

Distribution of Veterinary Colleges in India: A State Wise Need-Capacity Analysis

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Abstract: *Veterinary education in India plays a critical role in strengthening livestock development, rural service delivery, and One Health imperatives. Despite the steady expansion of veterinary colleges, their distribution remains uneven, often misaligned with livestock density and human resource needs. This paper employs a Composite Need Gap Index (NGI) to assess state-wise disparities in veterinary education capacity. The NGI integrates five indicators—Veterinarian Availability Ratio (VAR), Institution Coverage Ratio (ICR), Seat Intensity (SI), College Intensity (CI), and Seats per Node (SPN) to generate a composite ranking of states. Results reveal that eastern and central states such as West Bengal, Jharkhand, and Bihar face acute shortages, while others require selective consolidation and specialization. Findings underscore the importance of evidence-based planning in line with the National Education Policy (NEP 2020). Embedding NGI into policy, accreditation, and funding frameworks can ensure equitable veterinary colleges distribution, enhance educational outcomes, and contribute to sustainable rural development.*

Keywords: Veterinary Education – India; Need Gap Index (NGI); Veterinary Colleges Distribution; Livestock Development; Rural Service Delivery; Veterinary Service Institution.

1. Introduction

Veterinary education in India occupies a unique position at the intersection of higher education, public health, food security, and rural development. Veterinary colleges not only produce skilled professionals but also serve as nodal institutions for clinical services, disease surveillance, research, and One Health imperatives. As India's livestock sector continues to expand and diversify, the demand for competent veterinarians and allied professionals has grown exponentially, particularly in rural and peri-urban regions where livestock is central to livelihoods.

Despite the expansion of veterinary colleges in recent decades, their spatial distribution remains uneven. Several states with high livestock populations and service delivery needs continue to face acute shortages in educational capacity and veterinary manpower, while others have seen rapid growth driven by socio-political or private-sector factors rather than demand-based planning. This imbalance poses challenges not only to the equitable availability of veterinary services but also to the quality and efficiency of veterinary education itself.

The National Education Policy (NEP) 2020 and the evolving higher education regulatory framework present both opportunities and challenges for veterinary education in India. On the one hand, they encourage multidisciplinary integration, global benchmarking, and innovation in pedagogy; on the other, they demand evidence-based planning, rational distribution of institutions, and stronger alignment with national developmental priorities. In this context, traditional metrics of institutional growth are insufficient for guiding policy and investment decisions.

This paper introduces a Composite Need Gap Index (NGI) as a systematic framework to identify and prioritize states for investment in veterinary education. By integrating multiple indicators—including Veterinarian Availability Ratio (VAR), Institution Coverage Ratio (ICR), College Intensity (CI), Seat

Intensity (SI), and Seats per Node (SPN)—the NGI highlights relative gaps across states and provides an evidence-based tool for decision-making. The objective is to move beyond ad hoc expansion toward a balanced, need-responsive, and outcome-oriented veterinary education system that strengthens service delivery, fosters research, and contributes to sustainable rural development.

2. Role of Veterinary Colleges & Policy Context:

Veterinary colleges in India serve a dual purpose: producing competent veterinary professionals and acting as hubs for research, animal health, food safety, and One Health initiatives. Their mandate extends beyond education to encompass community service, translational research, and policy advisory roles. With the advent of the National Education Policy (NEP) 2020, veterinary education faces both opportunities and challenges in aligning with multidisciplinary, globally benchmarked higher education systems.

The veterinary colleges provide services like primary and referral services for livestock, companion animals, and poultry; extension and community outreach centres; and play a role in monitoring zoonoses, meat inspection, and food chain safety, thereby linking animal and human health.

These veterinary colleges also contribute to research and innovation like translational and applied research contributing towards vaccine development, diagnostic kits, reproductive biotechnologies, and breed improvement programs; collaborative research networks, partnering therewith ICAR institutes, DAHD, state animal husbandry departments, and international agencies strengthen the research ecosystem.

Veterinary colleges are also nodal institutions for one Health imperatives and are central to identifying and responding to outbreaks of rabies, avian influenza, brucellosis, and other zoonoses – zoonotic disease surveillance; Embedding One

Health curricula fosters collaboration between veterinary, medical, environmental, and public health professionals; and contribute to antimicrobial resistance stewardship programs and biosecurity frameworks at local and national levels.

