

Review Article

A review-based socio-economic framework for studying school-age malnutrition among government school children in Ranchi district, Jharkhand

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ABSTRACT

School-age malnutrition remains under-recognised in nutrition research and public-health planning, particularly in socio-economically vulnerable districts where children depend on government schools and public services. Ranchi district, Jharkhand, is a relevant setting because it includes rural, peri-urban and urban populations, a sizeable tribal presence and dependence on public schooling and nutrition support. This review-based paper develops a socio-economic and demographic framework for studying malnutrition among government schoolchildren aged 6–12 years in Ranchi district. It draws on primary-data studies from India and other developing regions to identify determinants repeatedly associated with school-age malnutrition. The reviewed evidence indicates that nutritional outcomes are shaped by household poverty, parental education, family size, gender, caste, tribe, ethnicity, dietary diversity, sanitation, morbidity and school environment. The proposed framework links distal determinants such as socio-economic status, household demography and social-group background with proximate pathways such as diet quality, water, sanitation and hygiene, recent illness and school-based support. It also outlines a practical field methodology based on multistage sampling, anthropometry, child and parent schedules, school-level information and descriptive analysis. School-age malnutrition in Ranchi should be studied not only as an anthropometric condition but also as a public-health and social-development issue. A school-centred, household-sensitive and district-level framework can support future field enquiry, nutrition monitoring and targeted public-health responses.

Keywords: School-age malnutrition, Government school children, Socio-economic determinants, Dietary diversity, WASH, Jharkhand

INTRODUCTION

School-age children are often less visible in nutrition research than children below five years, even though the years between early childhood and adolescence remain important for physical growth, school participation, habit formation and later health. Poor nutrition during these years may affect energy levels, morbidity, attendance, learning and preparation for adolescence.^{1,2} The World Health Organization growth reference for children and adolescents aged 5–19 years also supports the need to

assess school-age nutrition through height-for-age and body mass index-for-age indicators rather than treating nutrition assessment as relevant only to preschool children.^{3,4}

In India, national nutrition and health surveys provide important background evidence, but they do not fully address the district-level situation of children aged 6–12 years who attend government schools. The Comprehensive National Nutrition Survey covers a wider child and adolescent age range, while the National Family

Health Survey provides district and state-level evidence mainly for under-five children and women.^{5,6} This leaves a gap in understanding the nutritional status of primary-school age children, particularly those from poorer, tribal, rural and socially vulnerable households.

School-age malnutrition is not confined to one form. Children may experience stunting, thinness, underweight, low dietary diversity and micronutrient vulnerability, while overweight and obesity are also emerging in some settings. Such patterns indicate that school-age nutrition should be studied as a continuum of nutritional risk. In this continuum, household poverty, parental education, family structure, caste, tribe, ethnicity, sanitation, morbidity and school-level support all become relevant. Schools are especially important because they provide a practical setting for anthropometric assessment, mid-day meal monitoring, health screening, nutrition counselling and referral.

Ranchi district in Jharkhand provides an important context for such an enquiry. The district includes rural, peri-urban and urban populations and has tribal and other socially vulnerable communities. Existing Ranchi-based studies have already reported dietary diversity concerns and malnutrition among preschool and school-age children, particularly in tribal settings.^{7,8} However, a focused socio-economic and demographic framework for studying government schoolchildren aged 6-12 years remains limited. This paper addresses this gap by developing a review-based framework and field methodology suitable for a future district-level study in Ranchi.

REVIEW BASIS FOR THE FRAMEWORK

This paper uses evidence from primary-data studies on school-age children and related age groups in India and other developing regions. The purpose is not to conduct a full systematic review, but to organise recurring determinants into a practical framework for future field research. A structured narrative review with scoping elements is appropriate because available studies differ by age group, sample size, setting, anthropometric indicator

and analytical method. Such an approach helps map relevant concepts and identify common determinant patterns.⁹⁻¹¹

Studies were considered relevant when they reported nutritional outcomes among school-age children, adolescents or children above five years and included socio-economic, demographic, dietary, sanitation, morbidity or school-related variables. Particular attention was given to studies using height, weight, body mass index, height-for-age, body mass index-for-age, mid-upper arm circumference (MUAC), underweight, thinness, stunting, overweight, obesity or dietary diversity. Studies focused only on under-five children, purely clinical treatment, or interventions without baseline determinant analysis were not treated as core evidence.

