

A Partnership Catalyzing Change in Underserved Communities in India – Transforming Access to Essential Healthcare and Nutrients

November 2024

RESTRICTED

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1. Executive Summary

In many parts of India, access to sufficient food and severe nutritional gaps are major challenges. The average diet of an Indian provides only 70% or less of the essential nutrients required for optimal health, with the remaining 30% needed to be covered by supplementation. To address these nutritional challenges, reach52 and Bayer established a partnership in 2023 to launch a nutrition campaign across underserved communities in India in peri-urban areas as well as those in farming regions that produce most of the food consumed in the country. The campaign, targeting 70,000 residents across Karnataka and Uttar Pradesh (UP), aims to promote 100% nutrition, from food to supplementation, by distributing educational materials and conducting door-to-door engagements over 12 months.

The first phase of the partnership focused on establishing a baseline of needs in rural communities and running a health education campaign on 100% nutrition, from food to supplementation, in 70 communities in Karnataka and Uttar Pradesh.

The following highlights the key results:

- **Baseline Research:** A qualitative study with smallholder farmers (SHFs) in Karnataka and Uttar Pradesh revealed significant gaps in nutrition knowledge and health-seeking behaviours. While SHFs understand the importance of nutrients, their knowledge is rooted in traditional practices rather than scientific understanding. Economic constraints and limited access to nutrient-rich foods hinder their ability to maintain balanced diets, and SHFs often delay medical care due to financial challenges.
- **Training of Community Health Workers (CHWs):** As of 15 November 2024, 28 CHWs and 15 health educators had been trained and deployed. Post-training assessments indicated that 81% of CHWs and health educators showed improved knowledge of diet and nutrition.
- **Resident Engagements:** Over 80,000 residents were engaged in Karnataka and Uttar Pradesh, revealing key findings around dietary diversity, supplement usage, and their potential links to health outcomes.

The findings in both states reveal a significant gap between perceived and actual dietary adequacy, contributing to widespread health issues, including fatigue, physical ailments, and mental health concerns. Despite the majority of residents in both states believing their diet is sufficient—93% in Karnataka and 75% in Uttar Pradesh—dietary assessments indicate low diet diversity and minimal use of supplementation.

In Karnataka, 87% of residents lack dietary diversity, with 83% not using supplements. This inadequacy correlates with frequent reports of fatigue, productivity loss, and physical and mental health issues, yet only a small fraction (7%) acknowledge poor nutrition as a potential cause. Similarly, in Uttar Pradesh, a lack of dietary diversity (79%) and supplement use (66%) is linked to increased fatigue and health problems, especially among the malnourished. However, just 23% attribute these health concerns to inadequate diet or nutrition.

The consequences of poor nutrition vary by region and occupation. In Karnataka, residents in rural Chikkaballapur are more likely to experience fatigue, productivity loss, physical, and mental health issues compared to residents in urban Bangalore. Moreover, farmers in Chikkaballapur face higher rates of fatigue, physical, and mental health problems compared to non-farmers, impacting their productivity and the agricultural output on which many communities depend. In both Karnataka and Uttar Pradesh, mental health issues are intertwined with physical health, particularly among individuals with chronic conditions. This is evident in rural areas, where the physical demands and isolation exacerbate emotional distress, as well as in urban settings, where work pressures and screen time are noted stressors.

Socioeconomic factors exacerbate the health disparities observed, limiting access to diverse foods, supplements, and healthcare. Economic constraints in rural Karnataka and Uttar Pradesh contribute to malnutrition and the underuse of preventive health measures, including usage of supplementation as an effective tool to ensure 100% nutrition. Urban residents show a relatively greater usage of supplementation, indicating a potential greater availability and affordability of supplementation in their communities. These findings underscore the need for comprehensive interventions addressing both education on nutritional adequacy and structural improvements to enhance access to resources and healthcare. Addressing these gaps is critical to improve nutritional status, reducing health disparities, and improving quality of life in these communities.

- **Behavioural Impact:** Data from post-engagement interviews indicated modest improvements in dietary diversity and supplement use among residents in Karnataka.

Minimal improvements in dietary diversity (6% in Chikkaballapur and 1% in Bangalore) highlight persistent challenges related to economic limitations and entrenched dietary beliefs and habits.

Supplement adoption was notably higher in Bangalore (23%) than Chikkaballapur (6%), possibly due to variations in accessibility, awareness, and trust in supplementation. Those who adopted supplements reported multiple health benefits, including improved energy, immunity, and digestion. For non-users, the belief in the sufficiency of current diets was the primary reason for avoidance, with Bangalore residents also citing skepticism about supplement efficacy and reliance on medical advice. These findings suggest that tailored strategies are needed—improving supplement affordability in Chikkaballapur and building confidence in supplementation benefits in Bangalore—to effectively address region-specific needs and barriers and unlock health benefits for all residents.

The campaign has established a foundational understanding of the key gaps that need addressing to help India cover 100% of its nutritional needs, from food to supplementation: entrenched beliefs, economic barriers, and awareness of the importance of dietary diversity and supplementation and access to nutrient-rich foods and supplements.

The campaign shows some promising results, including effective training of community health workers (CHW), initial shifts in raising awareness and improving knowledge of

nutrition and supplementation, and impactful changes in behaviors, where new supplementation users show improved energy and immunity.

To build on current successes and address persisting challenges, the report recommends expanding nutrition education, increasing access to affordable supplements, enhancing CHW training, integrating nutrition into broader health policies, and developing incentive-based programs. Strengthening partnerships with local governments, NGOs, and the private sector is also crucial to scale successful interventions and achieve sustained improvements in health behaviors across India's underserved communities.

2. Organisational Background

Established in 2017, reach52 delivers health services in underserved markets across low- and middle-income countries. Our "offline-first" health tech platform, 'reach52 access,' enables a full range of health services in low-connectivity regions. Community members and Community Health Workers are equipped with our tech platform to run services such as prevention, health education, screening, and referrals. We partner with governments, businesses, and non-profits to translate their business, social, and access strategies into impact through our platform, strengthening health systems and driving better health outcomes for populations that previously lacked access to the healthcare they need.

3. Project Description

With a population exceeding 1.39 billion, India faces a significant challenge in addressing the widespread issue of micronutrient deficiencies, a common form of malnutrition globally. A recent study published in *The Lancet Global Health* highlighted that over half of the world's population consumes inadequate levels of essential micronutrients like calcium, iron, and vitamins C and E, affecting long-term health outcomes.¹ India is not immune to this crisis, with millions of children and women suffering from "hidden hunger," a situation exacerbated by the COVID-19 pandemic, leading to increased food insecurity due to widespread unemployment and economic disruption.

A 2021 study revealed a significant gap in meeting the body's complete nutritional requirements, indicating that the average daily Indian diet provides only 70% or less of the essential nutrients required for optimal health.² The new global data also emphasize the urgency of this issue, particularly highlighting calcium, iodine, and iron deficiencies that severely affect population health.¹

To address the challenges associated with the Nutrient Gap in India, Bayer and reach52 established a strategic partnership in 2023 and launched a health campaign aimed at enhancing awareness of the importance of 100% nutrition, from food to supplementation, among underserved communities in both peri-urban and rural communities in India.

¹ Passarelli, Simone et al. (2024). Global estimation of dietary micronutrient inadequacies: a modelling analysis. *The Lancet Global Health*. [https://doi.org/10.1016/S2214-109X\(24\)00338-3](https://doi.org/10.1016/S2214-109X(24)00338-3)

² Mahesh M, Jayakrishnan B, Sudagani J, Mylapore SS, Bharti BB, Kumar Dhandhanian V, Pahel Meitei S, Kulkarni S, Chatterjee A, Mukherjee A, Laxmaiah A, Singh AK, Bhutani V, Goel P, Gupta S, Saxena P, Oswal V, Dargad R, Rai M, Erande SG, Shah P, Bangale N. Demystifying the micronutrient deficiency burden in India. *IP J Nutr Metab Health Sci* 2022;5(3):91-99.

The campaign aims to 1) establish a baseline understanding of diet, nutrition, and supplementation knowledge and habits in rural underserved communities through qualitative research, and 2) reach 70,000 residents (45,000 in Bangalore, 25,000 in Uttar Pradesh) with posters and flyers for nutrition education and door-to-door targeted engagements across 70 communities (45 in Bangalore, 25 in Uttar Pradesh) across peri-urban and rural areas in 12 months. The campaign employs a mix of door-to-door awareness initiatives covering 100% nutrition, from food to supplementation, and mass distribution of content through brochures, posters, SMS, and other marketing methods.

4. Results

4.1 Baseline research

A qualitative study was conducted through 15 focus group discussions (FGDs) with 90 smallholder farmers (SHFs) to explore their diet, nutrition, and supplementation behaviors. The research aimed to (1) assess SHFs' awareness and knowledge of nutrition and supplementation; (2) understand their current dietary and supplementation practices; (3) examine their general health-seeking behaviors and identify access barriers; and (4) evaluate their awareness and knowledge of climate change and its impact on health and livelihood. Appendix 7.3 provides comprehensive study details, including the sample size, respondent criteria, area coverage, and limitations.

Summary

The research results highlight significant gaps in nutrition knowledge and health-seeking behaviors among SHFs in Karnataka and UP. While SHFs understand the importance of nutrients for their health and lifestyle, their knowledge is often based on traditional practices rather than scientific understanding. They believe all nutrients the body needs can be obtained from their food, so they consider supplementation unnecessary.

Nutritional value is not a primary consideration in food preparation, and there is a heavy reliance on traditional foods without sufficient consideration of modern nutritional requirements. Economic constraints and limited access to nutrient-rich foods further hinder SHFs from achieving a balanced diet. Traditional diets of SHFs in Karnataka and Uttar Pradesh lack sufficient protein, essential fats, vitamins (C and B12), and minerals (calcium, iron, and zinc). Additionally, SHFs delay seeking medical treatment due to financial constraints, preferring to rely on traditional remedies until symptoms become severe.

Key highlights

Knowledge and Beliefs about Nutrition and Supplementation

SHFs in Karnataka and UP primarily rely on traditional practices and generational wisdom to guide dietary choices. Nutrition is perceived mainly through a functional lens, where food is valued for its ability to provide energy and sustain heavy physical labor rather than its nutritional content. Consequently, there is limited awareness of what constitutes a "nutritious" diet. SHFs lack knowledge about specific nutrients, such as vitamins and minerals, and are unfamiliar with proper plate portioning. Micronutrients are often collectively referred to as "vitamins," indicating a lack of detailed understanding.

The ideal plate of food in both areas is largely similar, except for the inclusion of meat in Karnataka and fruits in UP (Figure 1).

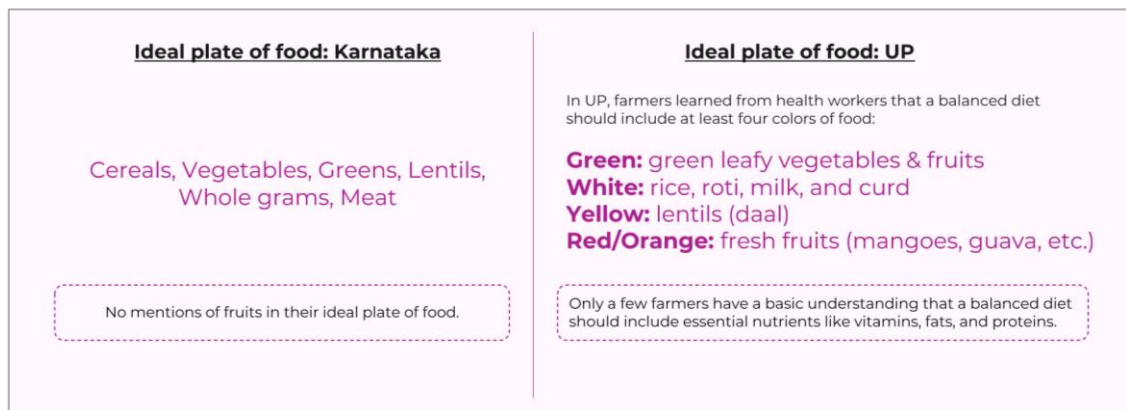


Figure 1. Ideal plate of food of SHFs in Karnataka vs UP

Farmers commonly believe that all nutrients needed by the body can be obtained from the food they consume; thus, they see little need for supplementation (Figure 2).

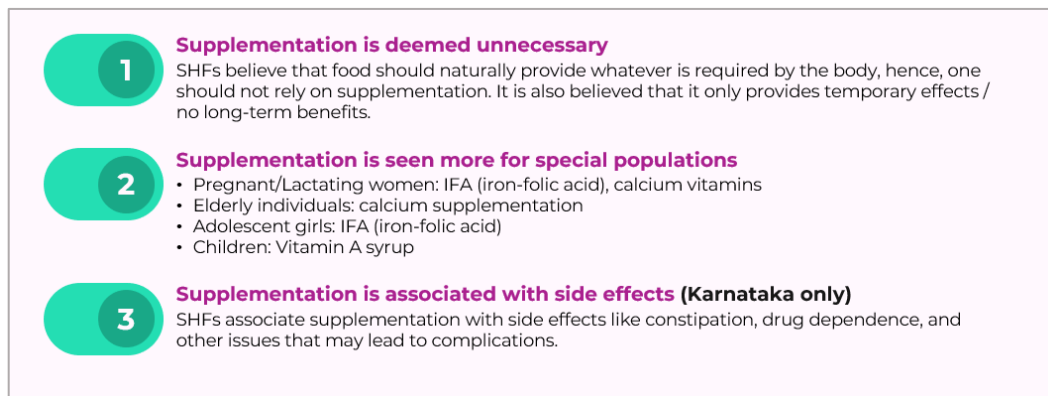


Figure 2. Beliefs on supplementation

Information on diet and nutrition is predominantly derived from traditional knowledge, with additional inputs from sources like Anganwadi centers, healthcare facilities, and NGOs (Figure 3).