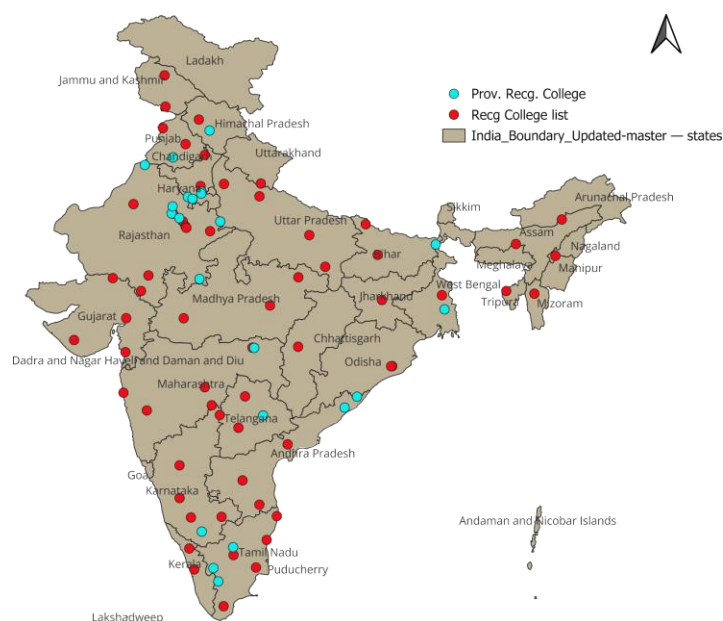
Currently Veterinary Council of India oversees recognition of veterinary qualifications, standards (MSVE regulations), and

professional registration. State veterinary/agricultural or central and deemed universities govern colleges with varied autonomy and accountability frameworks.

Presently the veterinary colleges under various category of universities are established as shown in the Table 1 below:

University Category	Public Sector		Private Sector	
	Recognised	Provisionally Recognised	Recognised	Provisionally Recognised
Veterinary University	38	09	07	10
Agriculture University	10	0	0	0
Central University	03	0	02	0
Private University	-	-	01	02
TOTAL	51	09	10	12

The distribution of recognized and provisionally recognized veterinary colleges are shown at figure 1 below.



3. Data & Methods

The data source for the present study was obtained from Department of Animal Husbandry & Dairying (DAHD), Ministry of Fisheries, Animal Husbandry & Dairying, Government of India Annual Report 2024-25 (as reported upto 31st March 2024), information collected from VCI/ICAR, and Gross State Domestic Product data from Ministry of Statistics and Programme Implementation as published by Statistics Times dated 08.04.2025 has been utilized for the study. GSDP Per capita (INR at current price 24-25) and for states where not available, GSDP Per capita (INR at current price 23-24) has been considered for the study. The data includes livestock & poultry population, veterinary institutions, registered veterinarians, and economic indicators.

3.1 Data Source

- Livestock population – Department of Animal Husbandry and Dairying (DAHD) Annual Report 2023–24
- Registered veterinarians – state-wise availability of professionals as reported in Department of Animal Husbandry and Dairying (DAHD) Annual Report 2023–24

- Veterinary institutions – service delivery institutions (hospitals, dispensaries, clinics) as reported in Department of Animal Husbandry and Dairying (DAHD) Annual Report 2023–24
- Seats & colleges – veterinary education admission capacity and number of colleges from personal communication with VCI.

3.2 Derived indicators (VAR, ICR, CI, SPN) and NGI Methodology

This study defines four operational indicators—VAR, ICR, SI and SPN—and presents a composite Need Gap Index (NGI) to prioritize states for strengthening veterinary services and education. Default scales use livestock counts only; poultry could be added as a sensitivity scenario.

3.2.1 Definitions, Rationale, and Formulae

3.2.1.1 Veterinarian Availability Ratio (VAR)

Definition: Registered veterinarians available per 1 lakh (100,000) livestock.

Rationale: Captures staffing adequacy for teaching, clinical, preventive, animal husbandry and extension services.

Formula: $VAR = (\text{Registered Veterinary Practitioners} \div \text{Total Livestock}) \times 100,000$

3.2.1.2 Institution Coverage Ratio (ICR)

Definition: Veterinary service institutions per 1 lakh livestock.

Rationale: Proxy for network density and physical access to services.

Formula: $ICR = (\text{Veterinary Service Institutions} \div \text{Total Livestock}) \times 100,000$

3.2.1.3 College Intensity (CI)

Definition: Veterinary colleges per livestock.

Rationale: Indicates medium- to long-term supply capacity of veterinarians and specialists.

Formula: $CI = \text{Number of Veterinary Colleges} \div \text{Total Livestock}$

3.2.1.4 Seat Intensity (SI)

Definition: Seats in Veterinary colleges per 100,000 livestock.

Rationale: Indicates medium- to long-term supply capacity of veterinarians and specialists.

