Strengthening food-based transfers for maternal health and nutrition: Evidence from Rural India

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Abstract

The first 1000 days of life is a well-known critical period in which nutrition is paramount. Yet, many women remain undernourished during pregnancy, despite rising standards of living globally. Food transfer programs play a critical role in bridging this gap, but there is limited evidence on the effectiveness of many of these programs, limiting evidence-based policymaking in this sphere. This paper examined a natural experiment comparing two large-scale interventions delivered through village-based community centers: (i) nutritious rations offered as ready-to-cook food packets once every two months (ii) the same rations program bundled with daily nutritious cooked meals. I used quasi-experimental methods to construct comparable village- pairs and collected primary data from ~ 930 pregnant women in rural Maharashtra in India. Relative to women who were offered rations only, those offered the bundled program experienced significant increases in daily nutrient intake, an additional 264 calories and 8 grams of energy and protein, leaving the protein-energy ratio unchanged. As compared to women's first trimester weight that were offered rations only, the bundled program led to additional weight gain of 2.03 kg in third trimester. Also, there are no spillover effects on the overall nutrient intake of women's existing children under age six, but there is a shift in the composition. Overall, these findings demonstrate that integrating daily cooked meals into existing ration programs can substantially improve maternal dietary intake and gestational weight, while generating benign intra-household spillovers on children.

1. Introduction

Although global food consumption has increased in recent decades, there is a concern that these gains may still not be well-aligned with physiological nutrition needs. In many low- income settings, diets remain inadequate in essential macro- and micronutrients, and undernutrition persists even amid growing concerns about obesity. Pregnant women are especially vulnerable because inadequate nutrition during pregnancy carries significant consequences for maternal health, fetal growth, birth outcome, and long-term development of the child (Black et al. 2008).

In this context, social protection programs are important policy instruments for addressing health and nutrition challenges, and food-based interventions are key components of these efforts (Morgan, Mittal, and Kumar 2025). Yet, policy discussions often overlook the diversity within food transfers, frequently equating them with dry rations, whereas the universe of food transfers encompasses a wide array of modes, including food price subsidies, food vouchers, hot cooked meals, or a combination of the above (Ugo 2016). My research leverages the variations in the modality and design of government-based food transfer programs to examine their impacts on nutrition and health outcomes.

In this paper, I examine whether strengthening an existing nutrition program by supplementing dry rations with daily cooked meals improves the nutrition and health of pregnant women and their young children in rural India. This question is particularly relevant for India, which has some of the world's highest rates of maternal and child malnutrition. For instance, nearly 19% of women in reproductive age had a Body Mass Index which was below normal (<18.5 kg/m^2) in 2019-21 (Government of India 2022b). These deficits translate to adverse birth outcomes and ultimately compromising child growth and development. The percentage of low birth weight babies (<2500 grams) was 18%, whereas every third child was stunted, every third child was underweight and every fifth child was wasted in 2019-21 (Government of India 2022b).

To address these very challenges, India operates large-scale food transfer programs such as the Public Distribution System (PDS) and the Integrated Child Development Services (ICDS), and these platforms are well-positioned to generate large-scale impacts. It is also important to recognize that transfer programs may have impacts beyond just the intended recipient. Transfers may ease resource constraints, improve women's bargaining power, or aid in targeting if explicitly labeled for women and children. By focusing on women's existing children under six, another

nutritionally vulnerable group, this study captures potential intergenerational benefits and provides more accurate assessment of program effectiveness and design.

To shed light on the relative effectiveness of different program designs, I leveraged a natural experiment comparing two nutrition programs offered through India's ICDS. The first program offered dry rations in the form of ready-to-cook nutritious food packets distributed once every two months; the second program bundled the same rations with nutritious cooked meals offered every day except Sundays. The rations comprised of cereals and/or pulses and when averaged over the distribution cycle, roughly provided around 430 calories and 14 grams protein per day. Beyond these rations, the cooked meal program offered a diverse composition, typically including cereals, pulses, vegetables, and eggs, and often accompanied by cereal-nut-jaggery based energy balls or bars, providing more than double the macronutrients as compared to rations, equivalent to 910 calories and 30 grams of protein per day. All the foods were distributed through village-based community health centers or Anganwadi centers (AWC), requiring the women to visit the center bi-monthly or daily to access them.

I examined the impact on macronutrient intake, focusing on energy intake, protein intake and protein-energy ratio. Further, I examined the impact on gestational weight, which is a key indicator of maternal nutrition, the inadequacy of which is linked with higher risks of preterm birth, low birth weight, and infant mortality (Ramakrishnan et al. 2012; Bhutta et al. 2013). I also investigated potential spillover effects of the programs on women's existing children (below six years), if applicable, focusing on energy intake and protein intake.

This study was based in Maharashtra, where the additional cooked meals were introduced in regions classified as scheduled and tribal areas of Maharashtra (Ministry of Tribal Affairs 2015). I exploited the fact that although the intention of the cooked meals program was to target tribal population, the program was implemented at village level and not individual level, benefiting all pregnant women in the selected villages regardless of their tribal status. Hence, villages with only small differences in the percentage of tribal population potentially received very different nutritional services.

Broadly, I employed two steps to address endogeneity issues in program placement. I undertook a selection of districts and blocks that exhibited heterogeneity in tribal population shares and treatment villages. Within these blocks, I made village-pairs using a combination of propensity score matching and geographic discontinuity design, ensuring that the matched villages were as

comparable as possible along key village characteristics and geographically proximate to each other. I assessed the robustness of the matching using individual-level balance tests and found minor differences across the two groups; these small imbalances were subsequently controlled for in the regression framework.

Data was collected from 927 pregnant women in their second and third trimesters, and a subsample of 258 women were followed across both trimesters, resulting in total observation count of 1185. Data was collected over six months (October 2024–March 2025) and notably included 24-hour dietary recall for calculating nutrient intake, information on utilization of food transfers, and weight of pregnant women across the two groups. The dietary recall captured all foods consumed during the previous day, including preparation details, quantities, and ingredients, allowing for precise calculations of nutrient intake. Dietary recall data was also collected for women's existing children (below six years), resulting in a total observation count of 483. Two types of weight data were collected, first, weights independently measured by the survey team on the day of the survey, and second, weights documented in women's government-issued *Mother and Child Protection cards*, which resulted in a total observation count of 2,693.