Indian studies repeatedly show that school-age malnutrition is socially patterned. Evidence from North Bihar links stunting and thinness among rural children aged 6-12 years with socio-economic status and mother's literacy.¹² Studies from West Bengal, Pune and other Indian settings also show the relevance of parental education, family size, sanitation, socio-economic status and school type.^{13,14} Ranchi-specific evidence suggests poor dietary diversity and anthropometric disadvantage among school-age and tribal children.^{7,8} Evidence from government and private school comparisons also shows that school setting may reflect underlying household inequality and food environments.^{15,16}

International evidence from South Asia, Sub-Saharan Africa and similar developing settings points in the same direction. Studies from Pakistan, Sri Lanka, Nigeria, Ethiopia, Ghana and other settings report associations between nutritional status and parental education, household economy, siblings, birth order, sanitation, morbidity, dietary diversity and social background.¹⁷⁻²⁵ Together, these studies support a layered framework in which distal determinants such as poverty, education, family demography and social identity operate through proximate pathways such as diet, water, sanitation, illness and school support.

Table 1: Evidence basis for the proposed Ranchi framework.

Determinant domains	Evidence pattern	Relevance for Ranchi framework
Household socio-economic status	Studies from India and developing regions repeatedly link child nutrition with poverty, assets, occupation and household resources.	Measure income category, ration card, occupation, assets, housing, land and welfare access.
Parental education	Mother's and father's education are associated with feeding, hygiene, health-service use and awareness.	Record mother's and father's education separately and examine their association with nutritional outcomes.
Family demography	Family size, siblings, birth order and dependency burden can affect food and care allocation.	Include family size, siblings, earning members, household type and birth order.
Social-group background	Caste, tribe and ethnicity indicate structural vulnerability and unequal access to services.	Treat Scheduled Tribe (ST), Scheduled Caste (SC), Other Backward Classes (OBC) and other social-group categories as markers of

Continued.

Determinant domains	Evidence pattern	Relevance for Ranchi framework
		social context, not biological causes.
Dietary diversity and water, sanitation and hygiene (WASH)	Diet quality, sanitation, handwashing and morbidity act as proximate pathways.	Use dietary diversity recall, drinking-water, toilet, handwashing and recent illness variables.
School environment	Government schools connect vulnerable households with public provisioning.	Assess mid-day meal regularity, menu diversity, school WASH and health check-ups.

RATIONALE FOR A RANCHI-SPECIFIC FRAMEWORK

A Ranchi-specific framework is needed because district-level nutrition risk is shaped by local social and institutional conditions. Ranchi is the capital district of Jharkhand, but it includes rural, peri-urban and urban populations with different levels of income, public-service access and social vulnerability. Many government schoolchildren come from households that may face poverty, uncertain livelihoods, low parental education, large family size, limited diet diversity, inadequate sanitation and dependence on public schemes.

The focus on government schools is important. Government schools serve as educational institutions, but they are also public-health platforms. They provide access to children through daily attendance, mid-day meals, drinking water, toilets, handwashing facilities, health check-ups and school-based counselling. For children from poorer and tribal households, these services may reduce nutritional vulnerability when they function regularly and with adequate quality. At the same time, government schools are useful sites for identifying children who are stunted, thin, underweight, overweight, frequently ill or nutritionally vulnerable.

The proposed framework therefore treats school-age malnutrition as a public-health and social-development issue. It does not regard caste, tribe or social group as biological explanations. Instead, these categories are treated as markers of structural disadvantage, location, access to services and historical exclusion.

Similarly, anthropometric outcomes are not examined in isolation; they are read alongside household background, parental education, social group, diet, water, sanitation, illness and school environment. This approach is suitable for Ranchi because it can produce information that is meaningful for district planning, school health services and nutrition-sensitive public action.