Formula: $SI = (\text{Number of Seats in Veterinary Colleges} \div \text{Total Livestock}) \times 100,000$

3.2.1.5 Seats per Node (SPN)

Definition: – Seats per Node

Formula: $SPN = \text{Total seats} \div \text{Institutions}$

3.3 Need Gap Index (NGI) – Construction

The Composite Need Gap Index (NGI) is a multi-dimensional tool designed to identify and rank states by their relative need for investment in veterinary education capacity. By integrating five key indicators—VAR, ICR, SI, CI, and SPN—the NGI highlights regional gaps and guides resource allocation. It incorporates both education and service delivery indicators, allowing stakeholders to prioritize resources for states facing the largest gaps in veterinary education infrastructure and manpower.

3.3.1 Selection of Core Indicators

The NGI incorporates the following operational indicators, derived from livestock population, veterinary manpower, and education capacity data:

- Livestock per Seat (LS/SI) – Proxy for demand–supply gap in veterinary education seats.
- Veterinarians per 100,000 Livestock (VAR) – Adequacy of veterinary manpower relative to livestock population.
- Institutions per 100,000 Livestock (ICR) – Availability of service institutions in relation to demand.
- Seat Intensity per 100,000 Livestock (SI) – Education capacity relative to livestock population.
- College Intensity per 10,000,000 Livestock – pressure on veterinary colleges.
- SPN (Seats per Node) – average seats per veterinary institution.

3.3.2 Orientation Toward “Need”: Each raw indicator reflects availability, but NGI is meant to capture gaps (need). Therefore, indicators were inverted using the formula:

Need Component = $1 - \text{Normalized Value}$

Interpretation: a state with higher availability of vets, seats, or institutions shows lower need, while a state with low availability scores higher on need.

3.3.3 Normalization of Indicators: Since the indicators are measured on different scales (e. g., ratios, counts, intensities), normalization is required to make them comparable which were applied to transform values into a common range [0, 1]. The formula used for this is:

$$X' = (X - X_{\min}) / (X_{\max} - X_{\min})$$

Where X is the state's value, and $X_{\min}/X_{\max}$ are the minimum and maximum across all states.

If an indicator had no variation across states, a neutral score of 0.5 was assigned. After normalization, the need component was derived as $1 - \text{normalized value}$.

3.3.4 Weight Assignment: Relative importance was assigned to each driver as follows:

- Seat Intensity (SI): 40%
- College Intensity (CI): 15%
- Veterinarian Availability (VAR): 20%
- Institution Coverage (ICR): 10%
- Seats per Node (SPN): 15%

These weights sum to 100%.

3.3.5 Composite Score Construction

The composite NGI score was computed as the weighted sum of all five need components:

$$NGI = \sum (w_i \times \text{Need Component})$$

The result was scaled to a 0–100 index for interpretability, with higher values representing higher gaps/needs.

3.3.6 Ranking of States

States are ranked based on their NGI score in descending order. Higher NGI scores represent states with greater shortages of veterinary education capacity relative to livestock demand, thus requiring higher policy priority. This framework ensures a transparent, evidence-based prioritization of states for capacity strengthening and equitable veterinary education distribution.

Rank 1 = highest need (largest gap)

Lower ranks = relatively better served

4. Results

4.1 State wise DAHD Data

State wise statistics on veterinary colleges, livestock & poultry populations, veterinary service institutions, and registered veterinarians were compiled for analysis of the various indicators towards calculating the deficit through Need Gap Capacity. The data has been sourced from Annual Report 2024-25 of DAHD, M/o Fisheries, Animal Husbandry and Dairying, GoI. The GSDP per capita from Ministry of

Statistics and Programme Implementation as published by Statistics Times dated 08.04.2025.

4.2 The number of veterinary colleges tends to increase with GSDP because wealthier, larger states can afford more institutions — but when we adjust for livestock population, human population, and agri-livestock share, GSDP alone is not a strong determinant. Hence, in this study GSDP has not been considered to design Need Gap Index (NGI) to prioritize Indian states for investment in veterinary education capacity, based on resource gaps in human resources, institutional infrastructure, and training capacity.

4.3 Composite Need Gap Index (NGI) for Veterinary Education Capacity

This study presents a Composite Need Gap Index (NGI) constructed for Indian states to prioritize appropriate action in

veterinary education and service capacity. Five operational indicators (drivers) were included to capture human resources, institutional reach, educational capacity, and infrastructure efficiency:

VAR: Veterinarian Availability Ratio

ICR: Institution Coverage Ratio

SI: Seats available per 100, 000 livestock

CI: Veterinary colleges per 10, 000, 000 livestock

SPN: Average seats per veterinary institution (college).