The consumption of rations and cooked meals on the day prior to the survey was 16% and 52% respectively for the women in villages that were offered the bundled program as compared to 14% consumption of rations to those offered rations only. Women in the former group had a higher energy and protein intake of 264 kcal and 8 grams respectively, relative to the latter group. However, there was no significant impact on protein-energy ratio. Also, approximately 50-60% of the incremental energy and protein intake, respectively, was driven by cereals, with the remainder driven by vegetables and eggs & meat; these food groups were key components of the cooked meal program for pregnant women in Maharashtra. While energy and protein intake from home-cooked meals marginally decreased for the group that was offered the bundled program, the substantial gains from the cooked meals more than offsets this reduction. Overall, this aligns with the ICDS objective of providing supplementary nutrition.

Consistent with the increased nutrient intake in the cooked meals group, women in these villages also experienced meaningful increases in gestational weight during later stages of pregnancy. As compared to women in villages that were offered only rations, those that were offered the bundled program of rations and cooked meals, experienced an additional weight gain

of 2.03 kg in the third trimester. These findings are based on weights from women's health records, and are robust to using measured weight collected independently by the survey team.

These are substantial and important gains in this setting, where the average baseline weight in the first trimester is 46 kg and average weight in the third trimester is 51.4 kg across the two groups in the sample, based on cross-sectional evaluation of data. As such, the energy requirements for pregnant Indian women are 2410 & 2600 kcal[1] during second and third trimesters respectively (ICMR-NIN Expert Group on Nutrient Requirement for Indians 2020). Given mean energy intake for the women in villages that were offered only rations is 2387 kcal, the observed impact of 264 kcal from the bundled program is substantial, particularly during third trimester when the fetal growth is rapid, moving women towards their recommended energy requirements. Notably, these gains of approximately 6 kg from first to third trimester for the group that was offered rations only, with 2 kg additional average weight for the group that was offered the bundled program, are still substantially less than the recommended guideline of 10-12 kg for the entire duration of pregnancy. Furthermore, based on Body Mass Index calculations from secondary data sources[2], approximately 67% of women in this geography fall within the normal weight range, while about 25% can be classified as underweight (Government of India 2022a). This distribution underscores the relevance of examining nutritional improvements in a setting where undernutrition remains far more prevalent than overnutrition.

Although the interpretation of increase in caloric intake is relatively unambiguous, it is challenging to compare the results on protein intake in the context of latest recommendations. The latest guidelines are available for quality protein that considers important issues of amino acids, digestibility and environmental factors that may increase the crude requirements, whereas this study calculates protein intake as crude densities, given the limitations of available data on food composition (Minocha, Thomas, and Kurpad 2017; ICMR-NIN Expert Group on Nutrient Requirement for Indians 2020). Nevertheless, the present study reports a mean value of 67 grams for protein intake in group that was offered only rations, which are comparable to the recent estimates of 61.8 grams of per capita protein intake in Indian rural population (National Statistics Office, Ministry of Statistics and Programme Implementation 2025).

[1] Based on baseline requirement for a moderately active healthy Indian women under 30 years, which is 2130 kcal, and additional energy requirements during pregnancy of 280 kcal and 470 kcal during second and third trimester respectively, to support an overall gestational weight gain of 10-12 kg during pregnancy.

[2] Based on author's calculation using National Family Health Survey 2019-21 for the study districts.

From the analysis on the spillover effects on young children of pregnant women, I find that although the program does not increase children's overall nutrient intake, it shifts the composition of their diets towards cereals and away from snack foods, and is consistent with the data on sharing of cooked meals. These benign spillovers highlight natural household redistribution patterns without diminishing benefits to pregnant women.

This study makes several contributions to literature and has important policy implications. First, there is much interest in India in shifting away from food to cash transfers (Narayanan and Saha 2020). While food programs have been successful in reducing hunger and food insecurity, critics argue that their emphasis on subsidized cereals limits their impact on providing nutrition security through improvement in dietary diversity, and protein and micronutrient intake (Pingali and Sunder 2017; Minocha et al. 2019). Moreover, food based interventions have not always translated to corresponding health improvements, such as gestational weight, although that can be influenced by factors beyond nutrient intake such as nutrient absorption and infections (Ramakrishnan et al. 2012; Black et al. 2013). However, there is limited data backed evidence on the relative impact of various designs of food transfers, particularly for pregnant women. This study helps in filling that gap by building evidence on a relatively new type of food transfer, demonstrating it's positive impact on nutrition and health of the intended recipients.

Relatedly, policymakers are often concerned that transfers may be directly shared by other household members or women may reduce the consumption of other foods when receiving transfers, partially offsetting the nutritional gains. Hence, regardless of any food transfers, an improvement in nutrition and health of the intended recipient is not guaranteed. This study directly addresses these concerns and finds strong evidence that the cooked-meal program delivers meaningful gains to pregnant women. The decomposition analysis by sources of food shows that while women get slightly lower nutrients from home-cooked meals, the gains from cooked meals outweigh these reductions, resulting in an overall positive impact. Beyond that, this study also sheds light on potential of food transfer programs to have spillover effects on children of the intended recipients. Although it finds modest shifts in children's dietary composition but no change in their total nutrient intake, indicating benign effects without undermining the benefits to pregnant women.