PROPOSED SOCIO-ECONOMIC AND DEMOGRAPHIC FRAMEWORK

The proposed framework has three linked layers. The first layer consists of distal determinants: household socio-economic status, parental education, household demography and social-group background. Household

socio-economic status should be measured not only through income but also through occupation, housing condition, ration card type, assets, landholding and access to welfare schemes. Parental education, particularly mother's education, is important because it may influence diet awareness, hygiene practices, health-seeking behaviour and use of public services.^{14,17,18} Household demography includes family size, number of siblings, dependency burden, household type and birth order, all of which can affect food and care allocation.

The second layer consists of proximate pathways. These include dietary diversity, meal frequency, breakfast consumption, mid-day meal intake, packaged-snack consumption, drinking-water source, toilet availability, handwashing practice and recent illness. These are the immediate routes through which wider social and economic conditions may influence children's growth and nutritional status. For example, low household resources may reduce intake of pulses, milk, eggs, fruits and vegetables, while poor sanitation and repeated illness may reduce appetite and nutrient absorption.^{13,20-22}

The third layer consists of nutritional outcomes. Height-for-age can be used to assess stunting, while body mass index (BMI)-for-age can identify thinness, overweight and obesity according to age-appropriate standards.^{3,4} Weight-for-age may be used to assess underweight only among children aged 6-10 years because WHO weight-for-age reference data are not available beyond age 10. Mid-upper arm circumference may serve as a supplementary indicator where appropriate.

Dietary diversity score can help assess diet quality, although it should not be treated as a substitute for anthropometric measurement. A composite vulnerability category may also be developed by combining anthropometric risk, low dietary diversity, recent illness and social vulnerability.

The framework is designed for descriptive and comparative use. It can identify which groups of government schoolchildren appear more vulnerable and which household or school-level conditions are associated with nutritional disadvantage. It should not be used to make strong causal claims unless supported by stronger research designs. Its value lies in organising field information in a way that is simple, policy-relevant and suitable for district-level interpretation.

Table 2: Core components and variables in the proposed framework.

Components	Suggested variables	Purpose
Child profile	Age, sex, class, attendance, birth order and recent illness	Capture individual nutritional vulnerability.
Household demography	Family size, siblings, household type, earning members and dependency burden	Understand food sharing and care allocation.
Socio-economic status	Occupation, income category, ration card, housing, assets, landholding and welfare access	Assess household capacity to provide food, care and sanitation.
Social background	Scheduled Tribe, Scheduled Caste, OBC, General and minority/community identity	Locate nutrition within structural disadvantage and social vulnerability.
Dietary practices	Meal frequency, breakfast, food groups, mid-day meal intake and packaged snacks	Assess diet quality and energy balance.
WASH and morbidity	Drinking water, toilet, handwashing, recent illness and health-service use	Link infection exposure and illness with nutrition risk.
School support	Mid-day meal, water, toilets, handwashing, health check-ups and nutrition education	Examine the role of schools as public-health platforms.
Nutritional outcomes	Height-for-age, BMI-for-age, MUAC, dietary diversity and composite vulnerability	Measure the nutritional status of children.

CONCEPTUAL PATHWAYS IN THE FRAMEWORK

The framework identifies six pathways through which socio-economic and demographic conditions may be linked with school-age malnutrition. The first is the poverty-food access pathway. Poorer households may have fewer resources for diverse and nutrient-rich foods, leading to greater dependence on cereal-based diets and lower intake of pulses, milk, eggs, fruits and vegetables. This pathway is important for Ranchi because many government schoolchildren may come from households where food quality varies with income, employment, agricultural season and access to public distribution.

The second pathway is the education-awareness pathway. Parental education, especially mother's education, may influence nutrition through knowledge of balanced diets, hygiene, illness management, use of health services and awareness of school meals or other public programmes. The third is the household-demography pathway, where family size, number of siblings, birth order and dependency burden may influence how food, care and attention are distributed within the household. These factors are particularly relevant in resource-constrained families where small differences in food and care can produce visible differences in children's growth.