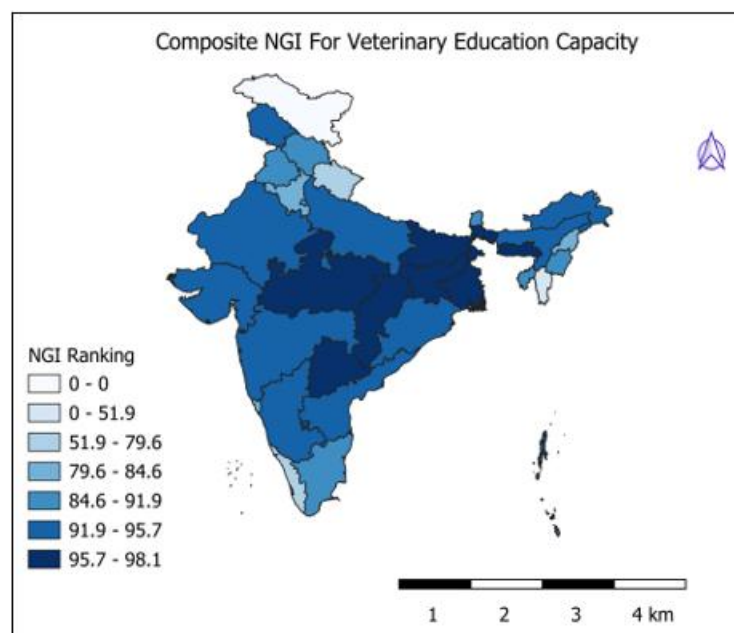
Each indicator was normalized, aligned to reflect need (higher = more deficit), and combined with weights with relative importance was assigned to each driver. Higher NGI scores indicate states with greater relative gaps in veterinary human resources, institutional infrastructure, and training capacity.

Top 15 Priority States (by Composite NGI) are given below:

State	VAR	ICR	SI	CI	SPN	NGI (0-100)	Rank
West Bengal	7.2672	8.8973	0.2668	0.2668	0.03	98.07	1
Jharkhand	4.1161	3.7773	0.271	0.4235	0.0717	97.92	2
Meghalaya	22.0195	12.3093	0	0	0	97.79	3
Bihar	9.8137	7.4766	0.3694	0.5473	0.0494	97.59	4
Chhattisgarh	8.1778	7.9195	0.5229	0.63	0.066	97.21	5
D & N Haveli	10.3297	35.1211	0	0	0	96.39	6
Madhya Pradesh	8.0369	6.6737	0.7382	0.7382	0.1106	96.37	7
Telangana	7.0648	6.7921	0.7659	0.9191	0.1128	96.31	8
Assam	17.7314	6.6824	0.7738	1.1054	0.1158	95.67	9
Andhra Pradesh	16.5641	10.1915	1.1154	1.1741	0.1094	95.26	10
Arunachal Pradesh	21.0947	43.9115	0	0	0	95.07	11
Odisha	15.861	22.5313	1.4309	1.651	0.0635	94.66	12
Uttar Pradesh	1.8173	1.6453	0.4411	0.7352	0.2681	94.64	13
Karnataka	17.516	14.5933	1.4821	2.068	0.1016	94.48	14
Lakshadweep	76.5915	19.6949	0	0	0	94.36	15

The Need Gap Index for the various States with respect to veterinary education and its capacity building is shown in the figure below. The range 0 – 0 indicated for Ladakh is due to

the fact separate values in respect of this Union Territory is not available and worked out as a composite ranking for Jammu & Kashmir.



It is observed that the top 5% states showing relative gaps in veterinary human resources, institutional infrastructure, and training capacity for veterinary education lies in the eastern, central and partially southern (Andhra Pradesh and Telangana) states of India.

4.4 NGI State Scorecard

The following table presents State/UT-wise NGI scores, ranks, and tier classifications derived from the composite index.