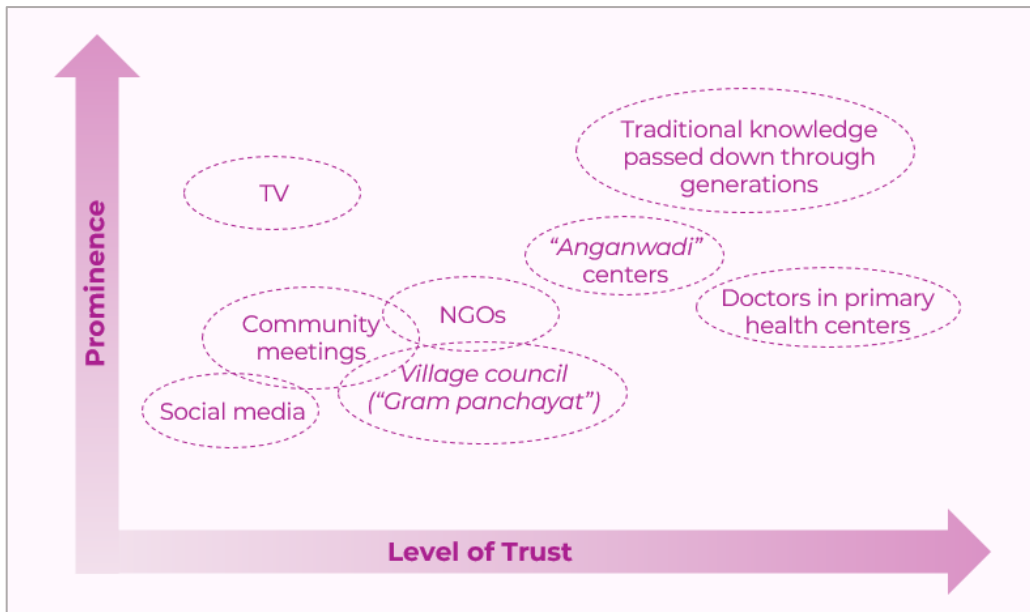


Figure 3. Sources of information about diet and nutrition

While television and social media are recognized as information sources, the prevailing sentiment is that their reliability should be verified through social interactions, peer experiences, and personal experimentation.

In Karnataka, government programs provide nutritional support to pregnant women, lactating mothers, and children, though some SHFs express concerns about the quality and convenience of these services (Figure 4). Similar programs exist in UP, but they are limited in reach and accessibility (Figure 5).

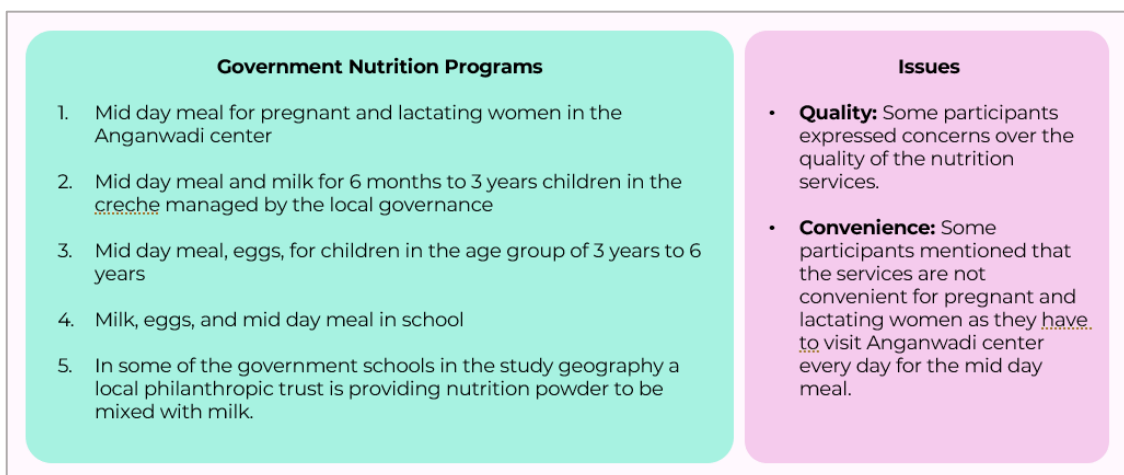


Figure 4. Government nutrition programs in Karnataka

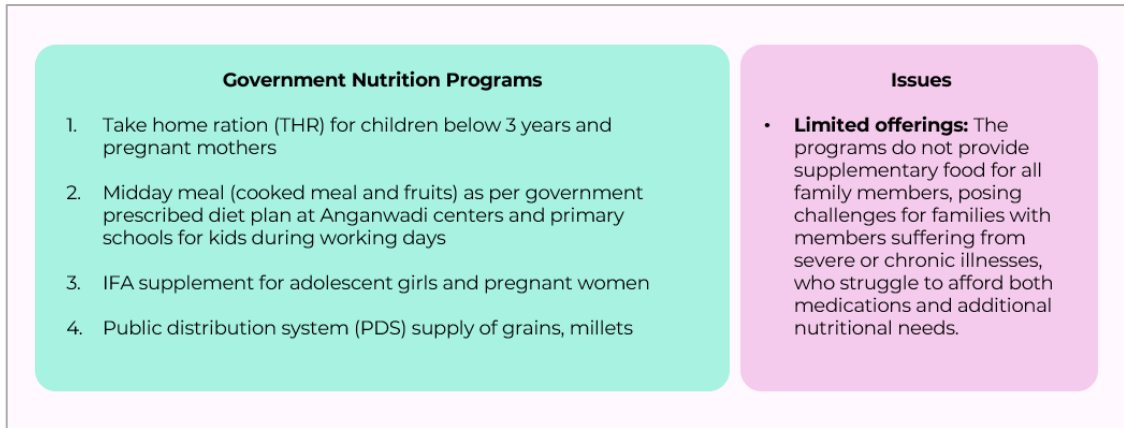


Figure 5. Government nutrition programs in UP

Current Diet and Supplementation Practices

Dietary choices among SHFs are guided by traditional knowledge, local availability, and economic factors (Figure 6).

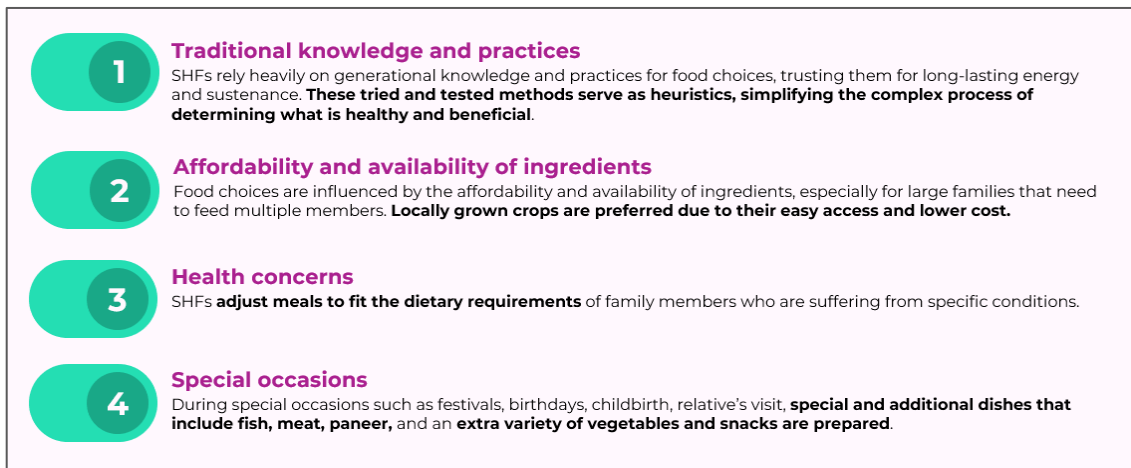


Figure 6. Key considerations in dietary choices

Traditional food preparation methods, such as slow cooking with firewood and using mud pots, are preferred for their perceived health benefits and ability to enhance flavor. SHFs advocate for mindful eating practices, emphasizing the importance of meal timing and moderate consumption to promote digestive health and overall well-being.

In Karnataka, finger millet (ragi) is a staple, providing energy and strength. Typical meals include ragi mudde, curry, buttermilk, or yogurt (Table 1). Although SHFs recognize the impracticality of adhering to an ideal diet daily, they ensure meal diversity over the week, incorporating fruits, meat, and greens on different days. Despite their efforts, their diets often lack sufficient protein, vitamins (B, C, and D), minerals (calcium and iron), and healthy fats. Children's preferences for unhealthy foods are also a growing concern.

Breakfast	Lunch	Dinner	Snacking
<ul style="list-style-type: none"> • Prebreakfast: tea/coffee • Ragi mudde and curry for adults/elderly • Idli/dosa/uppittu/lemon • Rice/puliyogare/bisibelebath/vangibhath (different kinds of preparation of rice) for children 	<ul style="list-style-type: none"> • Ragi mudde, curry, rice, and curd or buttermilk 		Regularly consumed by children and occasionally consumed by adults/elderly: <ul style="list-style-type: none"> • Instant noodles (Maggi) • Bread • Rusk • Bakery items

Table 1. Typical meals of SHFs in Karnataka

In UP, meals are centered around "filling" foods that provide sustained energy. Protein sources such as paneer, fish, meat, eggs, and dried fruits are consumed infrequently due to their high cost (Table 2). As in Karnataka, the diets in UP lack sufficient protein, essential fats, vitamins (C and B12), and minerals (calcium, iron, and zinc).

Breakfast	Lunch	Dinner	Evening Snack
<p>Pre-breakfast: tea/coffee for elders in the family, fresh milk for kids</p> <p>Gur (jaggery) and chana (sprouted or roasted black gram) are common early morning snacks. They are considered highly nutritious, energy-boosting, and beneficial for health.</p> <p>Breakfast:</p> <ul style="list-style-type: none"> • Milk with roti/ chapati, occasionally bread or Maggi instant noodles • Roti and cooked vegetables 	<p>Homemade or freshly cooked meals that typically include:</p> <ul style="list-style-type: none"> • Dal (lentils) • Roti (wheat chapati) • Chawal (rice) • Variety of green and leafy vegetables, depending on availability <p>In the afternoon, people usually eat some light homemade snack and jaggery water.</p>	<p>Usually between 8-9PM.</p> <p>Homemade or freshly cooked meals that typically include:</p> <ul style="list-style-type: none"> • Dal (lentils) • Dhawal (rice) and green vegetables (sabzi); or • Roti (wheat chapati) and green vegetables for salad (cucumber/green chili/onion) • Milk as per availability 	<ul style="list-style-type: none"> • Roasted cereals, gram, locally made mixture, Sattu • Jaggery water • Shikanji (a popular drink in the summer season; prepared using lemon, water, sugar, cumin powder, salt) • Sherbet • Occasionally, seasonal fruits like mangoes, watermelon, or muskmelon, and salads with cucumber, carrots

Table 2. Typical meals of SHFs in UP

For supplementation, SHFs prefer homemade nutrition powders over commercial products. Common supplements include powders from ragi, bajra, and sajjje, which are used to make porridge or other dishes. Other local supplements include Amrut noni, an Ayurvedic remedy, and iron and folic acid supplements provided to pregnant women through primary health centers.

General Health-Seeking Behaviors

SHFs generally address health issues only when they start to interfere with daily activities. They tend to avoid seeing a doctor, instead relying on home remedies or over-the-counter (OTC) medicines if symptoms are manageable.

Common home remedies include cumin water for gastritis, coconut water for dehydration, and porridge for fever in Karnataka, and ajwain for indigestion, lemon and jaggery water for heatstroke, and Tulsi kadha for colds in UP. OTC medications are used sparingly, with government primary health centers serving as the next recourse if home remedies fail. Private hospitals are sought in severe cases, though their services are often unaffordable.

Barriers to seeking medical care include the cost of consultations, tests, and medications, as well as the inaccessibility of health facilities, particularly for the elderly and women who face challenges with transportation.

Views and Attitudes Toward Climate Change

SHFs believe climate change negatively impacts nutrition through its effects on agricultural production and water quality. Changing weather patterns disrupt seasonal cropping, leading to uncertainty in crop yield and quality. These shifts also affect water resources, compromising irrigation and drinking water and affecting nutrition and health.

SHFs have adopted coping strategies such as shifting work hours and boiling water for drinking, but they recognize that these measures do not address the root causes of climate change.

The findings from the research were incorporated into training and awareness materials used in engagement (Figures 7 and 8).



Figure 7. Training materials showing the importance of balanced diet, eating diverse food groups and supplementation



Figure 8. Poster emphasizing the importance of supplementation

4.2 Agent training

As of 15 November 2024, **28 CHWs** and **15 health educators (HEs)** in Karnataka and Uttar Pradesh have been trained and deployed in the field across peri-urban and rural communities.

The trainings covered the following topics:

- Malnutrition (key information/facts and impact)
- Nutrition 101
 - Balanced diet
 - Food groups
 - Key facts
 - Tips to reduce malnutrition and micronutrient deficiency
 - Life-course approach to nutrition
- Anthropometric measurements
 - Measuring MUAC (mid-upper arm circumference)
 - Interpreting MUAC
- Resident engagement
 - Target cohorts
 - Key steps when approaching residents
 - Navigating through reach52 access app

All CHWs and HEs trained are female, with an average age of 33 years and an average service duration of one year (Figure 9). Post-training, 81% of the CHWs and HEs showed improved knowledge of diet and nutrition (Figure 10).

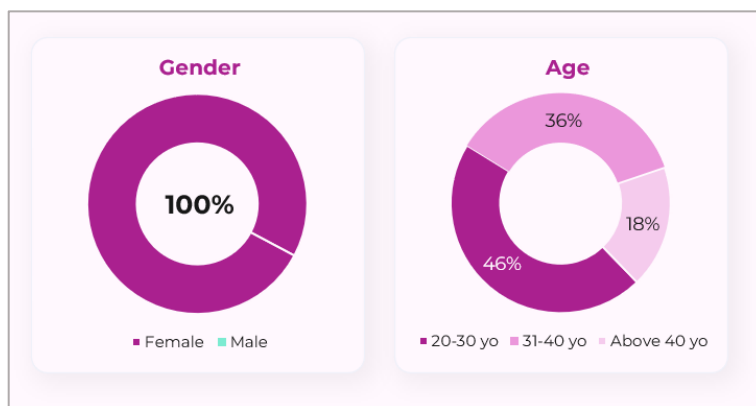


Figure 9. Gender and age distribution of trained CHWs and HEs.