Second, cooked meal programs in India have historically focused on children, although finding positive impacts. An evaluation in rural Bihar showed that cooked meals improved nutrient

intake among older children, although younger children who only received rations did not benefit as much (Mittal and Meenakshi 2019). Another study that examined India's mandated school meal program found that children's daily nutrient intakes rose by 49–100% of the in-kind meal value, substantially reducing protein and calorie deficits (Afridi 2011). More recently though, there has been an increasing policy interest in targeting pregnant women through cooked meals in India. Several states such as Telangana, Andhra Pradesh, Karnataka, Chhattisgarh, Gujarat and Maharashtra have introduced cooked meals, yet this remains a largely understudied program (Kachwaha et al. 2021). Notably though, one study conducted among 360 pregnant and lactating women in Andhra Pradesh and Telangana during the pilot stage of the program in 2016, reported enhanced dietary diversity (57–59% consuming more than six food groups) and high consumption of eggs and milk (74–96%) among cooked-meal beneficiaries (Sethi et al. 2019). By generating new evidence on cooked meals targeted to pregnant women, the present study complements this emerging literature and, importantly, also demonstrates a positive impact on gestational weight.

In doing so, this study also shows how natural experiments embedded in real-world policy implementation can be leveraged to evaluate programs. Specifically, this study used the selected program rollout in Maharashtra, that varied even within blocks for some districts, creating fertile grounds for finding comparable villages. By examining government documents, engaging with government stakeholders, and analyzing secondary data, this study developed institutional understanding of the nuances of program targeting and used it for strengthening the causal identification. Evaluating large-scale government programs delivered through platforms such as ICDS is highly valuable because they have potential to generate evidence that is meaningful at scale.

The rest of the paper is organized as follows: section 2 gives a brief background about ICDS and the food transfer programs for pregnant women, section 3 presents the research design, section 4 presents the results and section 5 concludes the study. The main tables and figures are presented after the references, followed by the appendix of the paper.

2. Background

2.1. Integrated Child Development Services and food transfers in India

The ICDS is one of the flagship programs of the Government of India providing a package of multisectoral interventions for early childhood care and development ("http://icds-wcd.nic.in/" n.d.). The program targets pregnant women, lactating mothers, and children under six years of age. The services under ICDS include supplementary nutrition, pre-school non- formal education as well as basic health services like immunization services, provision of nutritional supplements, health check-ups, growth monitoring, and nutrition and health counselling. These services are delivered through village-based community centers or *Anganwadi centers,* which typically has a catchment area of 500 to 1000 people and is staffed by an Anganwadi worker (AWW) and Anganwadi Helper (AWH). Currently, the program reaches about 82 million children under 6 years of age and over 19 million pregnant and nursing women (Chakrabarti et al. 2019). Hence, the scale at which ICDS creates an impact is huge.

The primary objective of the supplementary nutrition component of ICDS is to bridge the gap between the Recommended Dietary Allowance and the Average Daily Intake. The central government issues broad guidelines specifying minimum per-beneficiary costs and macronutrient content; for example, it recommends a minimum provision of 600 kcal and 18–20 grams of protein per day at a cost of Rs 7 ($0.079) for pregnant women ("http://icds-wcd.nic.in/" n.d.). However, the design and implementation of the program vary across states, which determines the modality of transfer, procurement of raw materials, quality standards, menus, and food preparation practices, which are often based on local availability, dietary norms, and administrative feasibility (Parasar and Bhavani 2018). Food transfers are offered in the form of dry rations or cooked meals or both. Since the program's inception, the status-quo approach in many Indian states has been cooked meals for children above 3 years, while dry rations for other eligible population groups, including pregnant women. Dry rations typically consist of ready-to-cook sweet or savory premix packets made from cereals and/or pulses, which are often consumed as a porridge. In many states, these premixes are fortified with additional micronutrients, and their packaging clearly specifies the ingredients and intended beneficiaries.

Andhra Pradesh was the first state in India that introduced cooked meals for pregnant women in 2013, which was followed by Chhattisgarh, Gujarat, Karnataka, and Maharashtra. The meals usually consist of cooked grains (rice, wheat, or millets), *dal* (cooked lentils or pulses),

vegetables, and eggs, and some states provide additional items like milk or nut-based energy balls, with nutrient content ranging between 900- 1200 calories and 21-33 grams protein (Kachwaha et al. 2021). Some states also distribute iron-folic acid tablets alongside the meals. To minimize sharing, meals are intended to be consumed on-site at Anganwadi Centers, although in practice several centers allow them to be taken home.

2.2. Food transfer Interventions in Maharashtra: A Natural Experiment

The present study is based in Maharashtra, which is a state in the western peninsular region of India with high rates of maternal and child malnutrition. For example, the percentage of women with body mass index below normal is 20.8%, low birth weight is 20% and stunting is 35%; these figures are similar to the national average (IIPS and ICF 2021). The participation in ICDS varies across districts in Maharashtra; 17% of women in the capital city of Mumbai reported utilizing food transfers through ICDS, compared to 92% in Gondiya district.

In Maharashtra, the status-quo food transfers for pregnant women consist of dry rations in the form of ready-to-cook lentil–rice and multigrain cereal premixes. Beneficiaries are offered approximately 6-6.5 kg of rations every two months, providing roughly 430 kcal and 14 g of protein per day for a serving size of 100-105 grams, based on averaging over the distribution cycle. The cooked meal program for pregnant women, *APJ Abdul Kalam Amrut Ahar Program*, was implemented in some regions of Maharashtra in 2016 (Ministry of Tribal Affairs 2015). As per the program guidelines, a diversified meal is provided 6 days a week, consisting of wheat flat breads, rice, egg, lentils, vegetables, and jaggery-groundnut based energy balls, with bananas substituted for eggs for vegetarians. The program aims to provide 910 calories, 30 g protein, 33 g fat, 91 mg calcium, and 6.5 mg iron per day. Although the program requires women to consume the meals at the *Anganwadi* center, in practice, these meals are often packed in tiffin boxes for home consumption.

Maharashtra has 553 ICDS projects that are spread across 36 districts, with these projects usually operating at the block or sub-block level and encompassing several hundred villages or municipalities under each project. The cooked meals program for pregnant women was a targeted program, implemented in about one-fifth of these projects, specifically in villages classified as scheduled and tribal areas within these projects, spread across 15 districts (Ministry of Tribal Affairs 2015). Notably, several ICDS projects are only partially covered under the program,

resulting in variation in implementation across villages within the same project, a feature that I exploit for sampling of this study.

