59 months, the latter rising from 35.7% to 68.4% [9]. Gujarat's child prevalence rose 17.1 pp to approximately 79.7%, the highest among the larger States [9]. Against this, child anaemia declined modestly in Uttarakhand (−1.0 pp), Haryana (−1.3 pp), Jharkhand (−2.4 pp) and Meghalaya (−2.9 pp), and prevalence among women declined in Himachal Pradesh, Andhra Pradesh, Tamil Nadu, Uttar Pradesh, Haryana, Meghalaya, Uttarakhand and Delhi [9].

Heterogeneity persists below State level. A published analysis of the 112 Aspirational Districts found anaemia among women rising from 58.7% to 61.1%, with 72 of 112 districts worsening and 29 of 112 worsening by at least 10 pp [23]. The practical implication is that the district, not the State, is the unit at which anaemia varies meaningfully and at which implementation decisions are made — a point that becomes central in Section 4.

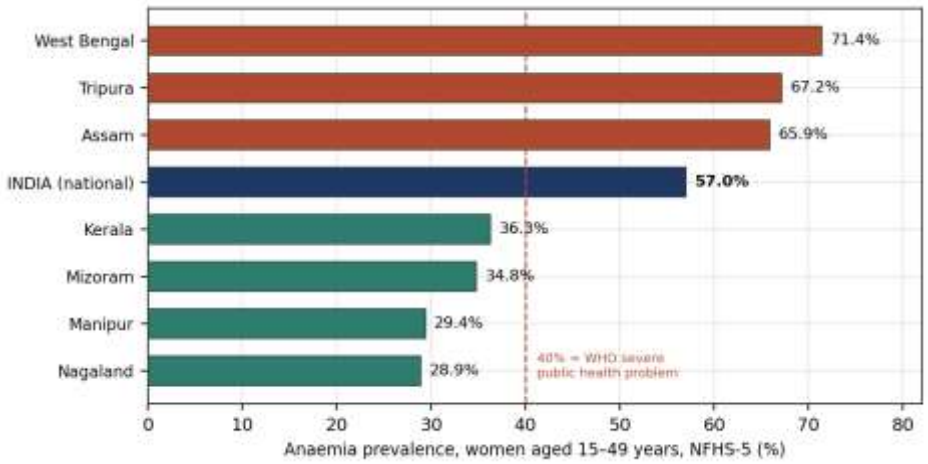

Figure 3. Anaemia prevalence among women aged 15–49 years in NFHS-5 for the States with the highest and lowest reported values, with the national estimate for reference. Data sources: references [9,20].

Table 2. Sub-national variation in anaemia, NFHS-5, with change from NFHS-4 where reported.

Indicator	Highest / lowest States	Value (%)	Notable change from NFHS-4
Women 15–49 years	West Bengal (highest)	71.4	—
Women 15–49 years	Tripura	67.2	—
Women 15–49 years	Assam	65.9	+19.9 pp
Women 15–49 years	Kerala (lowest large State)	36.3	—
Women 15–49 years	Nagaland (lowest)	28.9	—
Children 6–59 months	Gujarat (highest large State)	≈79.7	+17.1 pp
Children 6–59 months	Assam	68.4	+32.7 pp (from 35.7%)
Children 6–59 months	Kerala (lowest)	39.4	+3.7 pp
Adolescent girls 15–19 years	West Bengal	70.8	from 62.2%
Adolescent girls 15–19 years	Assam	67.0	+24.3 pp (from 42.7%)

pp = percentage points. Only States for which both values are documented in the cited sources are shown with a change figure. Sources: references [9,20].

3.4 How much of the burden is measurement?

The divergence between capillary-based and venous-based estimates in young children is large enough to alter the policy conclusion drawn from the same population (Figure 4). NFHS-5 reported 67.1% among

children aged 6–59 months using capillary blood and WHO cut-offs [8]. CNNS 2016–18, using venous blood and an automated analyser, reported 40.5% (95% CI 38.6–42.6) among children aged 12–59 months [12]. An independent multicentric study of 2,231 apparently healthy children aged 6–59 months, also using venous blood, reported 49.4% (95% CI 47.3–51.5) applying WHO cut-offs and 19.6% (95% CI 18.0–21.3) applying CNNS-derived cut-offs [22].