State/UT	NGI Score	Tier
West Bengal	98.07	Tier 1: Highest Need (Top 20%)
Jharkhand	97.92	Tier 1: Highest Need (Top 20%)
Meghalaya	97.79	Tier 1: Highest Need (Top 20%)
Bihar	97.59	Tier 1: Highest Need (Top 20%)
Chhattisgarh	97.21	Tier 1: Highest Need (Top 20%)
D & N Haveli	96.39	Tier 1: Highest Need (Top 20%)
Madhya Pradesh	96.37	Tier 1: Highest Need (Top 20%)
Telangana	96.31	Tier 1: Highest Need (Top 20%)
Assam	95.67	Tier 2: High Need (50–80%)
Andhra Pradesh	95.26	Tier 2: High Need (50–80%)
Arunachal Pradesh	95.07	Tier 2: High Need (50–80%)
Odisha	94.66	Tier 2: High Need (50–80%)
Uttar Pradesh	94.64	Tier 2: High Need (50–80%)
Karnataka	94.48	Tier 2: High Need (50–80%)
Lakshadweep	94.36	Tier 2: High Need (50–80%)
Gujarat	94.31	Tier 2: High Need (50–80%)
Rajasthan	94.06	Tier 2: High Need (50–80%)
Maharashtra	94.02	Tier 2: High Need (50–80%)
Jammu & Kashmir	93.36	Tier 3: Moderate Need (20–50%)
A & N Island	93.34	Tier 3: Moderate Need (20–50%)
Chandigarh	92.99	Tier 3: Moderate Need (20–50%)
Tamil Nadu	91.87	Tier 3: Moderate Need (20–50%)
Sikkim	91.52	Tier 3: Moderate Need (20–50%)
Manipur	90.89	Tier 3: Moderate Need (20–50%)
Delhi	89.80	Tier 3: Moderate Need (20–50%)
Himachal Pradesh	87.84	Tier 3: Moderate Need (20–50%)
Punjab	87.17	Tier 3: Moderate Need (20–50%)
Tripura	86.62	Tier 3: Moderate Need (20–50%)
Daman & Diu	85.00	Tier 3: Moderate Need (20–50%)
Goa	84.62	Tier 4: Lower Need (Bottom 20%)
Haryana	83.59	Tier 4: Lower Need (Bottom 20%)
Nagaland	82.18	Tier 4: Lower Need (Bottom 20%)
Uttarakhand	79.58	Tier 4: Lower Need (Bottom 20%)
Kerala	76.46	Tier 4: Lower Need (Bottom 20%)
Mizoram	51.94	Tier 4: Lower Need (Bottom 20%)
Puducherry	4.67	Tier 4: Lower Need (Bottom 20%)

5. Discussion

5.1 Current Scenario

The Need Gap analysis to prioritize investments in veterinary education and service capacity in different States of India it is observed that the five top most states in order of ranking in terms of livestock population are Uttar Pradesh, Rajasthan, Madhya Pradesh, West Bengal and Bihar. The five least number of livestock are available in Daman & Diu, Chandigarh, Lakshadweep, Goa, Andaman & Nicobar Island and Puducherry. Poultry population has not been considered for the analysis. Similarly, NGI has been computed on the

basis of livestock population and respective service institutions available. Pet animal service institutions have not been considered for the present study as these services do not find a major participation in the animal husbandry policy consideration by the state governments.

However, the present trend of admission shows that the highest number of annual admissions are made by Rajasthan with 14 veterinary college (recognized and provisionally recognized), followed by Tamil Nadu, Haryana with 7 college each; and Maharashtra, Karnataka with 6 college each. Eleven states/UT do not have any veterinary college and 09 states have single veterinary college. Rest of the states have 02 to 05 colleges.

The number of livestock per seat is the highest for West Bengal, followed by Jharkhand, both having more than 3.6 lakh livestock per seat, Bihar with more than 2.5 lakhs livestock, Uttar Pradesh with more than 2 lakhs and Chhattisgarh with about 2 lakhs livestock per seat. On the contrary the five states with highest number of admissions have an average of 49, 000 livestock per seat.

The states/UT of Uttar Pradesh, followed by Jharkhand, Telangana, West Bengal and Madhya Pradesh have the least number of vets per livestock. Whereas, the top five States making admission to undergraduate courses are ranked 28th, 18th, 16th, 15th, and 23rd, respectively, in ascending order of livestock population. Hence, there is huge disparity amongst the state in terms of need and availability of veterinary human resources, thus, affecting the veterinary services delivery.

The current admission pattern could be affected by the following rationale:

- 1) Socio-Political decision made by the State governments for veterinary colleges in the government sector.
- 2) Land resources available by registered Societies/Trust/etc. with an imbibed objective for opening veterinary colleges in their respective constitution or by individuals (as member of such organizations).
- 3) Expansion of educational institutions by the established universities in the private sector.
- 4) Restructuring of existing Diploma/Certificate courses by organization in both private and public sector.
- 5) Shifting to veterinary education by private sector keyholders from other professional courses.
- 6) Increasing demand of students to study veterinary sciences due to various factors:
 - a) Growing interest of student community to migrate to developed countries for livelihood.
 - b) Greater possibility for getting a government job.
 - c) Interest in non-practicing allowance.
 - d) Expansion of services by introducing Mobile Veterinary Units.
 - e) Increase in the number of pet owners due to shift in lifestyle, especially in the metros.