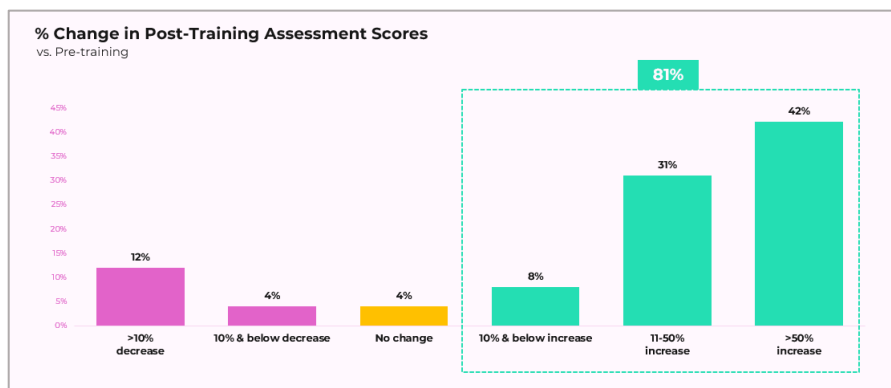


Figure 10. Assessment scores of trained CHWs and HEs.

4.3 Resident engagements

As of 15 November 2024, trained Community Health Workers (CHWs) have engaged **81,318 residents** in peri-urban and rural underserved communities across Karnataka and Uttar Pradesh. Through the reach52 Access app, the CHWs collected basic personal and health information (Figure 11) to create individual digital health profiles and conducted interviews using an in-app questionnaire to gain insights into residents’ diet, nutrition, and supplementation practices (Figure 12).



Figure 11. Resident sign-up and profiling flow in the reach52 Access app.

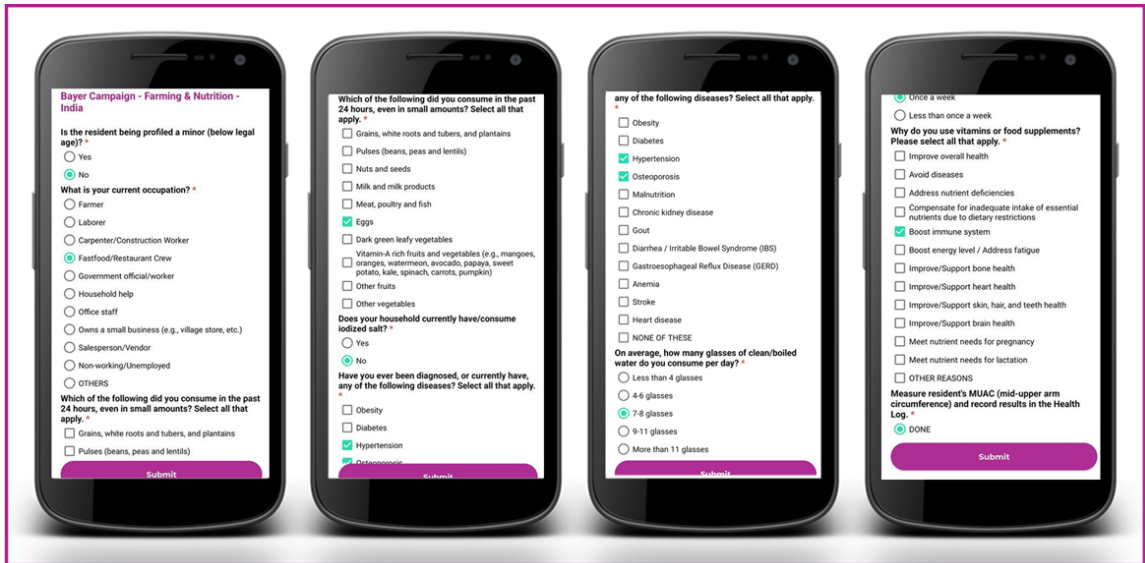


Figure 12. In-app questionnaire used to interview residents regarding their diet, nutrition, and supplementation practices.

Karnataka engagements

In Karnataka, 47,423 residents in peri-urban and rural underserved communities have been engaged in Chikkaballapur and Bangalore.

Bangalore has a younger demographic and higher earning potential than Chikkaballapur, with 92% of residents earning more than USD 76 per month, compared to 65% in Chikkaballapur. Additionally, a significantly higher proportion of engaged residents in Chikkaballapur come from farming households than in Bangalore (Figures 13 and 14).

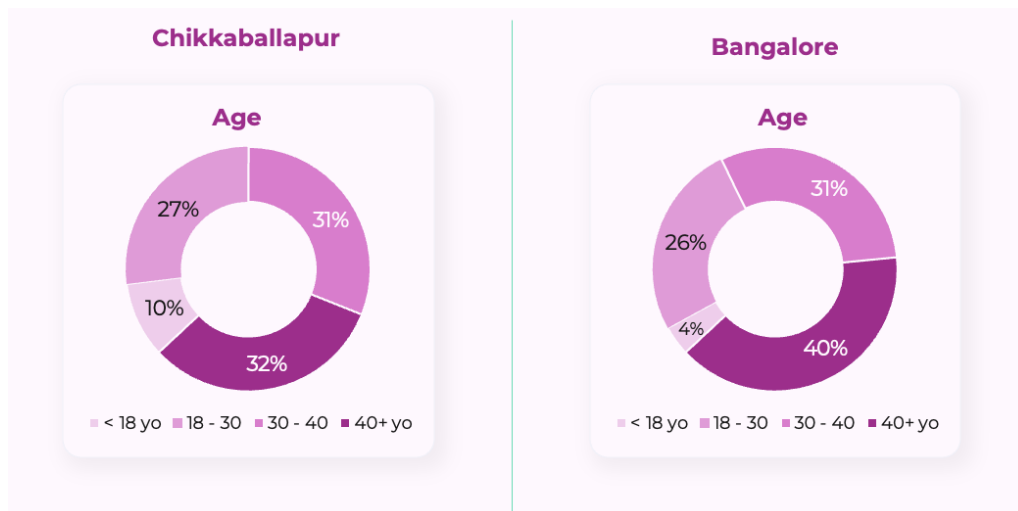


Figure 13. Age distribution of residents engaged in Chikkaballapur and Bangalore.

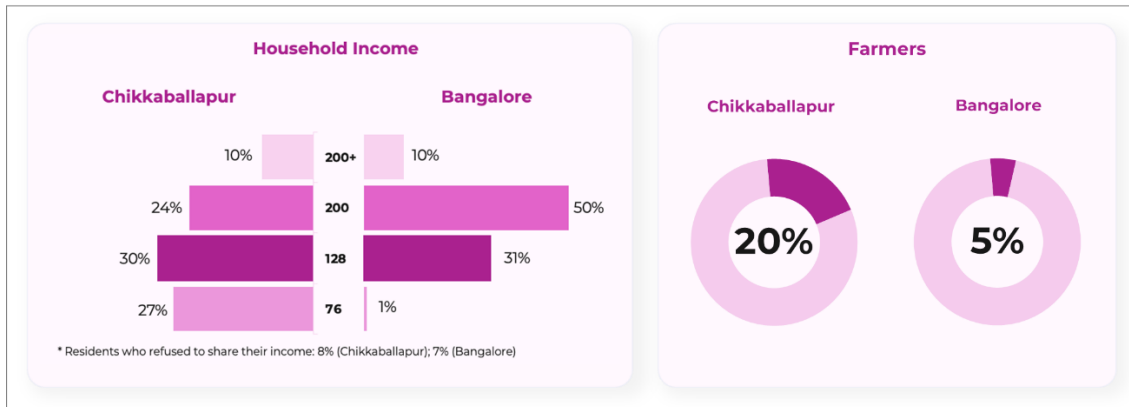


Figure 14. Household income distribution and incidence of farming among residents engaged in Chikkaballapur and Bangalore.

Diet and supplement usage reflect an urban-rural divide. Urban residents in Bangalore show greater reliance on supplements to offset low dietary diversity, whereas rural residents in Chikkaballapur maintain a slightly more diverse, traditional diet, though still limited. The availability of fresh, local foods may contribute to this diversity in rural areas. However, the convenience and accessibility of processed foods in urban Bangalore appear to lead to lower diet diversity, despite higher supplement usage aimed at addressing nutrient gaps (Figure 15).

The data also reveals distinct urban-rural divides in reasons for non-supplementation. Urban residents (Bangalore) show more skepticism about supplement efficacy but are less constrained by budget issues. In contrast, rural residents (Chikkaballapur) rely more on their traditional diets and face greater financial barriers to purchasing supplements (Table 3).

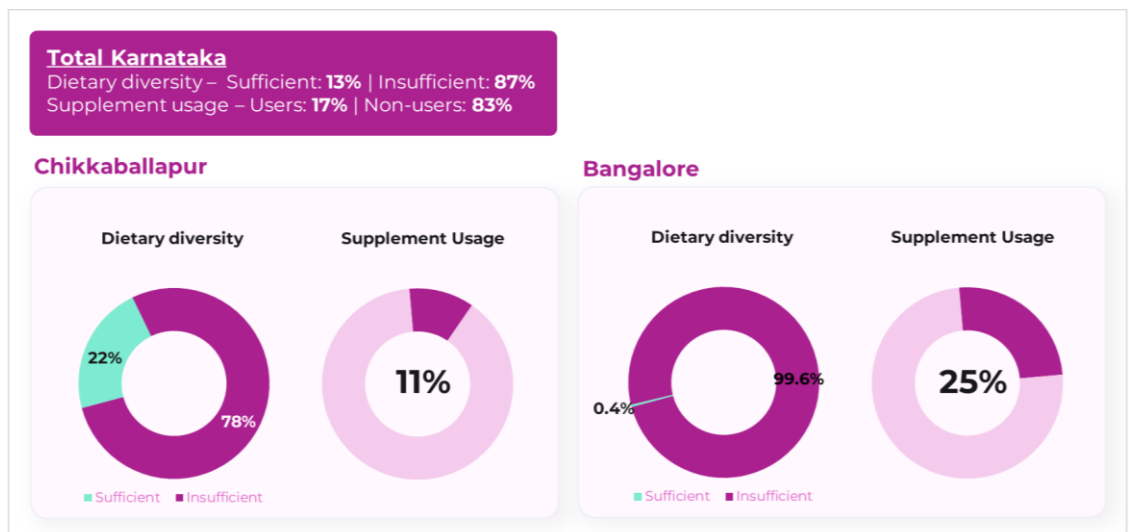


Figure 15. Dietary diversity and supplement usage among residents engaged in Chikkaballapur and Bangalore, Karnataka.

Reasons for non-supplementation	TOTAL KARNATAKA	Chikkaballapur	Bangalore
I already have a balanced diet	49%	58%	35%
I don't believe they are effective	27%	14%	48%
Advised by doctor due to my health condition	19%	13%	28%
No budget/money	16%	20%	9%
Don't know which vitamins/food supplements are right for me	7%	6%	9%
Safety concerns (e.g. worried of side effects contamination or interaction with medications)	4%	4%	4%
Don't know where to buy them	4%	5%	3%

Table 3. Reasons for non-supplementation in Karnataka.

Uttar Pradesh (UP) engagements

For the campaign leg in Uttar Pradesh, a pilot was launched to test different approaches to engaging residents. The social field force was utilized by involving reach52 community educators through Health Education Meetings (HEMs). Unlike in Karnataka, group events served as the primary mode of engagement, with less emphasis on door-to-door interactions. In this pilot, two key aspects were tested: 1) residents' willingness to share information for engagement data collection during HEMs, and 2) the effectiveness of targeted health education meetings by prioritizing female attendees.

In 12 days of operations, 601 Health Education Meetings (HEMs) were completed, with a total attendees of 33,895, and 9,206 residents interviewed at random. More than half (56%) of residents were males and farmers made up around a third (30%) of residents profiled, declaring rice and wheat as their main crops.

In terms of diet, diversity is insufficient for the majority (79%) of the residents, and only around a third (34%) currently use supplementation, reflecting similar patterns observed in Karnataka (Figure 16).

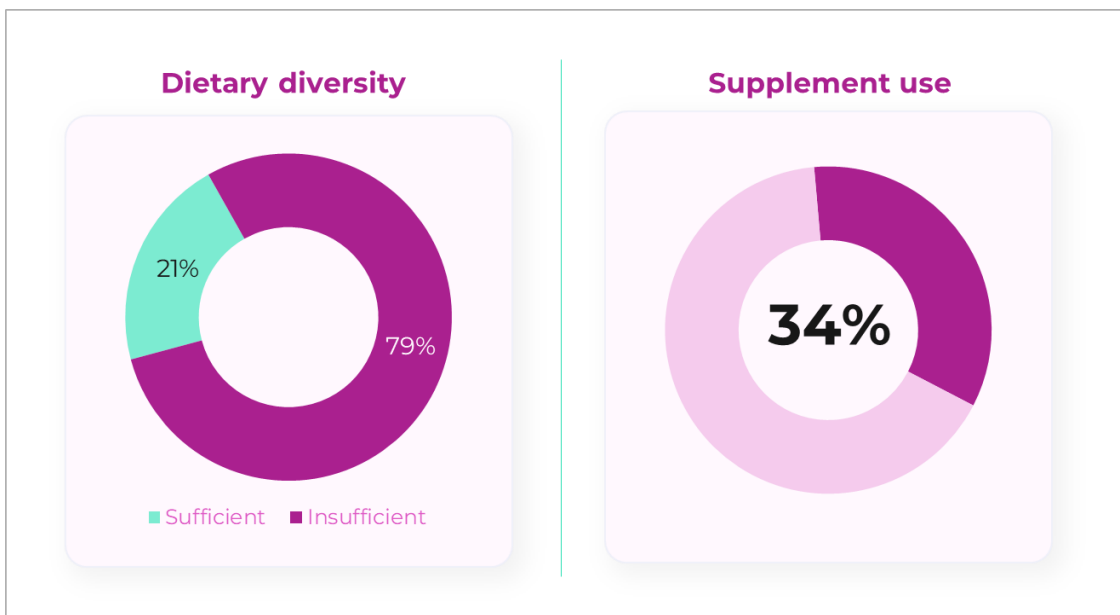


Figure 16. Dietary diversity and supplementation usage in Uttar Pradesh.

4.4 Insights on fatigue, productivity loss, physical, and mental health issues and their possible connections with supplement use, dietary diversity, and other factors

Post-engagement interviews in Karnataka and post-HEM interviews in Uttar Pradesh were conducted among residents to explore fatigue, productivity loss, physical and mental health issues, and their possible connections with supplement use, dietary diversity, and other factors. A total of 959 residents in Karnataka (details in Appendix 7.4) and 9,206 residents in Uttar Pradesh were interviewed.