The gap between the NFHS-5 capillary estimate and the CNNS venous estimate is 26.6 pp. This exceeds, by a factor of three, the entire 8.5 pp deterioration recorded between NFHS-4 and NFHS-5. The comparison is not exact — the surveys differ in age band, sampling frame and fieldwork period as well as in blood-draw method — but the ordering is consistent across independent venous-blood studies, and the direction is unambiguous: capillary estimation yields substantially higher prevalence.

The cut-off question compounds the method question. Within a single venous-blood study, moving from WHO to CNNS-derived cut-offs reduced estimated prevalence from 49.4% to 19.6% in the same children [22]. The same study found that 67.2% of anaemia was microcytic and that presumptive iron-deficiency anaemia accounted for 55.7% of cases — meaning that even under the conventional assumption, roughly two in five anaemic children in that sample had a cause other than iron deficiency [22]. A programme built predominantly around iron supplementation is therefore addressing, at best, somewhat over half of the condition it targets.

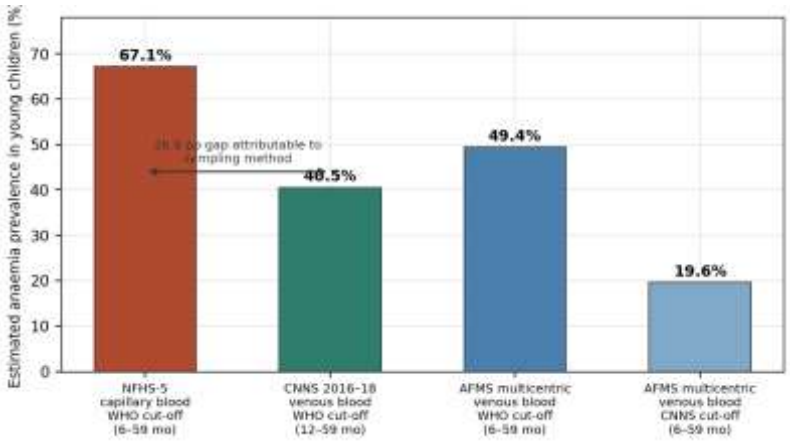

Figure 4. Estimated anaemia prevalence in young children by measurement method and diagnostic cut-off. Capillary-based national survey estimates exceed venous-blood estimates for comparable populations by up to 26.6 percentage points. Data sources: references [8,12,22].

Table 3. Comparison of the instruments that have produced, and will produce, India's anaemia estimates.

Attribute	NFHS-4 / NFHS-5	CNNS 2016–18	SAMPHADA / DABS-I
Blood specimen	Capillary (finger-prick)	Venous	Venous
Measurement device	Portable digital haemoglobinometer	Automated analyser, laboratory standardised	Automated analyser, laboratory standardised
Sample scale	≈6.1 lakh households (NFHS-5)	>1.1 lakh children and adolescents	≈2 lakh participants
Geographic coverage	All States/UTs and all districts	30 States	183 districts, 35 States/UTs
Reporting level	National, State and district	National and regional	National and State
Micronutrient biomarkers	Not collected	Iron, B12, folate and others	Collected
Anaemia in current round	Discontinued from NFHS-6	Single round	Ongoing successor instrument

UT = Union Territory. Sources: references [8,12,15,16].

4. THE ACCOUNTABILITY GAP CREATED BY TWO SIMULTANEOUS REFORMS

4.1 What changed in surveillance

Until NFHS-5, anaemia was measured inside a household survey covering approximately 6.1 lakh sample households and reporting for every district in the country, at roughly four- to five-year intervals [8]. From NFHS-6 it is not measured there at all; the survey collects no haemoglobin data, and estimation passes to a venous-blood instrument sampling around two lakh participants in 183 districts, designed and powered for national and State estimates [15,16]. Figure 5 sets the two arrangements side by side.