2.3. Scheduled and tribal areas of Maharashtra

To promote inclusive development of tribal communities, Maharashtra classifies its regions into three broad categories, based on the concentration of tribal populations and their geographical distribution (Government of Maharashtra 2020). The first category, Main Tribal Sub-Plan (TSP) areas, comprise of core tribal regions with a high concentration of tribal populations. These areas overlap with the Scheduled Areas identified under the Constitution of India in 1975, which are granted special administrative autonomy, enabling village councils and their elected representatives to exercise self-governance. The second category comprises Additional Tribal Sub-Plan (ATSP) areas, Modified Area Development Approach (MADA) areas, and Mini-MADA clusters, which have a relatively lower concentration of tribal population, implying mixed habitation of tribal and non-tribal communities. These areas were identified by the state government to extend tribal-focused development support to communities residing outside the center-classified Scheduled Areas but that may be facing similar social and economic disadvantages (Government of Maharashtra 2020). These areas are referred to as extended tribal areas in this paper. Many development programs in this area replicate the interventions implemented in the main tribal area, including the provision of cooked meals for pregnant women. Yet these areas lack the specialized autonomy that is potentially linked to service quality because these areas have the status-quo system of governance like the rest of India (Gulzar, Haas, and Pasquale 2020). Since many of these programs are operated at village level, they also benefit non-tribal communities of the village. Equally, tribals living in the third category, classified as Outside Tribal Sub-Plan (OTSP), which comprises the remaining regions of Maharashtra that are not covered under core tribal areas or extended tribal areas, do not get exposed to cooked meals. As such, around 48% of tribal population reside under the first two categories whereas rest of the tribal population still reside in the third category (Government of Maharashtra 2020). This study focuses on the second and third categories to form the two treatment groups. Specifically, villages in the third category are offered the status-quo dry ration program for pregnant women, while those in the second category are offered a bundled program of dry rations and cooked meals, but both these groups comprise mixed populations of tribal and non-tribal communities.

3. Research Design

3.1. Study Site

This study was conducted in 2 districts of Maharashtra- Chandrapur & Yavatmal, presented in **Appendix Figure 1**. These districts are in the rice and cotton producing belt of Maharashtra, close to proximity with each other. These districts have ~18% of the scheduled tribe population, almost double that of the average of Maharashtra ~10% (Government of Maharashtra 2020). These districts have high rates of malnutrition amongst women and children; for example, the prevalence of stunting amongst children under 5 is 37% in these districts (IIPS and ICF 2021). Women from these districts reported that 53-74% received supplementary nutrition through ICDS during last pregnancy (Government of India 2022b). Five ICDS projects or blocks spread across these two districts were selected: Bhadrawati, Warora, and Chimur in Chandrapur, and Yavatmal and Kalamb in Yavatmal, presented in **Appendix Figure 2**. These projects had variation in treatment status, as presented in **Appendix Figure 3**, and variation in tribal population, as presented in **Appendix Figure 4**. Additionally, these projects operate as extended tribal areas. The final selection of villages within these projects is presented in **Figure 1**. The eligibility criteria for primary data was women who had completed 3 months of pregnancy, by which women in Maharashtra are expected to register their pregnancy and access any government benefits. The eligibility criterion for women's existing children was being under six years of age, ensuring that information on their food intake could be reliably reported by their mothers.

3.2. Identification Strategy

I leveraged a natural experiment arising from variation in the implementation of food transfers across villages the given blocks, where pregnant women in some villages were offered only dry rations (the status-quo transfer), while those in others were offered a bundled intervention of dry rations and daily cooked meals. The cooked meal program was a targeted program in scheduled and tribal areas of Maharashtra, so the placement was not random and likely correlated with areas having high concentration of tribal population, amongst other factors.

I addressed the potential endogeneity in the program placement using quasi-experimental methods, broadly following two steps. In the first step, I undertook a selection of ICDS projects that exhibited variation in treatment status and tribal population across villages, ensuring that comparisons were made within the same administrative blocks and across similar populations. I further purposively restricted the sample to projects where the treatment status corresponded to

extended tribal areas identified by the state, rather than the constitutionally classified scheduled or core tribal regions. In the second step, I followed principles of geographic discontinuity and propensity score matching to make village-pairs within these projects that were similar to each other in terms of observable characteristics.

This first step allowed me to choose from a pool of villages that were geographically proximate, with similar social demography, agro-climatic conditions, sources of livelihoods, food habits and cultural norms. In addition, it allowed me to control for within-project or within-block level factors such as local governance and administration that affect the functioning of government programs including the ones that I studied in this paper. Last, by focusing on extended tribal areas, I didn't have to worry about the potential confounding effects arising from the distinct self-governance systems present in scheduled areas or core tribal regions.

The second step was important because even villages in extended tribal areas and non-tribal areas within the same block may be systematically different from each other. First, despite decades of migration and geographical proximity to non-tribal areas, the villages in extended tribal areas may have a relatively higher percentage of tribal population as this was the key criterion used for their classification in the 1970's. This is an important consideration because tribal communities in India remain among the most economically disadvantaged, with high poverty, low educational attainment, and limited livelihood options. These structural disadvantages alongside cultural differences profoundly influence their food choices, health status and access to government welfare programs. Second, the villages in extended tribal areas may receive additional funding support to dilute these very structural differences through investment in infrastructure and implementation of welfare schemes, implying that these villages may even be better-off than non-tribal villages in some of the above-mentioned outcomes. Third, political factors may vary across these areas, for example, social identity of people in important village positions may interact with village social composition in the utilization of development funds.