5.2 Role of Key Drivers in the Distribution of Veterinary Colleges in India

The growth in the number of veterinary colleges in India could have been driven by multiple socio-political, economic,

and institutional factors. While these drivers reflect increasing demand and stakeholder interest, they also carry implications for the spatial distribution of colleges, which is often uneven and not always aligned with livestock density or rural service needs. This paper links six key drivers to their role in shaping distribution, identifies associated risks, and suggests safeguards anchored to the Composite Need Gap Index (NGI).

5.2.1. Socio-political decisions by State Governments

- Role: State governments often establish new veterinary colleges as part of socio-political commitments. This tends to cluster colleges in politically significant districts, not necessarily those with the highest service deficits.
- Risk: Over-supply in some regions, under-supply in high-need states.
- Safeguard: Link approvals to NGI thresholds and geographic access gaps, ensuring new colleges target underserved regions. New government colleges should be linked to **NGI thresholds** (e. g., priority to Top-10/Top-16 NGI ranks), and to **distance buffers** (e. g., ≥ 150 km from nearest B. V. Sc. & A. H. college unless the district's VAR/ICR are below national median).

5.2.2. Land availability with Societies/Trusts/Individuals

- Role: Ready availability of land motivates setting of colleges, particularly in peri-urban or low-cost rural belts.
- Risk: Land-driven locations may lack livestock density or clinical exposure.
- Safeguard: Treat land availability as necessary but not sufficient; we may consider to use filters for NGI-based need, travel distance to nearest college, and signed service agreements with district veterinary institutions.

5.2.3. Expansion by established private universities

- Role: Private universities expand portfolios by adding veterinary colleges, usually near existing campuses and urban corridors.
- Risk: Skew toward urban/metropolitan clusters, limited rural service impact.
- Safeguard: Incentivize setting up colleges in NGI high- or moderate-need districts through fast-track approvals and targeted funding, while capping intake in over-served regions.

5.2.4. Restructuring of existing Diploma/Certificate courses

- Role: Existing training institutes are upgraded to full colleges, usually at legacy sites.
- Risk: Legacy locations may not correspond to current livestock/veterinary service gaps.
- Safeguard: Permit upgrades only where VAR/ICR are below national medians and infrastructure can support full BVSc & AH programs, with phased intakes tied to service capacity.

5.2.5. Shifting from other professional courses by private sector keyholders

- Role: Investors and institutions diversify from other professional streams into veterinary education.
- Risk: Rapid entry in permissive states or education hubs, risking over-crowding and quality dilution.

- Safeguard: Apply location-allocation rules requiring NGI High/Moderate classification and minimum access gaps before approval, plus compulsory rural training partnerships.

5.2.6. Increasing student demand for veterinary sciences

- Role: Rising career interest among students encourages expansion of seats, especially in education-centric urban centers.
- Risk: Supply of graduates may cluster in urban areas, leaving rural livestock belts underserved.
- Safeguard: Introduce rural-track admissions, bonded scholarships, and service obligations tied to high-NGI districts.

5.3 NGI-based Framework for Balanced Distribution

To ensure balanced and need-driven distribution of veterinary colleges, the following safeguards are suggested:

- Need Rule: New colleges or seat expansions must be in states/districts falling in High or Moderate NGI tiers.
- Access Rule: Must address geographic access gaps, ensuring a minimum distance/time threshold from the nearest veterinary college.
- Ecosystem Rule: Mandatory service compacts with PHCs and district hospitals to ensure adequate case-load.
- Capacity Rule: Phased intakes linked to faculty strength, case-load, and field exposure metrics.
- Equity Rule: Rural-track admissions and bonded scholarships tied to service in high-need districts.

5.4 Addressing Veterinary Education and Rural Development Gaps through the Composite Need Gap Index (NGI):

The Composite Need Gap Index (NGI), developed using indicators such as Veterinarian Availability Ratio (VAR), Institution Coverage Ratio (ICR), Seat Intensity (SI), College Intensity (CI), and Seats per Node (SPN), highlights disparities across Indian states. This brief outlines implications for veterinary education and rural development, grouping states into high, moderate, and lower-need clusters. This can be used for phased interventions (0–2 years, 3–5 years) and indicative budget envelopes.

5.4.1 State Clusters by NGI Ranking

5.4.1.1 High-Need States (Top 10): West Bengal, Jharkhand, Bihar, Meghalaya, Chhattisgarh, Dadar & Nagar Haveli, Madhya Pradesh, Telangana, Assam, Andhra Pradesh.

Key gaps: low VAR/ICR, absence of veterinary colleges in Meghalaya and Dadra & Nagar Haveli, low SI/SPN in several states.