The trade is explicit and, on accuracy, favourable. Venous blood on a standardised analyser is the appropriate reference method, and current guidance holds that finger-prick values cannot simply be converted to venous equivalents [10,11]. Adding micronutrient and inflammation biomarkers allows anaemia to be disaggregated by cause rather than assumed to be iron deficiency — precisely the disaggregation the multicentric evidence in Section 3.4 shows is needed.

What is lost is resolution and continuity. Two consequences follow that have received little attention. First, the comparable time series that ran from 1998–99 to 2019–21 ends; NFHS-6 cannot be compared with NFHS-5 on anaemia because it contains no anaemia, and the successor survey cannot be compared with NFHS-5 because it measures differently. Any claim about whether anaemia rose or fell after 2021 will, for the foreseeable future, rest on a broken series. Second, and more consequentially for programme management, no district-level population estimate of anaemia now exists anywhere in India — a country in which, as Section 3.3 showed, district-level variation is the dominant feature of the epidemiology.

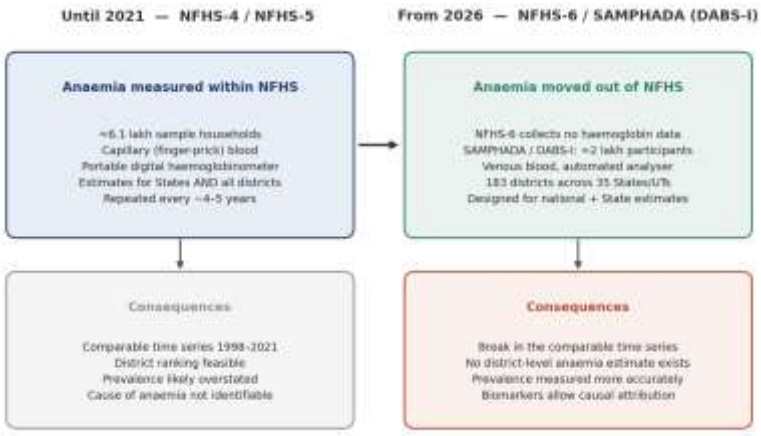

Figure 5. India's anaemia measurement architecture before and after the 2026 transition, with the principal consequences of each arrangement. Sources: references [8,15,16].

4.2 What changed in the programme

The revised operational guidelines released on 29 June 2026 expand the 6×6×6 framework to 7×7×7 (Figure 6, Table 4). Low-birth-weight infants aged 0–6 months are added as a seventh beneficiary group, with the explicit rationale of interrupting the intergenerational transmission of anaemia at its earliest point [17,19]. A seventh intervention, described as 'Eating Right', promotes dietary diversity rather than supplementation alone [19]. Institutionally, haemoglobin records for pregnant women from the JANANI portal, for children from the Rashtriya Bal Swasthya Karyakram portal, and from the U-WIN immunisation platform are to feed a unified Anaemia Mukt Bharat Abhiyaan portal, enabling what the Ministry describes as digital tracking of the entire continuum of care [18].

The most significant shift is conceptual rather than structural. The programme moves from prophylactic to therapeutic care, from input-based to outcome-based management, and from distributing supplements to confirming that identified individuals are screened, treated, tracked and recovered [17,18]. This is a genuine improvement in design. It also, necessarily, relocates accountability: an input-based programme is accountable for tablets dispensed, which a supply chain can report; an outcome-based programme is accountable for anaemia reduced, which only a population measurement can confirm.