For making villages- pairs, the following steps were undertaken. First, I compiled an exhaustive list of villages in the selected study projects and categorized them into the two treatment groups. In the first group, the non-tribal villages were only offered rations (status-quo program), and in the second group, extended tribal villages were offered both rations and cooked meals. A regression analysis, with this categorization as the dependent variable was performed using a host of village-level characteristics to understand the observable determinants of classification of these

areas. I used a logit model for this regression and saved the propensity scores. Following variables were used in the regression: 1) Deciles based on percentage of scheduled tribe population, 2) Deciles based on percentage of farming households, 3) Village Size, 4) Agriculture Infrastructure & Services Index, 5) Livestock Infrastructure & Services Index, 6) If the village has minor forest produce 7) Village Infrastructure & Services Index, 8) Distance to market, 9) Household Deprivation Index, 10) Welfare Programs Coverage Index, 11) Per capita approved labor budget for 2018-19, 12) Per capita expenditure on labor budget 2018-19, 13) Mobilization through self-help or producer groups. Specifically for scheduled tribes, I constructed a decile of this variable instead of using it as continuous variable, so as not to make the sampling less restrictive. Hence, by design I expect that there would be some differences in percentage of scheduled tribe across the two areas, but the magnitude of these differences should be within a reasonable bound. The complete list of variables used in forming the indices, justification for using these variables and the results of the logit regression are available in the **Appendix Note 1** and **Appendix Table 1** of the paper.

Second, I used the village centroids data to match each village in the extended tribal area to 10 nearest villages in the non-tribal area, restricting this choice to be within the same block. As mentioned above, these villages were likely to have similar socio-demography, agro-climatic conditions, sources of livelihoods, distance to nearby towns, food habits and cultural norms. I then merged this data with the propensity scores, and eliminated the villages which had a cutoff below 0.1 (0.25*SD of propensity score). Hence, each village in the first group was matched to several geographically close villages in the second group, with several overlapping options across the second group. Some villages in the first group did not find any matches from the second group, which were eliminated from the sample pool, whereas some villages found multiple matches from the second group. I then assigned a random number to each village- pair and made selection in ascending order, eliminating village-pairs with repeated villages from the second group. I randomly selected an AWC from the village if the village had multiple AWC, or selected more than one AWC if the match was with the village with the same number of AWC. The mean distance across the village-pairs is 6.7 km.

These steps minimized physical distance and observable characteristics between villages, under the key assumption that reducing such observable differences also minimized differences in

unobserved characteristics, and that post matching, the unobservables were not systematically correlated with program placement.

3.3. Data

The exhaustive list of villages for the sampled block was created using village shape files (2016) and the village census data (2011) from SHRUG data (Development Data Lab 2025). The former data was also used for calculating village centroids. The information on classification of villages as extended tribal areas, where cooked meal program was offered for pregnant women, was obtained from district or block level officers. For village level data on infrastructure and services, I used "Mission Antodaya Data (2020)" (Government of India 2020). One drawback of this data was that it did not have information about the percentage of tribal population, which was an important determinant for tribal areas so I extracted this information from census 2011 and integrated it with this data (Government of India n.d.).

Two rounds of primary data was collected between October 2024- March 2025, coinciding with the rabi agricultural season during which wheat and cotton are commonly grown in the study sites. The power calculations for primary data collection are presented in **Appendix Note 2**. To identify eligible respondents, the survey team contacted the Accredited Social Health Activists (ASHAs) of the village, who served as the first point of contact and helped in the listing of pregnant women associated with the given AWC. ASHA workers were contacted even though the Anganwadi Workers (AWW) were in-charge of the food transfers, so as to get an unbiased and exhaustive information about pregnant women in the village. In the first round, data was collected from women in their second and third trimesters of pregnancy. In the second round, the survey team re-interviewed women who were still pregnant, allowing for a repeated subsample of individuals who transitioned from the second to the third trimester. In addition, new respondents from the same villages who were in their second trimester at the time of the second round were added.

Specifically for gestational weight data, women's health records were used, although weight was also measured on the day of the survey. Since women were either in their second or third trimester of pregnancy at the time of the survey, and the weight measurements were recorded through different stages of pregnancy, this resulted in a larger sample of weight observations from health records. Note that for the repeated subsample, the most recent health records (from Round 2) were used to avoid double counting. Data was also collected about pregnant women's existing

children (if any), restricting it to those under six years of age so that reliable information could be obtained from their mothers. In addition, interviews were conducted with both ASHAs and AWWs to gather program-level insights.

The final number of unique and repeated observations for pregnant women and their existing children under six years of age is summarized in **Appendix Table 2**. On an average, there were 3 women per village so that the total number of villages in the sample are 203 across the two groups.

3.4. Outcome Variables

There are two broad sets of outcome variables for pregnant women, nutrient intake and gestational weight, and for children below six years, only nutrient intake data was collected. Nutrient Intake was estimated using the 24- hour multi-pass dietary recall method in which foods consumed by the respondent and their children during the previous day was recorded, including foods consumed at the Anganwadi center. For the home-cooked meals, the non-standard recipe method was applied in which recipe of the foods was documented, and food consumed by the respondent and her children below 6 years was factored out based on their reported consumption measurements (Kirkpatrick et al. 2022). However, recipes were not collected for snack items, leftovers or meals consumed outside home, and standard recipes were used to approximate the nutrient values of these food items (Vijayakumar et al. 2024). A detailed discussion of the food measurement procedures is provided in **Appendix Note 3**. A food composition table was compiled to map all the foods consumed to their nutrient values (Longvah et al. 2017; Kirkpatrick et al. 2022). The current analysis focuses on calories intake and protein intake. To address potential measurement error, the data were winsorized at the 1st and 99th percentiles, restricting energy intake in the range of approximately 828–4742 kcal and trimming about 22 observations.

Two types of gestational weight data were used. First, information was obtained from women's health records documented in the *Mother and Child Protection (MCP) card* that records the last menstrual period, measurement dates, and corresponding weights. These records enabled precise identification of weight at any given day, week, or month of pregnancy and was used as the primary data source for the empirical specification. Second, women were also weighed on the day of the survey, providing an additional measure of weight corresponding to their stage of pregnancy, which was used for robustness check.