The fourth pathway is the social-exclusion pathway. In the Ranchi context, Scheduled Tribe, Scheduled Caste, OBC and minority-community categories should be recorded carefully because they may indicate unequal access to schooling, health care, infrastructure and welfare support. The fifth pathway is the sanitation-morbidity pathway, where unsafe drinking water, poor toilets, inadequate handwashing and recurrent illness may affect appetite, nutrient absorption and school attendance. The sixth is the school-support pathway, where mid-day

meals, drinking water, toilets, health check-ups and nutrition education may reduce vulnerability if they are regular, acceptable and well monitored.

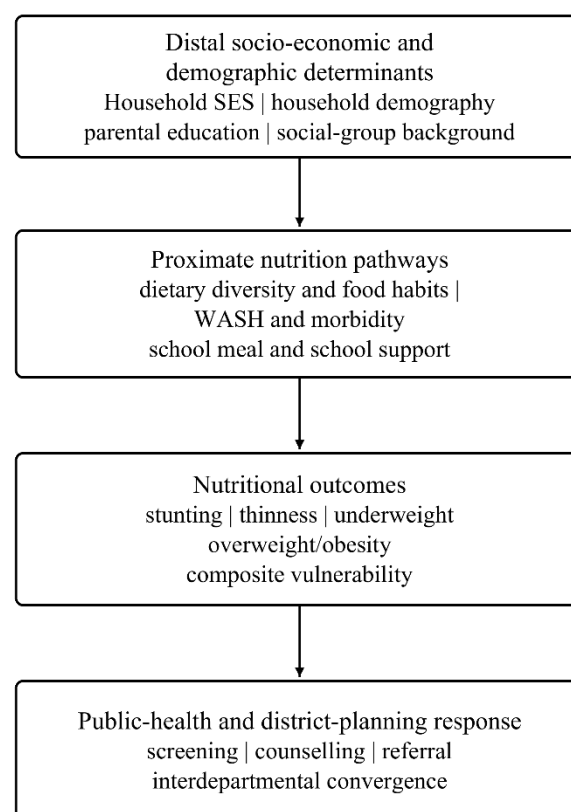


Figure 1: Proposed socio-economic and demographic framework for studying school-age malnutrition among government schoolchildren in Ranchi district, Jharkhand.

PROPOSED VARIABLES, MEASUREMENTS AND SAMPLING APPROACH

A future field study based on this framework may use a school-based cross-sectional design. The study population should include government schoolchildren aged 6-12 years from primary and upper-primary classes in Ranchi district. Children may be selected from rural, peri-urban and urban areas to reflect the district's spatial and social diversity. Children outside the age range, children without parental consent or child assent, severely ill children on the day of data collection and children whose physical condition does not permit accurate measurement should be excluded.

A multistage sampling design is appropriate. First, Ranchi district may be stratified into rural, peri-urban and urban settings. Second, government primary and upper-primary schools may be selected from each stratum using an official school list. Third, eligible children aged 6-12 years may be selected from school registers through systematic random sampling. Fourth, household information may be collected through parent or guardian schedules, take-home forms, school records or parent meetings. This is necessary because children may not reliably report caste, income, parental education, ration card type, family size or welfare access.

The proposed sample size may be around 600-650 children. If the true prevalence of malnutrition among government schoolchildren in Ranchi is unknown, a 50 per cent assumed prevalence can be used for conservative estimation. At 95 per cent confidence level and 5 per cent margin of error, the minimum sample size is around 384. Applying a design effect of 1.5 gives 576 children; adding 10 per cent for non-response or incomplete data gives approximately 634. A target sample close to 640 children would therefore be practical for rural, peri-urban and urban comparisons.

Field tools may include four instruments: a child schedule, a parent or guardian schedule, an anthropometry sheet and a school schedule. The child schedule may collect age, sex, class, attendance, breakfast habit, mid-day meal consumption, food preferences,

hygiene practice and recent illness. The parent schedule may collect parental education and occupation, family size, siblings, household type, social group, ration card, housing, assets, drinking water, toilet facility and welfare access. The school schedule may collect mid-day meal regularity, menu diversity, drinking water, toilets, handwashing facilities, school health check-ups and nutrition-related activities.