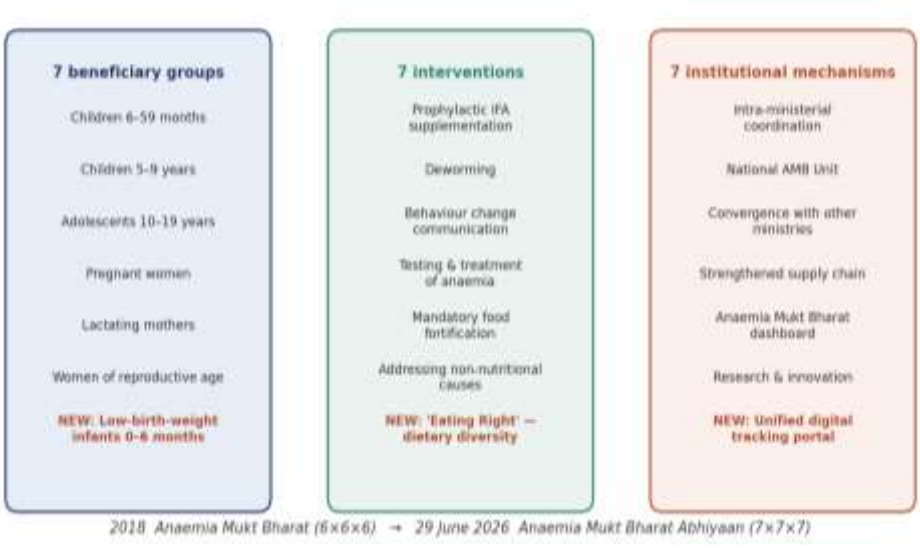

Figure 6. The revised Anaemia Mukt Bharat Abhiyaan 7×7×7 framework, with the three components added to the 2018 6×6×6 design shown in colour. Sources: references [6,17,19].

Table 4. Principal differences between the 2018 Anaemia Mukt Bharat programme and the 2026 Anaemia Mukt Bharat Abhiyaan.

Dimension	AMB, 2018 (6×6×6)	AMB Abhiyaan, 2026 (7×7×7)
Care model	Predominantly prophylactic supplementation	Therapeutic: intensified testing, treatment and case management
Management logic	Input-based (coverage of supplements)	Outcome-based (screened, treated, tracked, recovered)
Beneficiary groups	Six, from children 6–59 months to women of reproductive age	Seven, adding low-birth-weight infants aged 0–6 months
Interventions	Six, centred on iron–folic acid, deworming, fortification	Seven, adding 'Eating Right' dietary diversity
Data systems	Programme dashboard, largely aggregate reporting	Unified portal integrating JANANI, RBSK and U-WIN records
Population verification	NFHS district-level estimates available	No district-level population estimate available

RBSK = Rashtriya Bal Swasthya Karyakram. Sources: references [6,17–19].

4.3 Mapping the programme against the evidence available to verify it

Table 5 maps each intervention in the revised framework against the data source that would be required to demonstrate a population effect, and the level at which such a demonstration is now possible. The pattern is consistent. Coverage of every intervention can be tracked from programmatic records, in most cases better than before, because the digital portal captures individual-level screening and treatment events. But population effect — the question of whether anaemia actually fell in the population served — can now be answered at national and State level only, and for most interventions only indirectly, since the successor survey reports total anaemia rather than intervention-specific outcomes.

This creates an asymmetry that deserves to be named plainly. Programmatic records will, by construction, show improvement: as screening intensifies and treatment is tracked, the proportion of identified cases that are followed to resolution will rise. That is a real operational achievement and worth reporting. It is not evidence that population prevalence fell, and it is vulnerable to a well-documented failure mode in which service-based indicators improve while population indicators do not, because the denominator of a service-based indicator is those who presented rather than those who are affected. Without an independent population yardstick at the level of implementation, this distinction cannot be adjudicated.

Table 5. Intervention-by-intervention mapping of the revised framework against verification capability.

Intervention (7×7×7)	Coverage measurable from	Population effect measurable at	District verification
Prophylactic IFA supplementation	AMB Abhiyaan portal; supply-chain records	National and State (total anaemia only)	Not possible
Deworming	Campaign coverage records	National and State (indirect)	Not possible
Behaviour change communication	Programme activity reports	Not separately measurable	Not possible
Testing and treatment of anaemia	JANANI, RBSK, U-WIN; unified portal	National and State	Service-based proxy only
Mandatory food fortification	Distribution and procurement records	National (biomarker-linked)	Not possible
Addressing non-nutritional causes	Facility and programme records	National (biomarker-linked)	Not possible
'Eating Right' dietary diversity	Survey-based dietary modules	National and State	Not possible

IFA = iron and folic acid. 'Service-based proxy only' denotes indicators computed among those who presented for care, whose denominator is not the affected population. Authors' mapping based on references [16–19].