3.5. Empirical Strategy

I estimated intention-to-treat effects by comparing pregnant women residing in villages offered bundled cooked meals and rations to those in villages offered rations only. I pooled the data from both the rounds, including the subsample of women observed in both periods. The primary specification regresses the outcome (calorie intake/protein intake/protein-energy ratio) on an indicator for exposure to the cooked-meal program, controlling for baseline covariates, district and survey-month fixed effects. Standard errors were clustered at the village level and individual level where repeated observations were used. The same empirical specification was applied to estimate program impacts on nutrient intake of the existing children of the sampled pregnant women.

$$Y_{it} = \beta_0 + \beta_1 Cooked\ Meals\ \&\ Rations\ Group_i + \alpha' X_i + \delta_{d[i]} + \tau_{m[it]} + e_{it} \quad (1)$$

Where Y_{it} refers to calories intake, protein intake and protein-energy ratio for a pregnant women/ child i in time period t. This is time variant because I considered two data points for a subsample of women. $Cooked\ Meals\ \&\ Rations\ Group_i$ refers to pregnant women residing in villages where food transfers were offered as a bundled program consisting of both cooked meals and rations whereas the base category are the women residing in villages where only rations were offered. In the vector of baseline covariates, X_i, I included variables which were found imbalanced across the two groups; this included wealth index, hygiene index, dummies for caste of the household, if the household had Below Poverty Line card, and if the main occupation of spouse was "Non-Agricultural labor". A detailed description of the construction of the indices is presented in **Appendix Note 4** and implications of these differences are discussed in *Section 4.1.,* where Balance Tests are presented. $\delta_{d[i]}$ and $\tau_{m[it]}$ capture the district and survey month fixed effects. β_1 captures the average differences in nutrient intake of pregnant women which were offered both cooked meals and rations as compared to those which were only offered rations.

For gestational weight, I extended this regression to include trimester indicators and their interactions with program exposure, allowing estimation of trimester-specific effects while controlling for baseline weight (i.e., weight during the first trimester). This adjustment is important for two reasons: first, gestational weight naturally expected to increase across trimesters; and second, since the program begins in the early second trimester, its effects on weight gain are likely to manifest only in subsequent stages of pregnancy. The empirical specification is given as follows:

$$W_{it} = \beta_0 + \beta_1 Cooked\ Meals\ \&\ Rations\ Group_i + \sum_{k=2}^{3} \beta_k Trimester_{k,it} + \sum_{k=2}^{3} \gamma_k (Trimester_{k,it} * Cooked\ Meals\ \&\ Rations\ Group_i) + \alpha' X_i + \delta_{d[i]} + \tau_{m[it]} + e_{it} \quad (2)$$

Where W_{it} refers to gestational weight for a pregnant women *i* in time period *t*. $Trimester_{k,it}$ are indicators for the weight measurement in trimester k=2, 3, whereas the base category is Trimester 1. Additional factors such as number of visits for Antenatal Care Services and the type of care services received may also impact the weight, however, these were balanced across the two groups so were not added as control variables. γ_2 and γ_3 are the parameters of interest that captures the differential effect of the program in trimester 2 and 3 respectively, relative to trimester 1.

3.6. Robustness Checks and Extensions

To assess the robustness of the matching procedure, I conducted a series of checks. First, I examined balance in village-level characteristics using the variables included in the logit regression based on secondary data; these are expected to be balanced by design given their use in matching. Second, I tested balance in individual-level characteristics using the primary survey data collected for this study, which served as a true test of post-matching comparability. Third, I performed a placebo test using information on other government programs unrelated to the food transfer intervention. Specifically, I used data on maternity cash transfer schemes such as the *Pradhan Mantri Matru Vandana Yojana (PMMVY)*, *Janani Suraksha Yojana (JSY)*, and *Indira Gandhi Matritva Sahayog Yojana (IGMSY)*. I used indicators for program participation in any of these programs and total benefit amount received as placebo outcomes; given the design of these programs, there should be no systematic difference in access between extended tribal and non-tribal areas, providing a validity check for my identification strategy.

For checking the robustness of the empirical models and ensuring that the results are not driven by a particular set of model assumptions, I examined the stability of the estimated coefficients across alternative model specifications, which involved sequentially removing control variables. The magnitude and significance of the key treatment effect should remain consistent for robustness.

To strengthen causal interpretation of the impact on nutrient intake and verify that the observed impacts are driven by the food transfer program itself, I tested the heterogeneous treatment effects by trimester on nutrient intake. Given that the program content is constant across the two trimesters, I don't expect significant differences in the program effects across trimesters.

To test the robustness of the estimated impact on gestational weight, I used the directly measured weight data from the survey instead of the weight recorded in health cards, and compared the results.

Finally, to get a greater understanding of the drivers of impact, I decomposed the total nutrient intake by different food groups to identify which foods drove the overall effects, expecting that the foods offered through the program primarily drove the effect. I also made use of the data on the sources of food to examine which sources contributed to the effect, with the expectation that the consumption reported through cooked meals program drove the effect. This also allowed me to examine whether the program complemented or substituted for other sources of food. Also, since the cooked meals program substituted banana for eggs amongst vegetarians, this implies that while the overall nutritional impact of the program would be similar across vegetarians and non-vegetarians, the sources of foods through which nutrients were derived will differ accordingly. I examined heterogeneous treatment effects by vegetarian status, analyzing how the impact on nutrient intake varied across different food groups and sources.

The regression equation for all heterogeneity analysis is given as follows:

$$Y_{it} = \beta_0 + \beta_1 Cooked\ Meals\ \&\ Rations\ Group_i + \beta_2 Heterogeneity\ Group_i + \beta_3 Cooked\ Meals\ \&\ Rations\ Group_i * Heterogeneity\ Group_i + \alpha' X_i + \delta_{d[i]} + \tau_{m[it]} + e_{it} \quad (3)$$

Where $Heterogeneity\ Group_i$ represents the group along which heterogeneity is examined (e.g., trimester, vegetarian status, etc).