5.4.1.2 Moderate-Need States (Ranks 11–24): These states show partial deficits in seat intensity, institutional coverage, or VAR. Interventions should focus on selective seat growth, field training enhancement, and institutional upgrades.

5.4.1.3 Lower-Need States (Ranks 25–36): States with relatively higher veterinary education coverage and lower NGI scores. Focus should be on quality consolidation,

advanced research, and One Health hubs while maintaining rural access.

5.5 Implications for Veterinary Education from the Composite Need Gap Index (NGI) Study:

This study outlines the implications of the Composite Need Gap Index (NGI) for veterinary education in India. The NGI ranks States/UTs by the relative demand–supply mismatch in veterinary education capacity and service delivery. Higher NGI indicates higher need for targeted interventions. The following sections provide actionable insights for policy, planning, and institutional development.

5.5.1 Funding Targeting: We can prioritize Tier 1 (Top-20% NGI) states for immediate investments in new colleges, satellite campuses, and expansion for increasing the annual admission in the existing veterinary colleges. NGI drivers (Livestock per Seat, VAR, ICR, SI) can be used as measurable benchmarks for grants and phased approvals.

5.5.2 Capacity Planning (Seats, Colleges, Network Design): Expand seat capacity strategically in Tier 1/2 states, using distributed models where geography demands. Rationalize seat-to-node ratios and reduce Livestock per College through new institutions or hub-and-spoke structures.

5.5.3 Faculty, Infrastructure, and Service Compacts: Ensure seat expansion is matched with faculty recruitment and infrastructure. Strengthen Teaching Veterinary Clinical Complexes (TVCCs) and service compacts with State AH Departments for experiential learning.

5.5.4 Curriculum & Experiential Learning: Adapt MSVE curricula to embed longer rural postings in Tier 1 states, align competencies to regional livestock needs, and strengthen One Health and Public Health rotations.

5.5.5 Admissions, Equity & Retention: Increase state-quota seats and scholarships in high-need states. Design bonded rural service schemes tied to NGI tiers, and provide bridge programs for underrepresented learners.

5.5.6 Accreditation & Quality Assurance: Adopt risk-weighted peer reviews with higher audit cadence in Tier 1/2 institutions. Certify field sites for adequacy of clinical cases, supervision, and biosecurity.

5.5.7 Digital Health, Tele-Veterinary & Extension: Deploy tele-triage and tele-OPDs where Institution Coverage Ratio is low. Incentivize credit-bearing extension activities in Tier 1/2 districts.

5.5.8 Research & Specialization Portfolios: In Tier 1, fund applied research on endemic diseases, fertility, and AMR. In Tier 3/4, build centers of excellence and advanced specializations.

5.5.9 Partnerships & PPP Models: Leverage PPPs with private dairies and poultry integrators for teaching sites. Partner with NGOs/startups for innovative service delivery in underserved regions.

5.5.10 Monitoring & Evaluation: Institutionalize annual NGI precomputations with State Score cards. Use early indicators like faculty vacancies, OPD caseload/student, and bonded-service compliance to adjust seat allocations.

5.5.11 Overall Transformation in Veterinary Education: Admissions, scholarships, and bonded rural service together reshape veterinary education in three critical ways:

- From access to alignment: expanding opportunities for rural students while ensuring graduate deployment matches service needs.
- From classroom to community: shifting pedagogy toward herd health, disease surveillance, and real-world livestock systems.
- From output to outcome: success measured not only in graduate numbers but in rural service coverage, livestock productivity, and One Health indicators.

5.6 Implications for Rural Development & Service Delivery from the NGI (Need Gap Analysis) Study:

The NGI doesn't just guide where to build colleges—it shows where rural livelihoods, livestock-based income, and public health are most at risk from veterinary service gaps. By aligning seat expansion, service compacts, and rural deployment with NGI tiers, India can transform rural development outcomes and strengthen veterinary service delivery at scale.

5.6.1 Addressing Service Gaps in Underserved States: Tier 1 states (highest NGI) face the widest mismatch between livestock demand and veterinary education/service supply. For rural development, this implies large pockets of farmers have limited or delayed access to veterinary care, leading to reduced productivity, higher mortality, and slower adoption of improved practices. Urgent investment in new service nodes (clinics, TVCC-linked rural hospitals, ambulatory units) is critical.

5.6.2 Strengthening the Veterinarian–Farmer Interface: Where Veterinarian Availability Ratios (VAR) are low, farmers rely on para-vets or informal providers. The NGI suggests the need for bonded rural service schemes, ensuring graduates spend a defined tenure in underserved blocks. Scholarships and state quotas linked to rural postings can help retain talent in high-need areas.