5. A PROPOSED THREE-TIER SURVEILLANCE ARCHITECTURE

The problem identified above does not call for reversing either reform. Restoring capillary testing to NFHS-6 would reintroduce an estimate that the expert community has judged unreliable, and diluting the therapeutic reorientation of AMB Abhiyaan would forfeit a genuine design improvement. What is required is a third element that neither reform supplies: a district-resolution signal, methodologically anchored to the venous-blood reference standard. We propose the architecture in Figure 7, comprising three tiers with defined roles and an explicit calibration relationship between them.

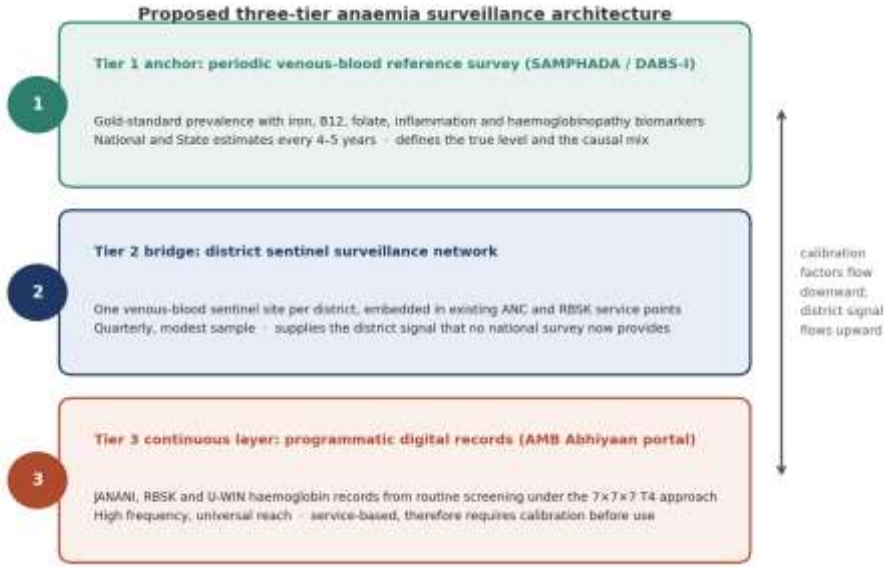

Figure 7. Proposed three-tier anaemia surveillance architecture linking a periodic venous-blood reference survey, a district sentinel network, and calibrated programmatic digital records.

5.1 Tier 1 — the reference anchor

The periodic venous-blood survey retains its designed role: establishing the true level of anaemia at national and State level, and — uniquely — its causal composition, through iron, vitamin B12, folate,

inflammation and haemoglobinopathy biomarkers. This tier answers what anaemia in India actually is, a question that no amount of haemoglobin measurement alone can answer, and which Section 3.4 shows is not adequately answered by the iron-deficiency assumption embedded in current programme design.

5.2 Tier 2 — the district sentinel bridge

The missing element is a district signal. We propose one venous-blood sentinel site per district, embedded within existing antenatal care and Rashtriya Bal Swasthya Karyakram service points rather than established as a parallel structure, sampling quarterly from defined population strata. The sentinel design is deliberately modest: it is not intended to produce a precise district prevalence estimate of the kind NFHS once supplied, but to detect direction and magnitude of change against the Tier 1 anchor, which is what district programme management actually requires. Sentinel surveillance is a well-established approach where full enumeration is unaffordable, and the marginal cost of adding standardised venous haemoglobin to facilities already drawing blood for antenatal profiling is small relative to the cost of a dedicated district survey.

5.3 Tier 3 — calibrated programmatic records

The unified digital portal generates data of a volume and frequency that no survey can match. Its weakness is that it is service-based: it describes those who presented, and its haemoglobin values come from point-of-care devices of varying specification. Both weaknesses are addressable, and neither requires new data collection. Where a sentinel site and programmatic screening operate in the same district, the paired measurements permit a district-specific calibration factor relating routine point-of-care values to the venous reference, and permit estimation of the selection differential between those screened and the general population. Calibrated in this way, programmatic data become usable for trend monitoring between sentinel rounds rather than merely for activity reporting.