These observations suggest factors that may be closely associated with fatigue, productivity loss, and physical and mental health issues in these populations. However, it is important to recognize potential caveats to these findings. Given the overlapping nature of the analyzed segments, some individuals belong to multiple groups (e.g., supplement users with insufficient dietary diversity, malnourished individuals with pre-existing conditions, etc.), which can complicate interpretations. Additionally, high incidences in certain segments do not establish causation; rather, they suggest associations that may be influenced by other unmeasured factors, such as workload, socioeconomic conditions, etc. Further study and analysis would be needed to confirm the extent of their influence, ideally by controlling for other variables. This cautious interpretation highlights the value of these factors in understanding fatigue, productivity loss, and physical and mental health issues but also emphasizes the complexity of drawing definitive causal conclusions from correlational data.

Summary

In both Karnataka and Uttar Pradesh, there is a significant gap between perceived and actual dietary adequacy, as well as limited awareness of the role of diet and supplementation in overall health. Most residents lack 100% nutrition, yet they fail to recognize its effect on their daily lives.

Perceived vs. Actual Dietary Adequacy

The greatest majority of residents across Karnataka and Uttar Pradesh believe that their diet provides all the necessary nutrients (93% in Karnataka and 75% in Uttar Pradesh), despite assessments showing that most of them have insufficient dietary diversity (87% in Karnataka, 79% in Uttar Pradesh) and do not use supplements (83% in Karnataka, 66% in Uttar Pradesh). In Uttar Pradesh, this misbelief is even more pronounced among those who lack dietary diversity (77%) or are malnourished (93%), signifying a clear gap in diet and nutrition knowledge.

Implications on Daily Life

Karnataka residents experienced fatigue and productivity loss (six to seven workdays lost due to poor health, i.e., sickness, not feeling well) (40%), physical (35%), and mental (26%) health issues in the past month. Those who lacked dietary diversity and did not use supplements were on average nearly twice as likely to experience any of these issues compared to those who use supplements and maintain sufficient dietary diversity. Yet very few residents (7%) identified poor diet or nutrition as a possible cause, confirming the gap in awareness.

In Uttar Pradesh, residents also reported experiencing fatigue (23%), productivity loss (23%), physical (45%), and mental (21%) health issues in the past month. While dietary diversity did

not show much difference in prevalence, residents who did not use supplements were more likely to experience physical and mental health issues compared to those who use supplements, showing the importance of ensuring 100% nutrition beyond diet. Moreover, malnutrition also correlates strongly with fatigue and physical health issues: malnourished residents, as indicated by MUAC (Mid-Upper Arm Circumference) measurements reported significantly higher fatigue and productivity loss (35%) than those with normal MUAC measurements, of whom only 22% experienced similar symptoms. This suggests that poor nutritional status may be a significant contributor to fatigue and reduced productivity in this population. However, only 23% of residents in UP identified poor diet or nutrition as a perceived cause of fatigue and productivity loss after lack of exercise and sleep.

Nuances across Occupational Roles (Farmers vs. Non-farmers)

Farmers in Chikkaballapur were more likely to experience fatigue and productivity loss (79%), physical (61%), and mental (56%) health issues than non-farmers (45%, 42%, and 30% respectively). They also showed a lack of diet diversity and little use of supplementation, while not identifying diet and nutrition as a potential cause of their experiences. This has broader implications for nutrition as it impacts the farmers' ability to produce the food that feeds the country.

Mental Health Interactions

Mental health challenges, including anxiety and sleep disturbances, appear linked to physical health and productivity issues in both states, particularly among those with chronic conditions. In Karnataka's Chikkaballapur region, rural residents report high rates of emotional and mental health issues, which they often attribute to physical demands, social isolation, and lack of mental health support. UP residents with chronic conditions similarly report higher mental health challenges, indicating that stress associated with managing chronic illnesses and low dietary diversity may contribute to both mental and physical fatigue. Urban Bangalore residents, meanwhile, identify screen time and work pressure as mental health stressors, suggesting different urban-rural stressors that may compound fatigue and reduce productivity.

Socioeconomic Context

Socioeconomic constraints underlie the disparities in dietary diversity, supplement use, and access to healthcare, contributing to the health challenges observed across both states. In Karnataka, rural residents, particularly farmers, report barriers to improving dietary diversity, possibly due to limited access to varied foods and financial limitations. Similarly, UP residents face socioeconomic challenges impacting their diet, with a lower reliance on supplements and higher rates of malnutrition. Economic factors likely influence the ability to seek healthcare and adopt preventive health measures. This indicates that addressing fatigue and health disparities may require structural improvements in access to resources, healthcare, and educational outreach regarding nutrition and health maintenance.

Results

Karnataka

Residents in both Chikkaballapur and Bangalore demonstrate a significant disconnect between their perceived and actual nutritional adequacy. Despite high levels of confidence in the balance and nutrient sufficiency of their diets, low dietary diversity prevails, particularly in Bangalore. This misconception reflects a widespread knowledge gap about the critical role of diet diversity and supplementation in achieving nutritional adequacy. The reliance on familiar or calorie-dense foods in Bangalore, and possibly less diverse home-

cooked meals in Chikkaballapur, underscores a shared cultural misunderstanding of what constitutes a nutritionally adequate diet. The lack of diet diversity and low usage of supplements correlates with reports of fatigue, productivity loss, and physical health issues, especially in Chikkaballapur, where the demands of rural lifestyles and limited dietary options appear to exacerbate the issue.

The findings also reveal broader implications for health outcomes. In Chikkaballapur, fatigue, productivity loss, and physical health issues are disproportionately reported among residents with low dietary diversity, pre-existing conditions, non-users of supplementation and high physical energy demands, such as farmers. In Bangalore, while the prevalence of these issues is lower, they are still notably higher among residents with low dietary diversity or those who do not use supplements. Emotional and mental health challenges further underscore this disparity, with rural residents experiencing higher rates of stress, poor sleep, and depressive symptoms, often linked to limited dietary variety and the lack of a robust support system. Across both regions, the limited attribution of health issues to poor diet and nutrition reflects a critical gap in health literacy, underscoring the need for targeted interventions to promote diet diversity, role of supplementation and their importance for physical and mental well-being.

Diet assessment

Residents' assessments of their diets in Chikkaballapur and Bangalore reveal a significant knowledge gap regarding the role of food diversity in achieving nutritional adequacy. Although they perceive their diets as adequate and balanced, their confidence contrasts with the reality of low dietary diversity in both regions. This reliance on limited food options underscores a disconnect between perceived and actual nutritional adequacy, highlighting the need for greater awareness of the importance of diverse diets and role of supplementation in ensuring optimal nutrition.

As seen in Figure 17, both regions show similarly high levels of agreement regarding their diets' balance and nutrient adequacy, with 92% of respondents in both Chikkaballapur and Bangalore reporting that their diets are well-balanced. Additionally, 96% of Chikkaballapur residents and 90% of Bangalore residents believe their diets provide all the necessary nutrients. These perceptions possibly suggest shared cultural confidence in traditional or familiar foods, where a diet that feels "sufficient" may be viewed as inherently balanced. However, the low dietary diversity in both areas, especially in Bangalore, indicates that many residents may not be receiving a wide enough range of nutrients from their foods, possibly equating diet adequacy with routine rather than variety.

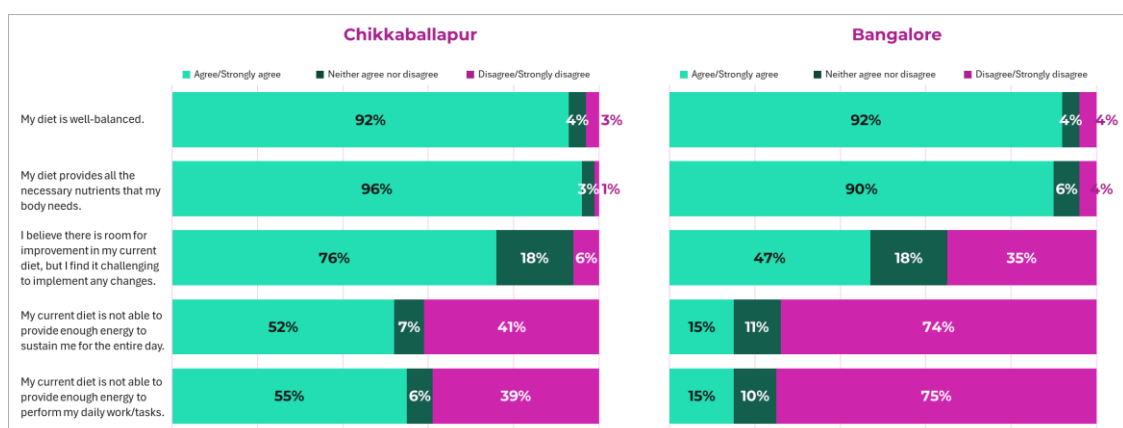


Figure 17. Personal diet assessment (Chikkaballapur, Karnataka).

The perception of energy sufficiency shows a sharp divide between regions, with over half of Chikkaballapur residents (52% and 55%, respectively) feeling their diets fail to provide enough energy for daily activities or to sustain them throughout the day. By contrast, only 15% of Bangalore residents share this concern, with 74% and 75% disagreeing that their diets fall short in energy provision. This finding could reflect the lower physical demands of urban lifestyles in Bangalore, but it may also indicate that Chikkaballapur’s residents have greater physical energy needs that are unmet by their current dietary patterns. For Bangalore residents, the perception of energy sufficiency may stem from reliance on calorie-dense but nutritionally limited foods—perhaps fast food or processed options common in urban diets—which can provide immediate satiety without necessarily contributing to long-term health benefits. In contrast, residents of Chikkaballapur might not only be dealing with higher energy requirements but may also rely on home-cooked meals that, while fresher, may not always be optimized for sustaining prolonged physical exertion.

Further distinctions emerge in residents’ attitudes toward dietary improvement. In Chikkaballapur, 76% of residents see room for improvement but find it difficult to implement changes, suggesting barriers related to food access, economic limitations, or logistical constraints in accessing varied foods. On the other hand, Bangalore residents show less interest in improving their diets, with only 47% indicating room for change and a significant 35% feeling no need for improvement. This low motivation to change in Bangalore could reflect an urban reliance on processed or convenience foods and a misunderstanding of what “dietary balance” entails. The lack of dietary variety in Bangalore, combined with a low perceived need for improvement, points to a knowledge gap regarding the role of food diversity in achieving nutritional adequacy.

Fatigue, productivity loss, and physical health issues

In Karnataka, fatigue and productivity loss are notably more common among rural residents. Over half (53%) of the residents interviewed in Chikkaballapur, while only a quarter (27%) in Bangalore reported experiencing fatigue and productivity loss within the past month (Figure 18).

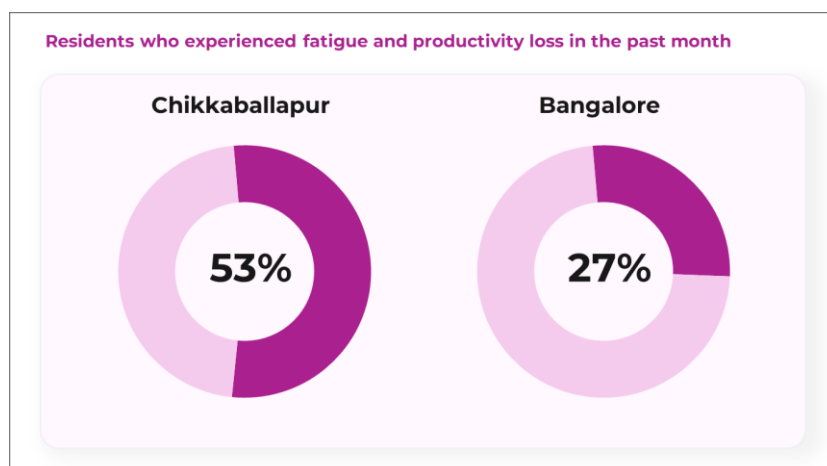


Figure 18. Incidence of experiencing fatigue and productivity loss in the past month in Chikkaballapur and Bangalore, Karnataka.

In Chikkaballapur, fatigue and productivity loss are more notable among residents who do not use supplements, have insufficient dietary diversity, have pre-existing chronic conditions, and are farmers. More than half of the residents who do not use supplements

(57%) and have insufficient dietary diversity (59%) and more than three-quarters of the residents who have pre-existing conditions (78%) and are farmers (79%) reported experiencing fatigue and reduced productivity in the past month. These figures are significantly higher compared to residents who use supplements (31%), maintain sufficient dietary diversity (23%), have no pre-existing conditions (47%), and non-farmers (45%) (Figure 19).

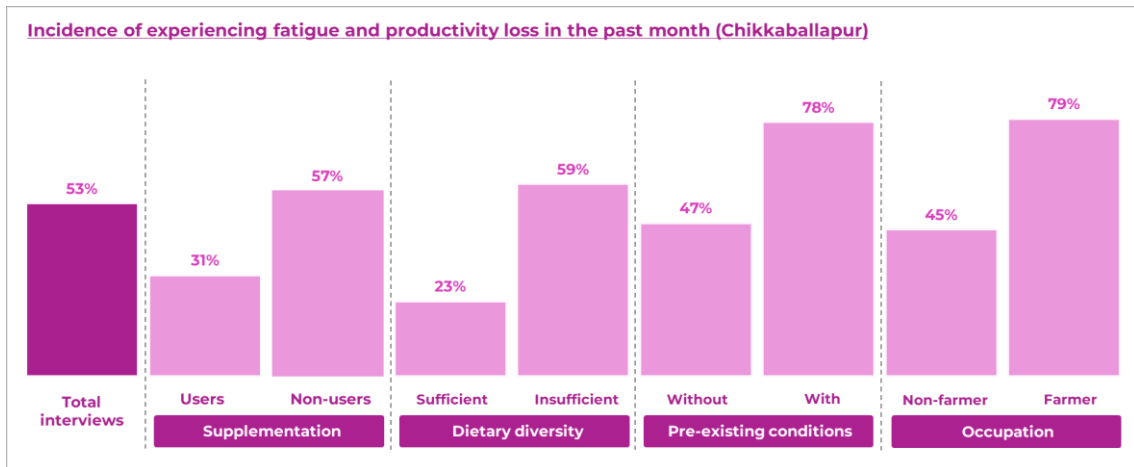


Figure 19. Incidence of experiencing fatigue and productivity loss in the past month (Chikkaballapur, Karnataka).

In Bangalore, fatigue and productivity loss are more notable among residents who do not use supplements and have pre-existing chronic conditions. 31% of the residents who do not use supplements and 60% of those with pre-existing conditions reported experiencing fatigue and reduced productivity in the past month. These figures are significantly higher compared to residents who use supplements (20%) and those who have no pre-existing conditions (22%) (Figure 20).