5.6.3 Livestock-Centric Rural Development: High NGI correlates with states having dense livestock populations but thin service coverage. This constrains milk yield, reproductive efficiency, and disease control, directly affecting rural incomes. Bridging NGI gaps will unlock higher rural GDP contributions through livestock productivity gains.

5.6.4 Public Health and Biosecurity: Service delivery gaps in Tier 1 regions translate into weak disease surveillance and vaccination coverage. This undermines rural development and raises zoonotic risks. NGI-driven prioritization ensures that public health labs, disease investigation units, and mobile clinics are strategically located in deficit states.

5.6.5 Rural Employment and Skills Development: Expanding veterinary institutions and service nodes in high-need states generates local employment (faculty, para-vets,

lab staff, animal attendants). It also provides upskilling opportunities for rural youth through diploma/para-vet programs, creating a rural skill pipeline that sustains service delivery beyond veterinarians alone.

5.6.6 Service Compacts with State AH Departments: The NGI highlights where state-run service infrastructure is inadequate relative to livestock load. Colleges in such states should formalize Service Compacts with Animal Husbandry Departments for joint rural outreach (infertility camps, vaccination drives, farmer training). This ensures education capacity doubles as a rural service multiplier.

5.6.7 Equity and Inclusion in Rural Livelihoods: Women, small holder farmers, and tribal communities in Tier 1 regions are most disadvantaged by service shortages. NGI evidence supports targeted rural extension and gender-sensitive service delivery, ensuring equitable access to animal health, nutrition, and insurance schemes.

6. Conclusion

The Composite Need Gap Index (NGI) study highlights that veterinary education in India is not merely an academic concern but a cornerstone of rural development, livestock productivity, and national public health resilience. The six drivers identified play a central role in the expansion and distribution of veterinary colleges across India. Without careful regulation, distribution may skew toward political or economic convenience, leaving genuine livestock service gaps unaddressed. By systematically identifying high-need states and aligning investments with service deficits, the NGI provides policymakers, regulators, and institutions with an evidence-based roadmap for future planning.

Closing the gaps in veterinary human resources, institutional reach, and education capacity will deliver multiple dividends: better rural livelihoods, stronger disease surveillance, enhanced food safety, and more equitable access to animal health services. The transformation envisaged is one that shifts veterinary education from being supply-driven to need-responsive, ensuring that every new seat, college, and service compact is justified by measurable impact on communities and livestock systems.

In conclusion, embedding NGI into policy, accreditation, and funding decisions will foster a **balanced, inclusive, and outcome-oriented veterinary education ecosystem**. Such an approach will help India not only achieve parity across states but also position veterinary education as a catalyst for One Health, sustainable agriculture, and rural prosperity. Anchoring approvals and expansions to NGI-based rules and safeguards will ensure equitable, need-driven distribution, strengthening both veterinary education and rural development.

7. Summary

This study evaluates the distribution of veterinary colleges in India through a comprehensive Need Gap Index (NGI) framework. Veterinary colleges play a pivotal role not only in producing qualified veterinarians but also in advancing rural development, public health, and One Health outcomes.

Despite steady growth in the number of institutions, their distribution remains uneven and often misaligned with livestock density, rural service needs, and human resource availability.

Using data from the Department of Animal Husbandry & Dairying (DAHD), Veterinary Council of India (VCI), and GSDP statistics, the analysis employs five operational indicators—Veterinarian Availability Ratio (VAR), Institution Coverage Ratio (ICR), Seat Intensity (SI), College Intensity (CI), and Seats per Node (SPN). These were normalized and weighted to construct the NGI, ranking states by relative need for veterinary education capacity. Higher NGI scores indicate states with larger gaps in veterinary human resources, infrastructure, and training opportunities.

Findings show that high-need states, such as West Bengal, Jharkhand, Bihar, Meghalaya, and Chhattisgarh, face acute shortages in veterinary education relative to livestock populations. Moderate-need states, including Odisha, Uttar Pradesh, and Karnataka, require selective seat expansion and institutional upgrades, while lower-need states like Kerala, Haryana, and Goa should focus on quality enhancement, specialization, and One Health hubs.

The report emphasizes that socio-political decisions, land availability, private sector expansion, and rising student demand have influenced growth patterns, but often at the cost of regional balance. Safeguards anchored to NGI are essential to ensure equitable distribution of colleges, rationalized admissions, and rural service alignment.

In conclusion, embedding NGI into planning, funding, and accreditation processes will allow India to transition from supply-driven growth to evidence-based, need-responsive veterinary education. Such a transformation will strengthen rural livelihoods, disease surveillance, and public health, making veterinary education a catalyst for sustainable rural development and national food security.

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