4. Results

4.1. Balance Tests

The ex-ante village balance test based on secondary data used for logit regression are presented in **Appendix Table 3**. Overall, the sample appears well-balanced across the two groups, with the only notable difference being a higher percentage of scheduled tribe population in the extended schedule areas as compared to non-tribal areas. This is expected by design, since the propensity score matching was based on deciles of percentage of scheduled tribe population rather than exact values to make it less restrictive. Nonetheless, I find that the magnitude of these differences to be less than 10%, which is a reasonable difference.

I used the primary data to check balance at the individual level, presented in **Table 1**. The differences in caste composition at the individual level closely mirrors the differences observed in village-level secondary data. Additional differences were found in percentage of population holding Below Poverty Line (BPL) Card, the share of spouses of pregnant women engaged in non-agricultural labor, Wealth Index and Hygiene Index. These variables were added as controls in the main regression models, although the magnitude of the differences are modest. Importantly, these imbalances suggest that respondents in the extended tribal areas are relatively marginalized than the respondents in non-tribal areas, and that the baseline consumption levels amongst this group may be lower, so that the estimated program effects are likely conservative. This pattern is also reflected in the marginal differences in weight during the first trimester, based on health record data. This period precedes the start of the program and, biologically, the gestational weight gain is minimal during first trimester, if any.

4.2. Main Results

The consumption of transfers during the previous day is presented in **Table 2**. The average daily consumption of cooked meals and rations was 52% and 16% respectively for the group that was offered the bundled programs as compared to average daily consumption of rations at 14% for the group that was only offered rations. The main results for the impact of the program on pregnant women's energy intake, protein intake, and protein-energy ratio are presented in **Table 3**. These results are based on the preferred model specification that corresponds to Equation (1), which includes baseline controls as well as district and survey-month fixed effects. The results indicate that women residing in villages offered the bundled program of cooked meals and rations consumed, on average, 264 kcal more energy and 8 grams more protein daily than those in villages offered only rations. These are substantial gains when compared to mean energy intake and protein intake of 2387 kcal and 67 grams respectively for the group that was offered rations only. I don't find an impact on protein-energy ratio, which implies that the macronutrient balance of the meals is similar across the group.

These gains in nutrient intake also translate to positive effects on gestational weight during later stages of pregnancy, as presented in **Table 4**. The results indicate that women residing in villages in which the bundled program of cooked meals and rations is offered exhibited 2.03 kg higher weight in the third trimester, as compared to their first-trimester weight and to those in

villages offering only rations. When disaggregated by month of pregnancy, the gains appear to be concentrated in the final months of gestation, as presented in **Appendix Table 4**.

The results for the impact on the existing children of pregnant women are presented in **Table 5**. The estimates indicate no significant spillover effects of the program on children's total nutrient intake. However, the composition of food sources contributing to nutrient intake changed, as presented in the following section.

4.3. Results on Robustness Checks and Extensions

To check the comparability of extended tribal and non-tribal villages, other than the above-mentioned balance tests, I also performed a placebo test by using information on government-run cash transfer programs that are unrelated to the food transfer intervention, presented in **Appendix Table 5**. The first column reports the results for participation, and second column reports the benefit amount received from program specifically targeted to pregnant women. I find no differences on these outcomes across the treatment groups. This indicates that unobservable factors, such as political influences that might effect access to welfare programs, were not systematically different across the two groups.

To check the robustness of the impact on energy intake, protein intake and protein-energy ratio, I checked the stability of estimated coefficients across different model specifications. The results for energy intake, protein intake, and protein-energy ratio are presented in **Appendix Table 6, Appendix Table 7,** and **Appendix Table 8** respectively. The estimated coefficients remained stable when I sequentially removed the controls in column (2) to (4). The coefficients ranged from 253–271 kcal for energy intake and 7.6–8.2 grams for protein intake providing confidence that the results are robust to alternative model specifications. Further, I test for the heterogenous impact of the program by trimester and do not find significant differences between Trimester 2 and Trimester 3, which is expected given that the program content does not differ by trimesters even though nutrient requirements increase as the pregnancy progresses. These results are presented in **Appendix Table 9.**

To check the robustness of the program's impact on the weight of pregnant women, I use the data on measured weight, as presented in **Appendix Table 10**. Since the eligibility criteria of this study was women in the second and third trimester, so that first Trimester could not be used for comparison, therefore, the second trimester serves as the reference category in the regression equation (2). This is still a reasonable baseline as the weight gains during second trimester are

expected to be modest. I find that, relative to women in second trimester from villages that were offered rations only, women in villages that was offered both rations and cooked meals, gained an additional weight of 2.03 kg in the third trimester. These results support the impact of the program on gestational weight based on health records.

For understanding the drivers of the impact, I decomposed the total energy and protein intake by different food groups, and regressed it on the treatment indicators, as presented in **Table 6**. Women in villages that were offered cooked meals and rations got higher energy and protein intake from grains, vegetables and eggs & meat as compared to women in villages that were only offered rations. These food groups are key components of the cooked meals program. Notably, the largest gains were from cereals, which account for about 60% and 50% of the incremental increase in cooked meals in terms of energy intake and protein intake respectively. I also found a marginal decrease in nutrient intake from snack foods, an unintended but positive consequence of the cooked meals program. Furthermore, I decomposed nutrient intake by the source of food and regressed it on the treatment indicators, as presented in **Table 7**. Women in the group offered both rations and cooked meals got lower nutrient intake from home-cooked meals compared to those offered only rations so there is some crowding-out. However, this reduction is more than offset by the substantial gains in nutrient intake from cooked meals program. In other words, the complementary effect of the program dominated the substitution effect, which is an important finding given that the program is designed and promoted as a source of *supplementary* nutrition. This decomposition is also studied for pregnant women who identify as vegetarians, presented in **Appendix Table 11** and **Appendix Table 12**. The nutrient intake among vegetarians is higher from foods categorized as "fresh & dry fruits" and lower from "Eggs & Meat", while the total nutrient intake, intake from other food groups and intake by sources of food do not differ significantly between vegetarians and non-vegetarians. This finding aligns with the program guideline of substituting bananas in place of eggs for vegetarians.