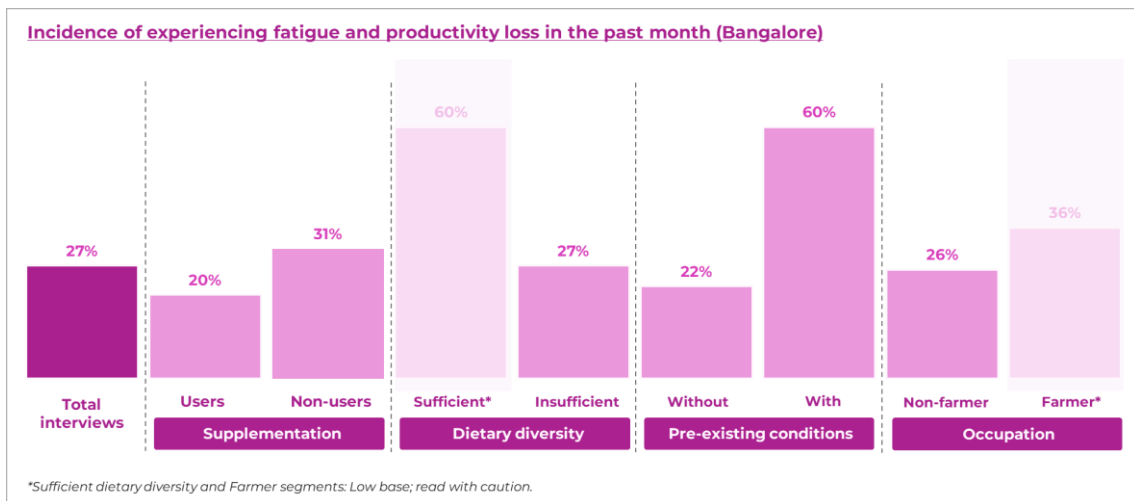


Figure 20. Incidence of experiencing fatigue and productivity loss in the past month (Bangalore, Karnataka).

Productivity loss is predominantly expressed as absenteeism—"missing work recently due to sickness or not feeling well"—in both areas (Table 4). The majority of residents who lost an average of six to seven workdays in the past month due to poor health (i.e., sickness, not feeling well) lack dietary diversity and do not use supplements.

Articulations of fatigue and productivity loss	Chikkaballapur	Bangalore
Fatigue & productivity loss (NET)	53%	27%
Missing work recently because of sickness or not feeling well	50%	25%
Feeling physically exhausted even after a full night's sleep	5%	3%
Decreased work quality as the day progresses	4%	3%
Significant decrease in overall work performance recently	4%	4%
Feeling mentally drained after a typical workday	3%	1%
Needing to take naps during the day to cope with tiredness	3%	2%
Frequently taking longer breaks due to feeling tired	1%	3%
Difficulty maintaining usual productivity throughout the day	1%	3%

Table 4. Articulations of fatigue and productivity loss experienced in the past month (Chikkaballapur and Bangalore, Karnataka).

Physical health issues are also more common among rural residents. Nearly half (46%) of the residents interviewed in Chikkaballapur, while only less than a quarter (23%) in Bangalore reported experiencing physical health issues in the past month (Figure 21).

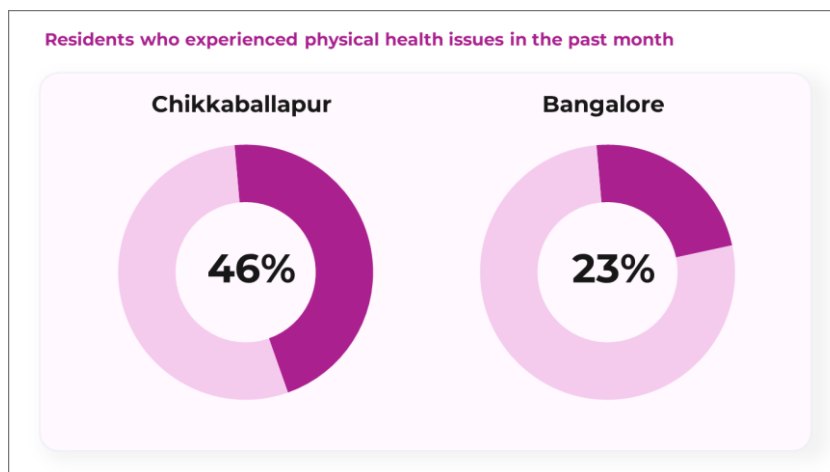


Figure 21. Incidence of experiencing physical health issues in the past month in Chikkaballapur and Bangalore, Karnataka.

In Chikkaballapur, the physical issues reported, specifically bone pain and muscle weakness, were predominantly observed among non-users of supplements, those with lower dietary diversity, have pre-existing conditions, and farmers. Half of the residents who do not use supplements (50%) and have insufficient dietary diversity (50%) and more than half of the residents who have pre-existing conditions (70%) and are farmers (61%) reported experiencing physical health issues in the past month. These figures are significantly higher compared to residents who use supplements (27%), maintain sufficient dietary diversity (28%), have no pre-existing conditions (41%), and non-farmers (42%) (Figure 22).

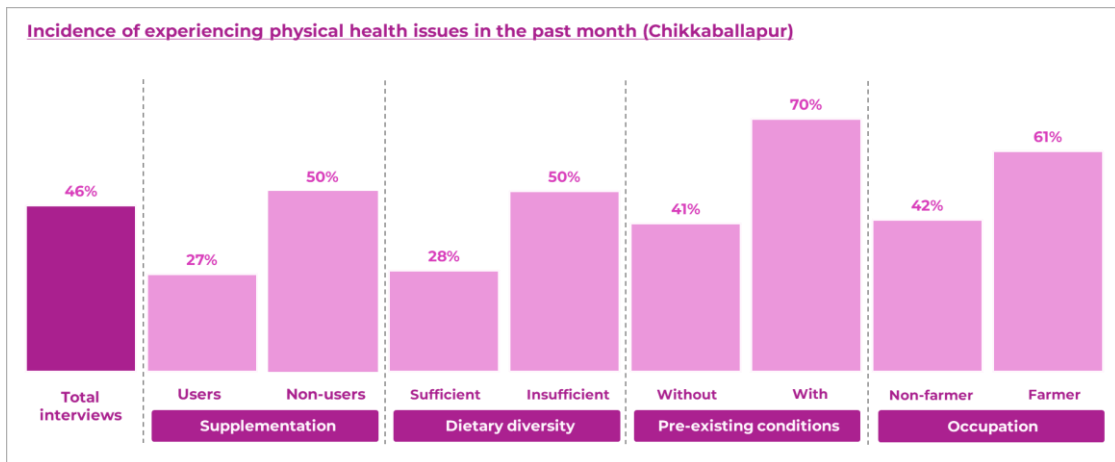


Figure 22. Incidence of experiencing physical health issues in the past month (Chikkaballapur, Karnataka).

In Bangalore, physical issues were more prominent among non-users of supplements and those who have pre-existing conditions. 28% of residents who do not use supplements and more than half (55%) of the residents who have pre-existing conditions experienced physical health issues in the past month. These figures are significantly higher compared to residents who use supplements (16%) and have no pre-existing conditions (19%). Despite the small sample size, the data also shows indications that farmers report physical health issues at a higher rate (32%) compared to non-farmers (23%), though this finding should be interpreted with caution (Figure 23).

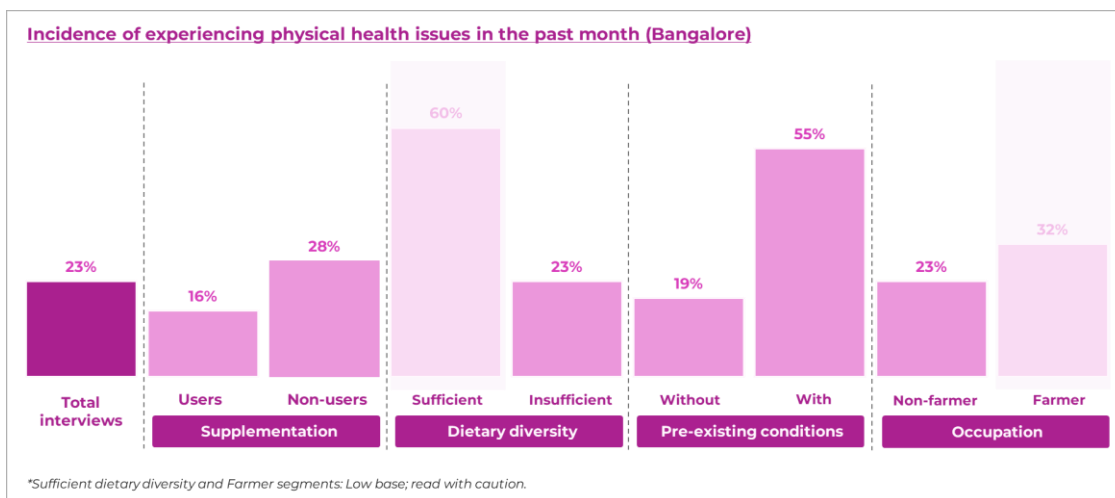


Figure 23. Incidence of experiencing physical health issues in the past month (Bangalore, Karnataka).

Residents who experienced fatigue, productivity loss, and physical health issues primarily attributed them to lack of sleep, overworking, lack of exercise, stress, and aging. In Chikkaballapur, lack of sleep (34%) and overworking (30%) are especially prominent as perceived causes, likely reflecting the physical demands of agricultural or labor-intensive work common in rural settings. Notably, in both areas, only a small percentage of residents attributed fatigue and physical health issues to poor diet and nutrition (5% in Chikkaballapur and 2% in Bangalore), suggesting that there is limited awareness of the connection between dietary habits and overall health (Table 5).

Perceived causes <i>Among residents who experienced fatigue and productivity loss and physical issues in the past month</i>	Chikkaballapur	Bangalore
Lack of sleep	34%	13%
Overworking	30%	22%
Lack of exercise	27%	11%
Stress	23%	13%
Aging	16%	39%
Medication side effects	10%	8%
Hormonal changes/imbbalances	8%	11%
Pollution	8%	9%
Pre-existing conditions like diabetes, hypertension, etc.	5%	3%
Poor diet or nutrition	5%	2%
Dehydration	3%	4%
Genetics	3%	1%
I DON'T KNOW	6%	17%

Table 5. Perceived causes of fatigue and productivity loss (Chikkaballapur and Bangalore, Karnataka).

Emotional and mental health issues

Emotional and mental health issues such as poor sleep quality and depressive symptoms are also more commonly reported among rural residents. In Chikkaballapur, over a third (36%) of residents reported experiencing recent emotional or mental health challenges, compared to less than a fifth (16%) in Bangalore (Figure 24).

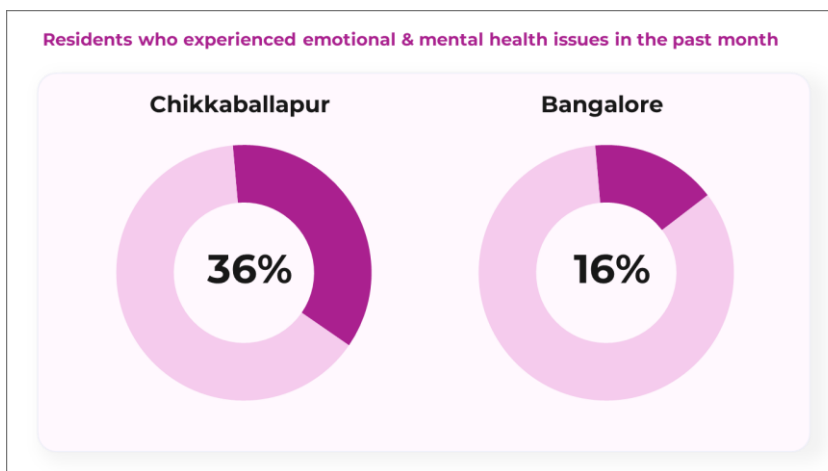


Figure 24. Incidence of experiencing emotional and mental health issues in the past month in Chikkaballapur and Bangalore, Karnataka).

In Chikkaballapur, emotional and mental health issues were more commonly reported by non-users of supplements (37%), those with lower dietary diversity (40%), have pre-existing conditions (45%), and farmers (56%). These figures are significantly higher compared to residents who use supplements (26%), maintain sufficient dietary diversity (14%), have no pre-existing conditions (33%), and non-farmers (30%) (Figure 25).

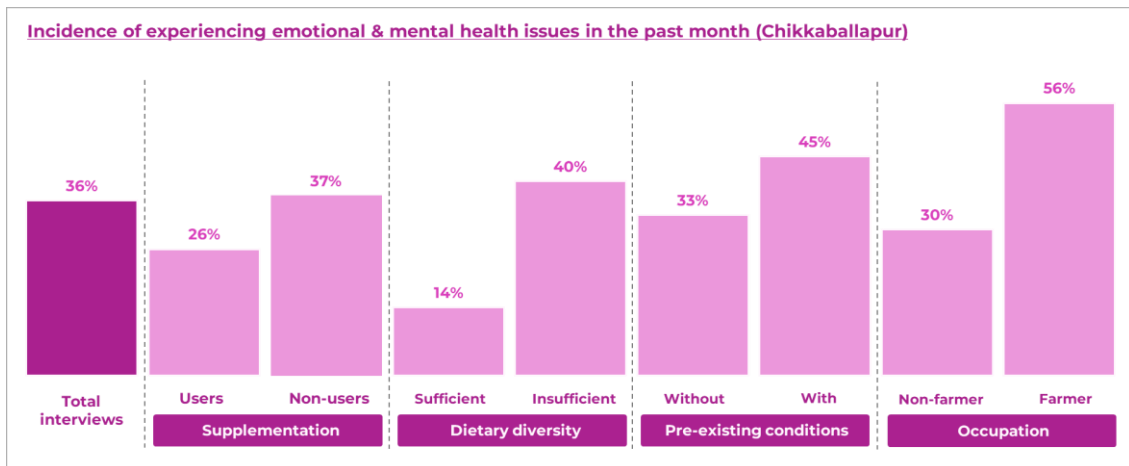


Figure 25. Incidence of experiencing emotional and mental health issues in the past month (Chikkaballapur, Karnataka).

In Bangalore, emotional and mental health issues were more prominent among non-users of supplements (19%) and those who have pre-existing conditions (44%). These figures are significantly higher compared to residents who use supplements (10%) and have no pre-existing conditions (12%) (Figure 26).