5.4 A district indicator set

Table 6 sets out a minimum indicator set that this architecture would support. The design principle is that every indicator should be attributable to a defined denominator and a defined measurement method, and that service-based and population-based indicators should be reported separately rather than blended into a single figure.

Table 6. Proposed minimum district-level anaemia indicator set under the three-tier architecture.

Indicator	Tier	Frequency	Denominator and caveat
Sentinel venous haemoglobin distribution, women 15–49 years	2	Quarterly	Sentinel sample; direction of change, not absolute prevalence
Sentinel venous haemoglobin distribution, children 6–59 months	2	Quarterly	Sentinel sample; stratified by age band
Severe anaemia detection rate at antenatal registration	3	Monthly	Registered pregnancies; service-based
Treatment completion among identified moderate/severe cases	3	Monthly	Identified cases; service-based outcome
Haemoglobin recovery at 90 days post-treatment initiation	3	Monthly	Treated cases with a follow-up reading
Point-of-care to venous calibration factor	2 and 3	Quarterly	Paired readings; validity check, not an outcome
Screening-to-population selection differential	2 and 3	Annual	Compares screened with sentinel profile
State anaemia prevalence and causal composition	1	Every 4–5 years	Population; reference standard

5.5 Policy recommendations

Table 7 translates the analysis into specific recommendations with an indicative responsible agency and horizon. Three merit emphasis. The first is that the successor survey's first round should be published with an explicit bridging analysis relating its estimates to NFHS-5 for overlapping populations; without this, India will have two incompatible anaemia histories and no way to state whether the situation improved. The second is that the district sentinel network should be established before, not after, the revised programme's first outcome review, since a baseline collected after an intervention begins cannot serve as a baseline. The third is that the Indian haemoglobin cut-off question should be resolved through a formal national expert process rather than left to accumulate in the literature, because the difference between WHO and CNNS-derived cut-offs in the same children was 29.8 pp [22] — larger than any intervention effect the programme could plausibly achieve.

Table 7. Policy recommendations, indicative responsibility and horizon.

Recommendation	Indicative responsibility	Horizon	Problem addressed
Publish a formal bridging analysis linking venous-blood survey estimates to NFHS-5 for overlapping populations	ICMR-NIN with MoHFW	Short term	Broken time series
Establish one venous-blood sentinel site per district within existing ANC and RBSK facilities	State health departments under NHM	Short to medium	Absent district signal
Derive and publish district-specific calibration factors for point-of-care haemoglobin devices	ICMR with State NHM units	Medium term	Uncalibrated programmatic data
Convene a national expert process to settle Indian haemoglobin cut-offs	MoHFW with ICMR and professional bodies	Short term	Diagnostic threshold uncertainty
Report service-based and population-based indicators separately in all AMB Abhiyaan reporting	National AMB Abhiyaan Unit	Immediate	Denominator conflation
Extend biomarker panels to sentinel sites in high-burden districts	ICMR with State health departments	Medium term	Iron-deficiency assumption
Publish district-disaggregated portal data as an open dataset with documented limitations	MoHFW	Short term	Independent scrutiny

ANC = antenatal care; ICMR = Indian Council of Medical Research; ICMR-NIN = National Institute of Nutrition; MoHFW = Ministry of Health and Family Welfare; NHM = National Health Mission. Recommendations are the authors' synthesis.

6. DISCUSSION

This analysis makes three claims. The anaemia burden documented by the last comparable survey pair worsened across every monitored group and deteriorated in severity composition as well as headline prevalence. A substantial share of the measured burden is attributable to measurement method and diagnostic threshold rather than to physiology, on an order of magnitude that exceeds the observed deterioration several times over. And the two reforms of 2026 have, in combination, removed the population yardstick at exactly the administrative level to which the reformed programme assigns accountability.

The third claim is the novel one, and it generalises beyond anaemia and beyond India. Health systems across South Asia and comparable low- and middle-income settings are simultaneously improving measurement precision and digitising programme delivery. These movements are usually treated as complementary, and in principle they are. But they can interact adversely when precision is purchased with sample size — which is what venous-blood sampling of a smaller cohort represents — while digitisation simultaneously devolves accountability to smaller administrative units. The result is a mismatch between the level at which performance is demanded and the level at which performance can be independently observed. Wherever a country replaces a large, coarse, geographically exhaustive survey with a smaller, precise, geographically sparse one, this mismatch should be anticipated and explicitly provided for.