PROPOSED ANALYSIS PLAN

The analysis should be descriptive and comparative. Data should first be checked for missing values, inconsistent responses and biologically implausible measurements. Frequencies and percentages may describe categorical variables, while means and standard deviations may describe continuous variables such as age, height, weight and body mass index. Prevalence of stunting, thinness, overweight, obesity, low dietary diversity and composite vulnerability may then be estimated for the full sample. Weight-for-age-based underweight may be estimated only for children aged 6-10 years.

Cross-tabulation can be used to compare nutritional outcomes by sex, age group, rural-urban location, caste or tribe, parental education, family size, economic status, dietary diversity, toilet availability, recent illness and mid-day meal consumption. Chi-square tests may be used to explore whether meaningful differences exist between groups, while Cramer's V may be used to indicate how strong those relationships are. Clear visuals such as bar charts, stacked charts and simple determinant matrices may help communicate these findings to district officials and school authorities.

The analysis should use non-causal wording throughout. Terms such as "associated with," "higher among," "lower among," and "varies by" are more appropriate than causal language. A cross-sectional, school-based design cannot establish causality, but it may still identify patterns that are useful for targeting, counselling, school-health follow-up and future research. This approach also keeps the framework suitable for local public-health planning without the need for complex statistical models.

Table 3: Proposed field methodology and analysis plan.

Elements	Suggested approach
Study design	School-based cross-sectional study among government schoolchildren aged 6-12 years.
Study setting	Government primary and upper-primary schools in rural, peri-urban and urban areas of Ranchi district.
Sampling	Multistage sampling: stratification by location, selection of schools, and selection of eligible children from registers.
Sample size	Approximately 600-650 children, subject to feasibility, school lists and non-response.
Data tools	Child schedule, parent/guardian schedule, anthropometry sheet and school schedule.
Measurements	Height, weight, BMI, BMI-for-age, height-for-age, MUAC and 24-hour dietary diversity recall.
Analysis	Frequencies, percentages, means, cross-tabulations, chi-square tests, charts and determinant matrices.
Ethics	Institutional approval, school permission, parental consent, child assent, privacy and referral where needed.

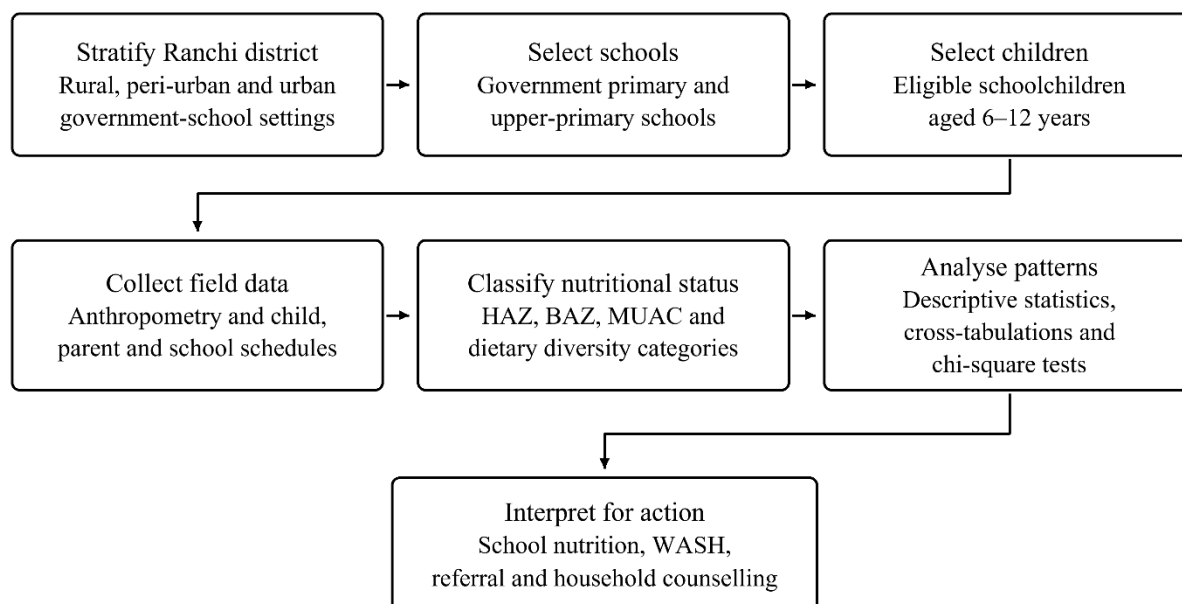


Figure 2: Proposed sampling, measurement and analysis flow for a future Ranchi district field study.