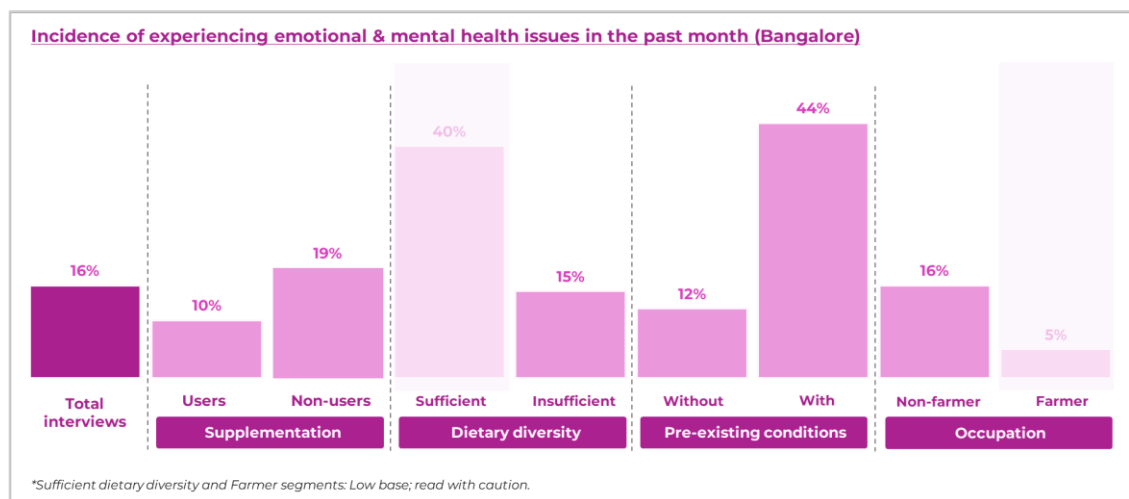


Figure 26. Incidence of experiencing emotional and mental health issues in the past month (Bangalore, Karnataka).

When asked about perceived causes of emotional and mental health issues they experience, perceptions vary between Chikkaballapur and Bangalore residents, shaped by factors such as lifestyle, access to support systems, and health literacy (Table 6).

While both areas recognize work pressure as a primary cause, it is significantly more pronounced in Bangalore, where nearly half of residents (49%) identify it as a primary stressor compared to 36% in Chikkaballapur. This contrast likely reflects the intense, high-pressure work environment characteristic of urban settings like Bangalore, where competition and long hours are common. In rural Chikkaballapur, by contrast, work pressure may be linked more to the physical demands of labor-intensive jobs and the inherent uncertainties of agricultural livelihoods.

Another stark difference lies in the perception of screen time and social media use as mental health stressors. In Bangalore, 34% of respondents cite excessive screen time as a

contributing factor to mental health challenges—over four times the rate in Chikkaballapur (8%). This disparity likely stems from greater integration of technology into daily life in urban areas, where professional and social activities increasingly rely on digital devices.

Sleep disorders and stress are more frequently acknowledged by residents of Chikkaballapur, with 29% and 28%, respectively, viewing these as significant contributors to mental health challenges. These higher rates may indicate that sleep disturbances and stress are linked to the demanding nature of agricultural work, irregular schedules, or limited access to health resources. Additionally, the absence of a robust support system emerges as a more pressing concern in Chikkaballapur, with 21% of respondents identifying this as a factor, compared to only 12% in Bangalore. This suggests that rural residents may experience a heightened sense of social isolation, compounded by fewer mental health resources, community support groups, and social safety nets. Further, 11% of Chikkaballapur residents report past traumatic events as contributing to current mental health challenges, possibly highlighting the lasting emotional impact of rural hardships, such as economic struggles and other possible stressors unique to the rural setting.

Poor diet or nutrition is rarely recognized as a mental health factor in either region, suggesting limited awareness of the link between nutrition and emotional well-being.

Perceived causes <i>Among residents who experienced emotional and mental health issues in the past month</i>	Chikkaballapur	Bangalore
Work pressure	36%	49%
Sleep disorders	29%	13%
Stress	28%	13%
Lack of support system	21%	12%
High sugar intake / Excessive consumption of sugary foods	13%	16%
Past traumatic events	11%	0%
Poor work-life balance	9%	4%
Excessive screen time/use of digital devices/social media	8%	34%
High caffeine intake	7%	9%
Poor diet or nutrition	5%	3%
Poor mental health / Mental health problems	5%	5%

Table 6. Perceived causes of emotional and mental health issues (Chikkaballapur and Bangalore, Karnataka).

Uttar Pradesh (UP)

The findings in Uttar Pradesh reveal a substantial gap in nutrition knowledge among residents, as evidenced by their perceptions of dietary adequacy and its relation to health outcomes. Despite a majority (75%) of residents believing their diets provide sufficient nutrients, nutritional assessments do not support this belief. Those with inadequate dietary diversity or malnutrition, as measured by MUAC, report higher instances of health challenges yet remain unaware of the potential role of nutrition in these issues. Specifically, fatigue and productivity loss, which are reported by 23% of residents, are strongly associated with malnutrition and pre-existing health conditions such as anemia and diabetes. Individuals with these conditions experience significantly higher rates of fatigue (35%) compared to those without (6%), indicating that poor nutritional status may exacerbate fatigue and impair productivity. While dietary diversity appears to have a minimal direct correlation with fatigue levels, the reliance on insufficiently nutritious or

imbalanced diets suggests that improving overall diet quality and addressing nutritional gaps through supplementation could alleviate these issues.

Physical and mental health outcomes similarly highlight the role of unacknowledged nutritional deficiencies. Residents with pre-existing conditions, malnutrition, or lack of supplementation reported markedly higher incidences of physical health issues (51% vs. 44% for malnourished vs. well-nourished; 48% vs. 37% for non-users vs. users of supplements). Mental health challenges, including anxiety and sleep disturbances, were also more prevalent among individuals with pre-existing conditions (32% vs. 5%). Despite these patterns, residents predominantly attribute their health problems to non-dietary factors, such as lack of exercise, sleep, or aging, overlooking the critical influence of inadequate nutrition. This disconnect suggests an urgent need for education on the importance of dietary quality, diversity, and supplementation in addressing both physical and mental health challenges.

Diet Assessment

Most (75%) residents believe that their current diets provide all the nutrients their bodies need. This perception is even more pronounced among those whose diets lack diversity (77%) and are malnourished based on MUAC results (93%), signifying a clear gap in diet and nutrition knowledge (Figure 27).

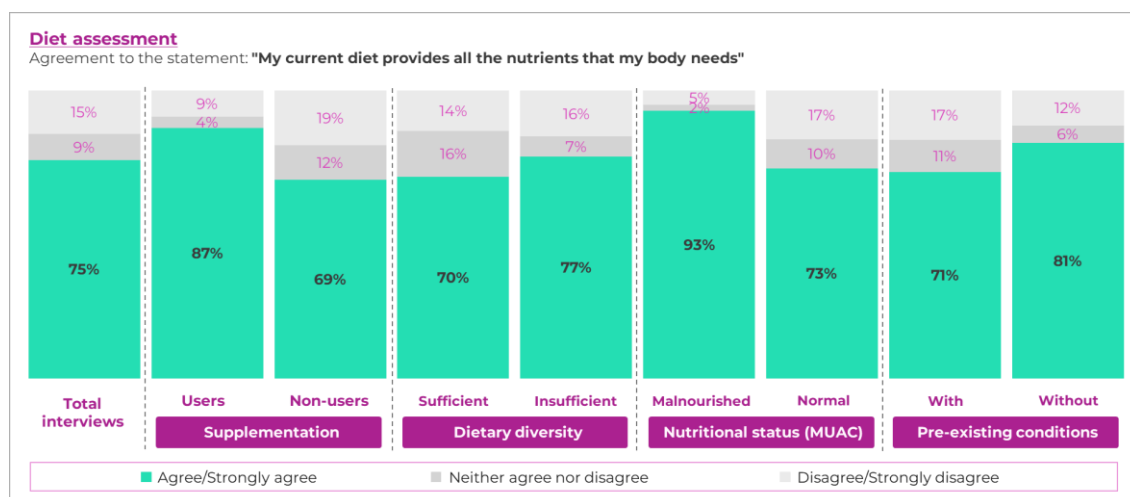


Figure 27. Diet assessment: agreement rating to the statement "My current diet provides all the nutrients that my body needs" (Uttar Pradesh).

Fatigue and productivity loss

In Uttar Pradesh, fatigue and productivity loss appear less prevalent than Karnataka, though certain segments report markedly higher incidences than others. Overall, less than a quarter (23%) of the population reported experiencing fatigue and productivity loss in the past month. However, the incidence rises noticeably within specific segments, particularly those associated with nutritional status and pre-existing health conditions (Figure 28).

Residents with pre-existing health conditions such as hypertension, diabetes, gout, and anemia report fatigue at a rate of 35%, much higher than the 6% incidence among those without such conditions. This considerable difference underscores how chronic illnesses possibly exacerbate fatigue and impair productivity. Similarly, malnourished residents, as indicated by MUAC (Mid-Upper Arm Circumference) measurements reported significantly higher fatigue and productivity loss (35%) than those with normal MUAC measurements, of

whom only 22% experienced similar symptoms. This suggests that poor nutritional status may be a significant contributor to fatigue and reduced productivity in this population.

Other factors such as dietary diversity and occupation show more moderate associations with fatigue. Both residents with sufficient and insufficient dietary diversity report fatigue incidences of 25% and 23%, respectively, suggesting that while dietary diversity might play a role, it alone may not strongly predict fatigue levels. Farmers, on the other hand, report a slightly lower incidence of fatigue (20%) than non-farmers (24%), which could be due to various occupational or lifestyle factors unique to farming.

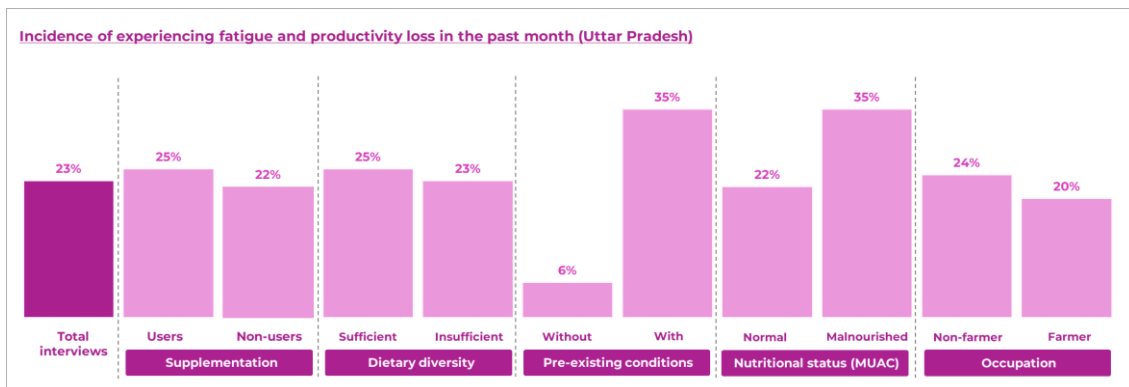


Figure 28. Incidence of experiencing fatigue and productivity loss in the past month (Uttar Pradesh).

The data also reveals a clear relationship between physical and mental health issues and the prevalence of fatigue and productivity loss. Residents who reported physical health issues reported a significantly higher incidence of fatigue and reduced productivity, with 30% affected, compared to just 17% of those who did not experience such issues (Figure 29). This notable difference highlights the strong impact of physical health problems on energy levels and productivity. Physical ailments, such as bone pain or muscle weakness, numbness or tingling in hands or feet, and difficulty seeing in low light conditions, likely drain the body's resources and/or impair a person's ability to function efficiently in daily activities.

Similarly, emotional and mental health issues also play a significant role in fatigue and reduced productivity. Residents who experienced mental health challenges reported a 31% incidence of fatigue, compared to 21% among those who did not report any emotional or mental health issues (Figure 29). This difference suggests that emotional and psychological well-being is closely tied to physical energy and work capacity. Mental health struggles, such as anxiety or trouble managing anxiety, difficulty sleeping, and/or frequent sleep disturbances, can lead to feelings of exhaustion, decreased focus, and a reduction in overall productivity.

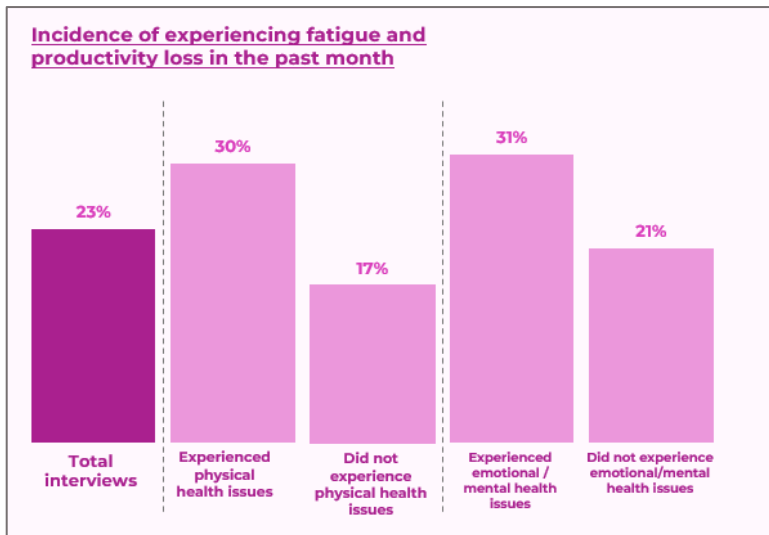


Figure 29. Incidence of experiencing fatigue and productivity loss in the past month (Uttar Pradesh).

Physical health issues

In terms of physical health issues, UP residents with pre-existing health conditions report the highest incidence at 63%, compared to just 17% among those without pre-existing conditions (Figure 30). This significant difference suggests a strong link between existing health issues and the likelihood of experiencing additional physical problems. Additionally, malnutrition appears to be associated with physical issues; malnourished residents, as indicated by MUAC measurements, report physical issues at a rate of 51%, slightly above the 44% reported by residents with normal nutritional status.