The findings also bear on programme content, not only measurement. If roughly two in five anaemic children have a cause other than iron deficiency [22], and if the biomarker evidence continues to support that pattern, then a framework that adds a seventh intervention promoting dietary diversity is moving in a defensible direction but may still be underweighting haemoglobinopathies, chronic inflammation and vitamin B12 deficiency. This is particularly relevant in parts of central and western India, including the tribal belts of Maharashtra, Gujarat, Chhattisgarh and Madhya Pradesh, where sickle cell disease and thalassaemia trait are prevalent and where an iron-centric response is not merely incomplete but, in specific haemoglobinopathies, potentially inappropriate. The addition of biomarker panels at sentinel sites in high-burden districts, recommended in Table 7, is directed at exactly this.

A final observation concerns the interpretation of the NFHS-4 to NFHS-5 increase itself. Because the method question was raised after the increase was reported, it has sometimes been treated as though it explained the increase away. It does not. Both rounds used the same capillary method, so a constant method bias cannot generate a change between them; what the method question undermines is the absolute level, not the direction of change. The direction of change — upward, across every group, in most States, and in moderate and severe categories as well as mild — remains a finding that requires explanation, and the fieldwork overlap of NFHS-5 with the COVID-19 pandemic and its attendant disruptions to supplementation supply chains, service delivery and household food security is a candidate explanation that the discontinuation of anaemia measurement now makes difficult to examine further.

Limitations

Four limitations bound these conclusions. First, this is a synthesis of published estimates rather than a reanalysis of microdata; State and district values are reported as documented in the cited sources, and we could not independently verify factsheet figures or compute confidence intervals for them.

Second, the comparison of capillary and venous estimates in Section 3.4 is a first-order difference between studies that differ in age band, sampling frame and fieldwork period as well as in blood-draw method. It bounds the plausible magnitude of method effect; it does not isolate it. A properly designed paired study, in which both specimen types are drawn from the same individuals across a representative sample, would be required for that, and would be a valuable addition to the sentinel design proposed here.

Third, the mapping in Table 5 is based on the revised operational guidelines and contemporaneous official reporting as available at the time of writing. Detailed monitoring and evaluation provisions may be specified in supplementary guidance not yet public, which could alter the verification classification for individual interventions.

Fourth, the proposed architecture and indicator set have not been piloted. Their feasibility depends on parameters we have not estimated: the marginal cost of venous sampling at sentinel sites, the achievable sample size per district per quarter, and the stability of device calibration factors over time. We present them as a policy proposal requiring evaluation, not as a validated instrument.

7. CONCLUSION

India's anaemia burden, as last measured on a comparable basis, worsened across every monitored population group between 2015–16 and 2019–21, with sub-national variation far exceeding the national movement. A substantial and quantifiable share of the measured burden reflects capillary sampling and WHO diagnostic cut-offs rather than physiology, and the correction of that measurement problem was both necessary and overdue.

The correction, however, has coincided with a programme redesign that relocates accountability to the district and facility level. The country has gained methodological accuracy and lost geographic resolution at the moment its programme most needs the latter. No district-level population estimate of anaemia currently exists in India, and none is scheduled.

The remedy proposed here is additive rather than restorative: retain the venous-blood reference survey as the anchor, add a district sentinel network embedded in existing service points to supply the missing district signal, and calibrate the new digital programmatic records against that sentinel layer so that their considerable volume becomes epidemiologically usable. Establishing this before the revised programme's first outcome review, rather than after, is what would allow India to answer — with evidence rather than activity reports — whether the Anaemia Mukt Bharat Abhiyaan is working.

Declarations

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Author contributions:

Name of Author	C	M	So	Va	Fo	I	R	D	O	E	Vi	Su	P	Fu
Mosrur Ahmed	✓	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓	✓

C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
Va : **Va**lidation
Fo : **Fo**rmal analysis
I : **I**nvestigation
R : **R**esources
D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

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