Note: The Proposed design is descriptive and comparative; it should not be interpreted as causal.

ETHICAL CONSIDERATIONS FOR A FUTURE FIELD STUDY

Although the present paper draws only on published literature, any future field study using the proposed framework will require strong ethical safeguards. Institutional ethics approval may be obtained before beginning fieldwork, along with permission from district education authorities and school heads. Written consent from parents or guardians, as well as assent from the child, may be secured before any anthropometric measurements or interviews. Children may be informed in simple, age-appropriate language that participation is voluntary and that choosing not to take part will not affect their schooling, mid-day meal entitlement or access to any service.

Anthropometric assessment should be non-invasive, respectful and carried out by trained investigators. Privacy should be maintained during height, weight, and MUAC measurements, and, ideally, female investigators should be available for girls. Sensitive information on caste, tribe, income, ration card status, ayushman card status, household conditions and illness should be collected carefully and stored without personal identifiers. Children who are found to be severely undernourished, unwell or in need of immediate medical attention may be referred through the school and the local health system for appropriate follow-up.

PUBLIC-HEALTH AND POLICY IMPLICATIONS

The proposed framework has direct public-health relevance. First, it can help bring school-age children into

nutrition monitoring, a group that is often less visible than under-five children. Second, it can help government schools serve as platforms for screening, referral, health education and follow-up. Third, it can help district authorities identify how poverty, parental education, social group, diet, sanitation and morbidity cluster among vulnerable children.

For school-level action, the framework suggests the need to improve mid-day meal regularity, menu diversity, drinking water, toilets, handwashing facilities and periodic health check-ups. For household-level action, it suggests nutrition counselling, which must be sensitive to poverty, low parental education, large family size and social disadvantage. For district-level planning, it supports convergence among school education, health, women and child development, food and civil supplies, tribal welfare and rural development departments.

The framework also recognises the double burden of malnutrition. Even if undernutrition remains the dominant concern in government schools, overweight and obesity should also be measured through body mass index-for-age. This is important because changing food environments, packaged snacks and reduced physical activity may gradually affect school-age children in urban and peri-urban settings. A balanced approach can therefore support both deficiency prevention and healthy growth.

Limitations

The proposed framework has a few limitations. It is based on published primary-data studies and does not present

new field evidence from Ranchi district. The studies used to develop the framework also differ in age groups, indicators, sample sizes, settings and methods. Therefore, the framework should be read as a guide for future field enquiry rather than as direct evidence of the actual nutritional status of government schoolchildren in Ranchi.

The proposed cross-sectional design can identify patterns and associations but cannot establish causality. Some household variables, such as income, assets, caste, tribe, recent illness and dietary recall, may also be affected by reporting errors. Since the sample is school-based, it will not include out-of-school children, who may be among the more nutritionally vulnerable. Future research can strengthen this framework through longitudinal evidence, mixed-methods enquiry or multilevel analysis.

CONCLUSION

School-age malnutrition in Ranchi district should be studied as a multidimensional public-health and social-development issue. The proposed framework links household socio-economic status, parental education, family demography and social-group background with dietary diversity, sanitation, morbidity and school-level support. It places anthropometric outcomes within the everyday conditions in which children live, eat, study and access public services. A future field study based on this framework can generate useful district-level evidence for government schoolchildren aged 6-12 years. By combining anthropometry with household, dietary, WASH and school variables, it can support targeted screening, nutrition counselling, improvement of school meals, better WASH facilities and interdepartmental planning. The framework is simple enough for descriptive public-health analysis, but broad enough to capture the social roots of school-age malnutrition in Jharkhand and similar vulnerable settings.

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