The data on dietary diversity presents a more complex picture. Surprisingly, residents with sufficient dietary diversity reported a slightly higher incidence of physical health issues (50%) than those with insufficient diversity (43%) (Figure 30). This could indicate that dietary diversity alone may not be a strong protective factor against physical health issues, or that other factors, such as the overall quality of the diet or lifestyle factors, may be at play. Moreover, the data indicates that even a diverse diet may not guarantee full nutritional adequacy, as non-users of supplements consistently experience higher rates of physical health issues than supplement users (48% vs. 37%). This highlights the role of supplementation in bridging nutritional gaps that dietary diversity alone may not address.

Some differences are also apparent when comparing other demographic factors as shown in Figure 30. Interestingly, farmers report lower physical issue rates (36%) than non-farmers (49%), which could be due to the higher levels of physical activity associated with farming that help farmers maintain stronger physical resilience and overall health. Regular physical labor could contribute to better musculoskeletal strength and overall physical endurance, potentially reducing the risk of some health issues.

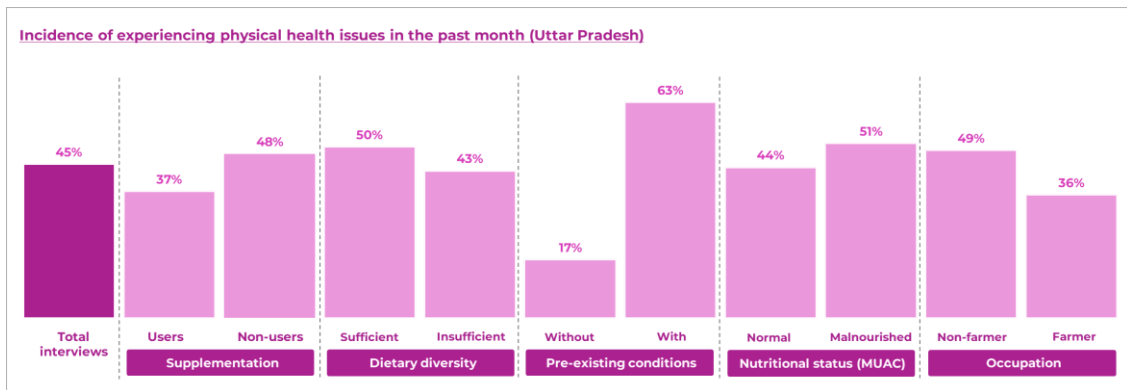


Figure 30. Incidence of experiencing physical health issues in the past month (Uttar Pradesh).

Emotional and mental health issues

Around a fifth (21%) of residents in UP reported having experienced emotional and mental health issues in the past month, including anxiety, sleep disturbances, and mood swings. However, the incidence varies across different segments, with some groups experiencing higher rates, including non-users of supplements, and particularly those with pre-existing health conditions (Figure 31).

Among residents with pre-existing conditions, such as hypertension, diabetes, obesity, gout, and anemia, the rate of emotional and mental health issues is notably higher at 32%, compared to just 5% among those without such conditions (Figure 31). This substantial difference suggests that pre-existing health conditions may play an important role in emotional and mental well-being, potentially due to the stress or physical discomfort associated with managing ongoing health issues.

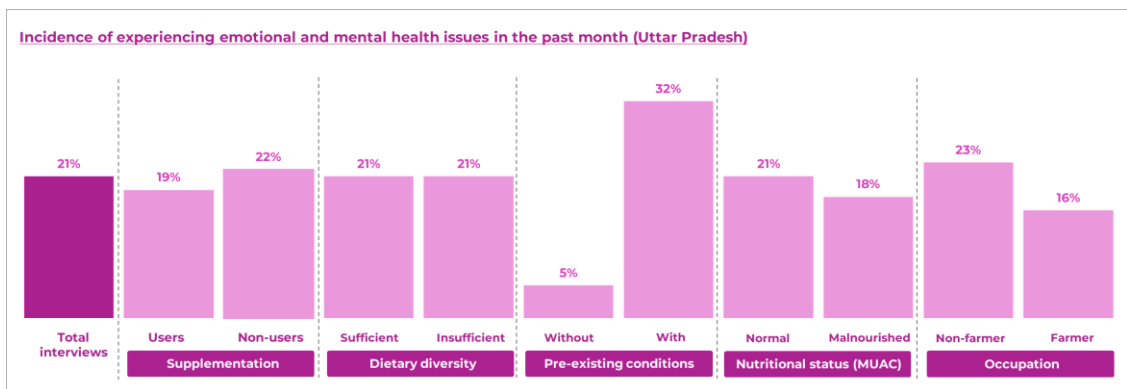


Figure 31. Incidence of experiencing emotional and mental health issues in the past month (Uttar Pradesh).

For other segments shown in Figure 31, such as those with different dietary and nutritional statuses, the incidence of emotional and mental health issues remains fairly close to the population average. For instance, both residents with sufficient and insufficient dietary diversity report similar rates of 21%, indicating that dietary variety alone may not significantly affect mental and emotional health in this context. Similarly, malnourished residents report a slightly lower incidence (18%) than those with normal nutritional status (21%), which might reflect that factors beyond immediate nutrition, such as health status or life circumstances, play more pivotal roles in mental health outcomes.

Occupational differences also emerge in the data. Farmers, with an incidence of 16%, report fewer mental health issues than non-farmers, who experience them at a rate of 23%. The lower rate among farmers might be due to the benefits of physical activity and outdoor

work, which have been linked to reduced stress and better mental health. Alternatively, it could reflect differences in lifestyle or occupational stress, with farming potentially involving different stressors than non-farming occupations.

In summary, while emotional and mental health issues affect a range of demographic groups, those with pre-existing conditions appear to be most vulnerable. Other factors, such as occupation, show some association with mental health outcomes but seem to play a more secondary role. As with all correlational data, these patterns do not establish causation, and other unmeasured factors, like access to social support or healthcare, may also influence mental health outcomes. Further analysis could help to clarify these associations and better understand the factors contributing to mental health in this population.

Perceived causes

The residents primarily attribute fatigue, productivity loss, physical, emotional, and mental health issues to five major causes: lack of exercise, lack of sleep, poor diet or nutrition, stress, and aging. Lack of exercise (28%) and poor diet or nutrition (23%) were attributed more to fatigue and productivity loss. On the other hand, emotional and health issues were more associated with aging (24%), along with lack of sleep (23%) and exercise (22%), overlooking the role of nutritional deficiencies in these challenges (Table 7).

Perceived causes	Among residents who experienced fatigue/ productivity loss	Among residents who experienced physical health issues	Among residents who experienced emotional/ mental health issues
Lack of exercise	28%	21%	22%
Lack of sleep	25%	20%	23%
Poor diet or nutrition	23%	17%	14%
Stress	19%	19%	17%
Aging	17%	15%	24%
Poor work life balance	14%	10%	8%
Sleep disorders	14%	10%	9%
Work pressure	13%	12%	10%
Pre-existing conditions	11%	6%	7%
Genetics	7%	7%	7%
Pollution	7%	5%	6%
Hormonal changes	6%	6%	11%
Medication side effects	4%	4%	5%
Dehydration	4%	5%	9%
Lack of support system	4%	2%	3%
Overworking	3%	2%	4%

Table 7. Perceived causes of fatigue and productivity loss, physical health issues, and emotional and mental health issues (Uttar Pradesh).

4.5 Campaign Outcomes

Post-engagement interviews were conducted among residents to measure campaign outcomes. A total of 959 residents were interviewed in Karnataka (476 in Chikkaballapur and 483 in Bangalore) to assess changes in behavior related to diet and supplementation (details in Appendix 7.4).

Behavior changes among residents in Karnataka

Following the engagement, the adoption of supplementation among initial non-users varied significantly between the two regions, with only 6% of non-users in Chikkaballapur starting supplementation compared to 23% in Bangalore (Figure 32). This difference highlights the possible variations in factors such as accessibility, awareness, or trust in supplementation between the regions, influenced by differing demographic or socioeconomic profiles.

Those who adopted supplementation observed a broad range of physical and mental health benefits, including increased energy levels, stronger immunity, improved mood, better skin health, and improved digestion.

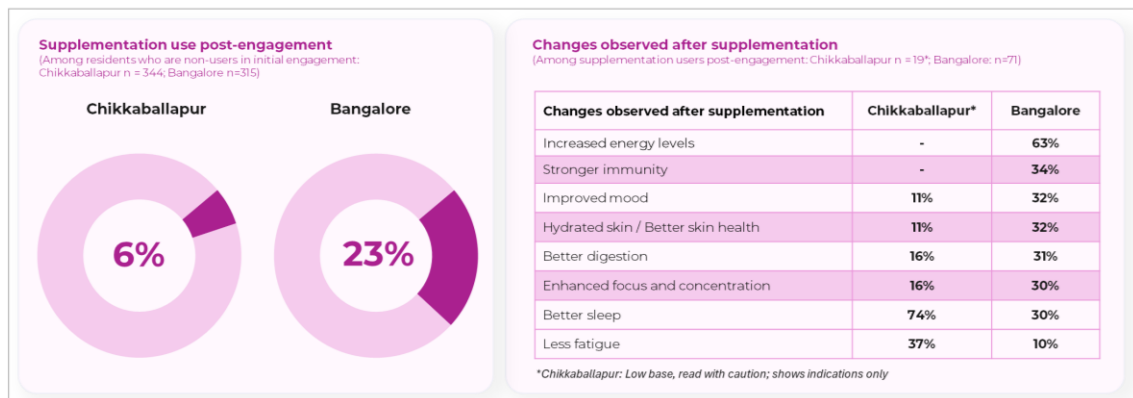


Figure 32. Supplementation use post-engagement; Changes observed after supplementation (Chikkaballapur and Bangalore, Karnataka).

Among those who remain non-users of supplements, the belief in the sufficiency of their current diets was cited as the primary reason across both regions. However, other reasons vary significantly, suggesting distinct regional attitudes and constraints (Table 7).

Reasons for continued non-supplementation	Chikkaballapur	Bangalore
I already have a balanced diet	87%	80%
No budget/money	27%	14%
Advised by doctor due to my health condition	18%	42%
Don't know where to buy vitamins/supplements	6%	9%
Safety concerns (e.g., worried of side effects, contamination, or interaction with medications)	4%	13%
Don't know which vitamins/food supplements are right for me	4%	21%
I don't believe they are effective	2%	46%

Table 7. Reasons for continued non-supplementation (Chikkaballapur and Bangalore, Karnataka).

As seen in Table 7, skepticism about the efficacy of supplements is a notable barrier in Bangalore, with 46% of respondents expressing disbelief in their effectiveness. This high rate indicates a widespread perception that supplementation may not add meaningful health benefits beyond a balanced diet, reflecting a region where supplementation awareness exists but is accompanied by critical scrutiny. Additionally, medical guidance plays a substantial role, as 42% of Bangalore residents refrain from supplements on their doctor's advice due to specific health conditions. This may imply a greater reliance on professional healthcare guidance in supplementation decisions. Other barriers include confusion over product choice (21%) and financial constraints (14%), with safety concerns (13%) and lack of knowledge about purchasing locations (9%) less commonly cited.

In contrast, the reasons for continued non-supplementation in Chikkaballapur differ, especially in terms of skepticism and financial limitations. Only 2% of residents in Chikkaballapur doubt the effectiveness of supplements, suggesting a population that is either open to supplementation or simply less exposed to discussions about their efficacy. However, financial limitations appear more prominent, with 27% indicating a lack of budget as a barrier—almost double the rate in Bangalore. This disparity hints at economic constraints that may significantly impact health-related purchasing decisions in rural Chikkaballapur.

Additionally, fewer individuals in Chikkaballapur refrain from supplements due to doctor advice (18%), potentially reflecting differences in healthcare accessibility or health-seeking behavior compared to Bangalore. Other barriers, such as lack of knowledge on choosing the right supplements and safety concerns, are minor (6% and 4%, respectively), indicating that for most Chikkaballapur residents, these factors do not weigh heavily in their decision-making.

While both regions cite having a balanced diet as the primary reason for avoiding supplementation, Bangalore residents demonstrate greater skepticism and reliance on medical advice, possibly reflecting a more informed but cautious approach to supplementation. In contrast, Chikkaballapur's lower skepticism and higher emphasis on financial barriers suggest economic factors and different regional perceptions shape attitudes toward supplementation. These insights underscore the need for tailored strategies that address financial accessibility in Chikkaballapur and build product confidence in Bangalore.

In terms of dietary diversity, very minimal improvements were observed in both regions, 6% in Chikkaballapur and 1% in Bangalore, underscoring persistent barriers in achieving dietary diversity due to economic constraints, food availability, or entrenched dietary beliefs and habits (Figure 33). Further, the majority of those whose dietary diversity remains insufficient across both regions perceive their current diets as adequate, suggesting a significant knowledge gap in diet and nutrition (Figure 34).

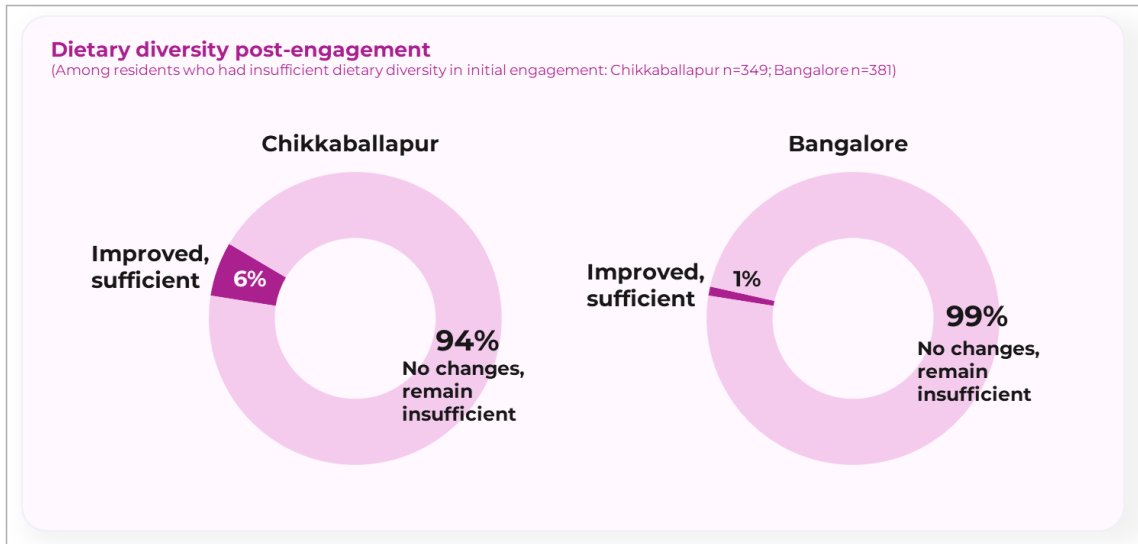


Figure 33. Dietary diversity post-engagement (Chikkaballapur, Karnataka)

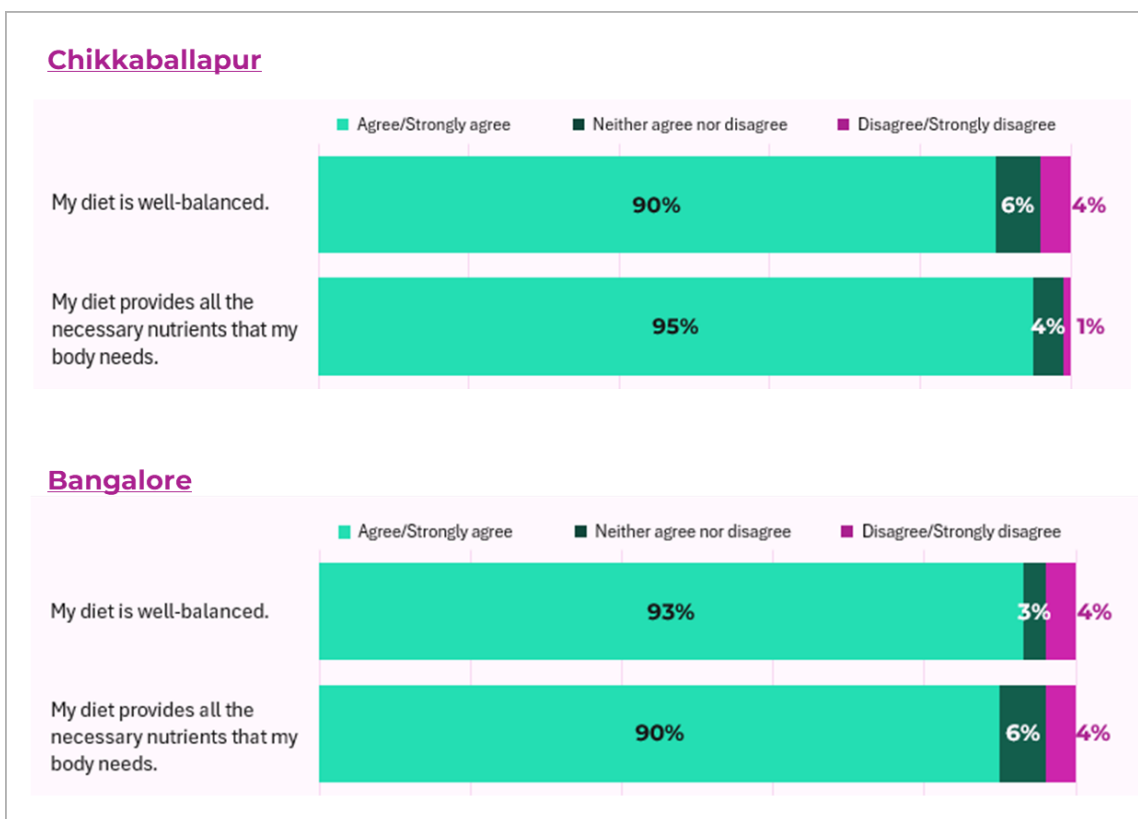


Figure 34. Diet assessment among residents whose diets pre- and post-engagement have insufficient diversity (Chikkaballapur and Bangalore, Karnataka).

5. Conclusion

The campaign has established a foundational understanding of the key gaps that need addressing to help India cover 100% of nutritional needs, from food to supplementation: shifting entrenched beliefs, overcoming economic barriers, and promoting dietary diversity and supplementation. Residents in underserved communities continue to rely heavily on traditional practices and have a limited understanding of specific nutritional needs, despite sub-optimal nutritional status and growing concerns about the declining quality of their food.

The campaign shows some promising results, including effective training of community health workers (CHW), and initial shifts in raising awareness and improving knowledge of nutrition and supplementation among over 80,000 residents in underserved communities in Karnataka and Uttar Pradesh. In addition, changes in behaviors, especially towards supplementation, show meaningful impact in improving residents' everyday health, from energy levels to immunity.

Continued efforts to raise awareness and shift behaviors towards better diet diversity and the use of supplementation are critical to closing the nutrient gap.

6. Recommendations

To build on the campaign's foundational learnings, the following recommendations are provided for the broader ecosystem to address persisting challenges in knowledge and access to nutrition. Stakeholders across sectors must take coordinated action to close the nutrition gap in India's underserved communities.

1. **Strengthen nutrition education programs:** Expand and deepen nutrition education efforts by incorporating more detailed and practical information on 100% nutrition, from food to supplementation, specifically on essential nutrients, balanced diet composition, and the benefits of supplementation. Educational materials should be customized to narrow the gap between traditional beliefs and modern nutritional guidelines, incorporating culturally relevant examples. This approach would make information more applicable and beneficial for underserved communities.

Moreover, addressing low dietary diversity may require awareness initiatives on the importance of food variety, emphasizing how diverse diets can provide essential nutrients that go beyond what is available in a more limited or repetitive diet. Tailored interventions that align with the unique circumstances of each community—whether through expanding access to diverse foods or enhancing nutritional literacy—could play a vital role in bridging these gaps and improving overall dietary quality.

2. **Increase access to affordable nutritional supplements:** Partner with government agencies, non-profits, and the private sector to improve the accessibility and cost-effectiveness of nutritional supplements in underserved areas. Initiatives like subsidized programs, community-driven distribution, and collaborations with local retailers can help deliver supplements to those in need.

3. **Enhance community health worker (CHW) training and outreach:** Equip CHWs with more in-depth training on nutrition and techniques for promoting behavioral change to address entrenched misconceptions more effectively. Additionally, expanding the reach of CHWs to more underserved communities will help extend the campaign's impact and ensure that no groups are left behind.
4. **Integrate nutrition into broader health and agricultural policies:** Advocate for integrating nutrition-specific goals into more comprehensive health and farming policies. Programs focusing on sustainable agricultural practices, food security, and climate resilience can directly impact improving nutritional outcomes. Continuing to raise awareness of daily nutrient needs and the contribution of diet (70%) and supplementation (30%) would be instrumental to help individuals achieve 100% of their needs, leveraging health workers, school educators, and consumer engagement to empower individuals at scale.
5. **Develop incentive-based programs:** Introduce programs encouraging dietary diversity and supplementation. For example, community-based competitions or recognition initiatives that acknowledge families or individuals who make significant improvements in diet diversity or use of essential supplementation may drive positive change.
6. **Monitor and evaluate long-term impact:** Continue robust monitoring and evaluation to track changes in knowledge, attitudes, and practices over time. This will help pinpoint areas needing further intervention and provide data to support the expansion of successful approaches. Involving local communities in monitoring efforts will also foster a sense of ownership and ensure long-term sustainability.
7. **Strengthen partnerships for greater reach and impact:** Leverage partnerships with various stakeholders, including local governments, NGOs, and private companies, to scale successful interventions and amplify the campaign's reach. To further support underserved communities in peri-urban and rural areas in improving their diets and accessing essential healthcare, explore partnerships with local stakeholders to provide economic assistance or subsidies for nutrient-dense foods and supplements, ensuring lasting improvements in health practices and outcomes.

7. Appendix

7.1 Project implementation milestones

The project consists of six key workstreams. As of November 15, 2024, the activities for the six milestones have been completed. The table below outlines details of these activities, organized by workstream.

Workstream	Implementation objectives	Project activities	Status
Program set-up and management	Align workplan with reach52 team and external stakeholders	Team kick-off: internal alignment of work plan, roles, and responsibilities	Completed
Research	Gather data in communities across Bangalore and/or Uttar Pradesh through customisable questionnaires to understand diet/nutrition and supplementation knowledge, attitudes, and practices	Build a questionnaire; Conduct interviews among residents in covered communities; Analyze data and identify themes	Completed
Development Planning & Learning for Performance	Using the insights, build content on nutrition education (food and supplementation) for Agent training and awareness campaigns	<ul style="list-style-type: none"> Decide communities to target, align with BLF sites Finalize project log frame matrix Draft competency framework for Nutrition Learning experience design & creation of health education materials for training 	Completed

Implementation	<ul style="list-style-type: none"> Execute training sessions CHW deployment for profiling, health promotion and screening 	<ul style="list-style-type: none"> Conducting training sessions and onboarding of CHWs CHVs will collect personal details and health data of residents with reach52 access CHWs will perform health promotion to targeted residents and run online campaigns; and manage referrals to trained HWs 	Completed
M&E plan and reporting	Track indicators for expected outputs and evaluate the intended impact	<ul style="list-style-type: none"> Conduct Training Evaluation (Pre- and Post-Assessment) Conduct Post-engagement feedback Submit Final Report 	Completed

7.2 Resident engagements (actual vs targets)

As of 15 November 2024, **81,318 residents have been engaged**, surpassing the target of 70,000 residents.

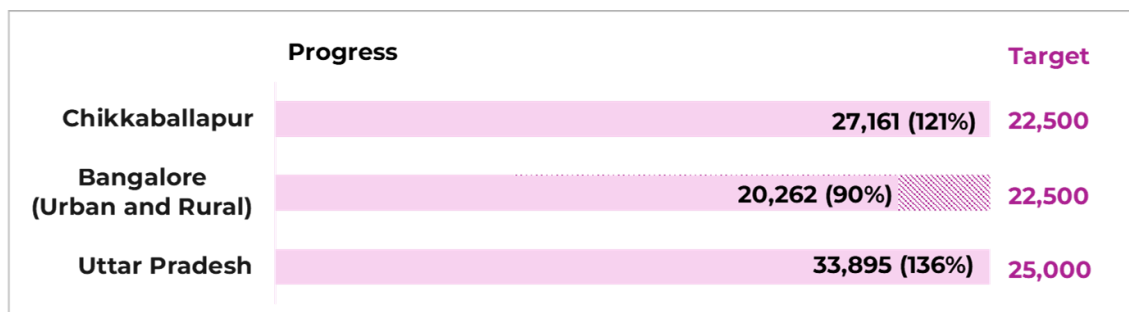


Figure 35 Resident engagements in Uttar Pradesh (Actual vs. Targets)

7.3 Baseline research specifications and limitations

Methodology: Focus Group Discussions (FGDs); length of interview: 50-60 minutes

Respondents:

- Smallholder farmers (SHFs), i.e., those that farm on less than 10 hectares (about 25 acres of land), many of them owning under 2 hectares (about 5 acres)
- The FGDs have a good mix of younger and older SHFs
- The farmers grow more than one type of crop

Sample size and area coverage:

- 10 FGDs (with 6 members in each group) in Chikkaballapur, Karnataka
- 5 FGDs (with 6 members in each group) in Mirzapur, Uttar Pradesh

Limitations:

- Given its qualitative nature, the sample size of this study is relatively small, which limits the generalizability of the findings to other populations or healthcare settings in India. Future research with larger and more diverse samples would enhance the external validity of the results.
- This study was conducted in selected villages in Chikkaballapur, Karnataka, and Mirzapur, Uttar Pradesh. Findings may or may not reflect the diet and nutrition landscape and behaviours in other divisions/districts/states in India.
- The recruitment process relied on convenience sampling, which may have introduced selection bias. Residents who volunteered to participate may have unique characteristics or experiences compared to those who did not, potentially influencing the study findings.
- Data collection was conducted through focus group discussions (FGDs), which relied on participants' self-reporting of their experiences. While efforts were made to establish rapport and trust with participants, social desirability bias may have influenced their responses, leading to potential inaccuracies or omissions in the data.
- The analysis of qualitative data is inherently subjective and interpretive, raising concerns about the reliability and objectivity of the findings. To enhance rigor and trustworthiness, multiple team members reviewed the data and report to resolve any discrepancies and inconsistencies. However, the potential for researcher bias in data interpretation cannot be eliminated.

7.4 Post-engagement survey in Chikkaballapur and Bangalore, Karnataka – specifications and limitations

Objectives:

- Understand fatigue and productivity loss among residents
 - Assess the incidence of fatigue and productivity loss among residents, examine its manifestations, and explore its connection to supplementation use and dietary habits.
 - Identify perceived causes of fatigue and productivity loss.
- Evaluate impact of campaign
 - Measure changes in behaviours in terms of supplementation use and dietary habits.

Methodology: Face-to-face interviews conducted by reach52 Agents among residents who were engaged in the nutrition campaign

Area coverage: Chikkaballapur and Bangalore, Karnataka

Sample size: A total of 959 residents were interviewed (Chikkaballapur: 476, Bangalore: 483)

Limitations:

- This survey was conducted in selected villages in Chikkaballapur and Bangalore, Karnataka, where reach52's nutrition health campaign was implemented. Consequently, the findings may not accurately represent the diet and nutrition status of the entire Chikkaballapur and Bangalore districts or other regions of India.

The limited geographic scope restricts the generalizability of the results to broader populations beyond the selected villages.

- The study employed a convenience sampling method, involving participants of the reach52 campaign. As the sample was not randomly selected, it may not fully capture the diversity of the broader village populations or the entire Chikkaballapur and Bangalore districts. This non-random sampling approach increases the likelihood of sampling bias, potentially overrepresenting certain demographic groups while underrepresenting others. As a result, the findings should be interpreted with caution, particularly regarding their applicability to the general population.
- Data collection was conducted through face-to-face interviews by reach52 Agents, who are primarily health workers with relevant subject matter expertise but without formal training in market research interview techniques. The use of non-professional interviewers may have introduced interviewer bias, affecting the consistency and neutrality of the data collection process. Respondents' answers could have been influenced by the interviewers' presence or the phrasing of questions, leading to potential biases in the data. This limitation should be taken into account when interpreting the findings.
- The observed associations between fatigue, productivity loss, supplement use, and dietary diversity in this study are based on a limited set of examined variables. It is important to recognize that other potential contributing factors, such as overall health status, psychological well-being, work intensity, and other environmental influences, were not assessed. Thus, the findings should not be construed as evidence that non-supplement use and insufficient dietary diversity are the sole or main determinants of fatigue and productivity loss. Future research should incorporate a broader range of variables to better understand the complex interplay of factors influencing these outcomes.
- Moreover, future research would benefit from employing a more representative sampling method to enhance the generalizability of the results. Using trained, professional interviewers could also improve the reliability of the data collected by reducing the potential for interviewer bias.