This decomposition, by food groups and sources of foods, is also studied for pregnant women's existing children and presented in **Appendix Table 13**, and **Appendix Table 14**. I find that the existing children of pregnant women from villages that were offered cooked meals and rations got relatively higher nutrients from cereals and lower nutrients from snack foods, and these results are driven by the cooked meals program.

5. Conclusion

In this paper, I examined whether strengthening an existing food-based transfer program by supplementing dry rations with daily cooked meals improved the nutrition and health of pregnant women and their young children in rural India. Leveraging a natural experiment, I compared women in villages that were offered food transfers as only rations with those in villages offered a bundled program of rations and cooked meals. This paper consistently demonstrates that this strengthening led to improvements in nutrient intake and meaningful gains in gestational weight during pregnancy.

For energy intake, the mean baseline consumption amongst women in villages that were offered only rations was 2,387 kcal. An impact of 264 kcal per day represents a substantial improvement relative to recommended requirements during pregnancy, particularly in the third trimester, when fetal growth accelerates and the body prepares for lactation. The gain in protein intake of 8 grams per day is also meaningful for a setting where diets are predominantly cereal-based with overall low quality protein intake; for example, in this sample, cereals account for roughly 50–55% of total energy and protein intake across the two groups. While the program raises overall protein intake, it does not substantially alter the macronutrient composition of diets, as reflected in the unchanged protein–energy ratio. These estimated impacts on nutrients should be viewed in context of average daily consumption of cooked meals and rations at 52% and 16% respectively for the group that was offered the bundled programs as compared to average daily consumption of rations at 14% for the group that was only offered rations.

The incremental impact on nutrient intake was accompanied by significant improvements in gestational weight. Women who were offered the cooked meals and rations gained 2 kg additional weight during the third trimester relative to baseline first-trimester weight, as compared to women in the rations-only group. These estimates were based on health records, and robust to using independently measured weight by the survey team. As such, the baseline maternal weight across the two groups in this setting was an average of 46 kg during the first trimester and an average of 51.4 kg during the third trimester, hence, such additional gains are substantial. This is particularly relevant given that the recommended total gestational weight gain during pregnancy is 10-12 kg. Moreover, in this setting, approximately two-thirds of women have normal BMI and about one-quarter are underweight. Improvements in gestational weight are important not only for maternal wellbeing but also for fetal growth, with implications for child health.

These results are driven by the cooked meals program because the decomposition analysis shows that firstly, the specific food groups that contributed to the increased intakes were those offered through the cooked meals, and secondly, the sources of foods that drove the program are explicitly cooked meals program. I also found evidence of marginal substitution away from home-cooked meals among women offered the bundled program; however, this reduction was more than offset by large increases in nutrient intake from the cooked meals themselves. Thus, the complementary effect of the program dominated any substitution effect. From a policy perspective, this is an important finding given that the program is explicitly designed and framed as a supplementary nutrition intervention, and the results indeed indicate that households do not significantly reduce their own food provision when free meals were offered through government programs. Moreover, the substitution effects induced by the cooked-meals program also take the form of reduced consumption of snack foods (based on decomposition by food group) and reduced consumption of foods purchased from outside the home (based on decomposition by sources of food). These are unintended but positive shifts in dietary behavior, although the magnitudes of these reductions are not large.

Beyond the effects on women, there is some indication of spillovers to existing children of participating women, who are another vulnerable population group. However, these spillovers do not translate into increases in children's overall nutrient intake. Instead, the bundled program shifts the composition of children's diets: decomposition results show increases in nutrients from cereals and reductions in nutrients from snack foods. These patterns are consistent with the data on sharing of program meals within the household; 50% of women explicitly reported sharing the cooked meals with other household members. Overall, these findings suggest that while the program primarily benefits pregnant women as intended, some portion of the transfers (cereals) are shared with children, reshaping their diet composition without altering their overall nutrient intake. This likely reflects a natural household strategy.

Several limitations of this study warrant acknowledgment. First, although the research design accounts for non-random program placement through (i) selecting ICDS projects that had variation in percentage of tribal population and treatment, and (ii) applying a combination of matching and geographic discontinuity design within these projects, unobserved differences may still persist. For example, political motivations of village leaders. The placebo tests using uptake of an unrelated cash transfer program during pregnancy show no association with program

placement, reducing concerns about systematic bias. Moreover, baseline differences indicate that villages offered the bundled program were somewhat poorer, suggesting that the estimated impacts are likely conservative rather than overstated. Second, dietary intake is based on 24-hour recall data, which may be subject to measurement error, however, these errors are likely to be similar across treatment status. Moreover, the observed increases in nutrient intake appear to correspond well with gains in gestational weight. Finally, external validity may be limited to rural and tribal-dominant geographies with comparable ICDS implementation and similar baseline nutrition and health conditions.

Despite these limitations, the findings have clear policy relevance. This study provides evidence that supplementing rations with cooked meals can be an effective strategy for improving maternal nutrition within India's ICDS framework. Moreover, policymakers often worry that transfers may be shared with other household members or that women may reduce consumption of other foods when receiving transfers, partially offsetting nutritional gains. However, this is not a concern in the given study setting. At a time when debates focus on shifting toward cash transfers, these results highlight the continued value of food-based interventions, particularly nutrient-dense meals provided on a regular basis (Narayanan and Saha 2020). Importantly, different types of food transfers vary in modality, nutrient composition, and frequency, underscoring the need to evaluate and refine existing programs rather than replace them entirely (Ugo 2016). Given the high prevalence of low BMI and inadequate dietary intake among women of reproductive age, strengthening existing food transfer platforms with cooked meals may help in improving maternal health and achieving the goals of the National Nutrition Mission.

In conclusion, providing daily cooked meals alongside dry rations leads to substantial improvements in dietary intake and gestational weight among pregnant women in rural India. ICDS has a reach of about 82 million children under 6 years of age and over 19 million pregnant and nursing women (Chakrabarti et al. 2019). By building on the social capital created by ICDS, there is a significant scope for reducing the problem of malnutrition at scale in India.

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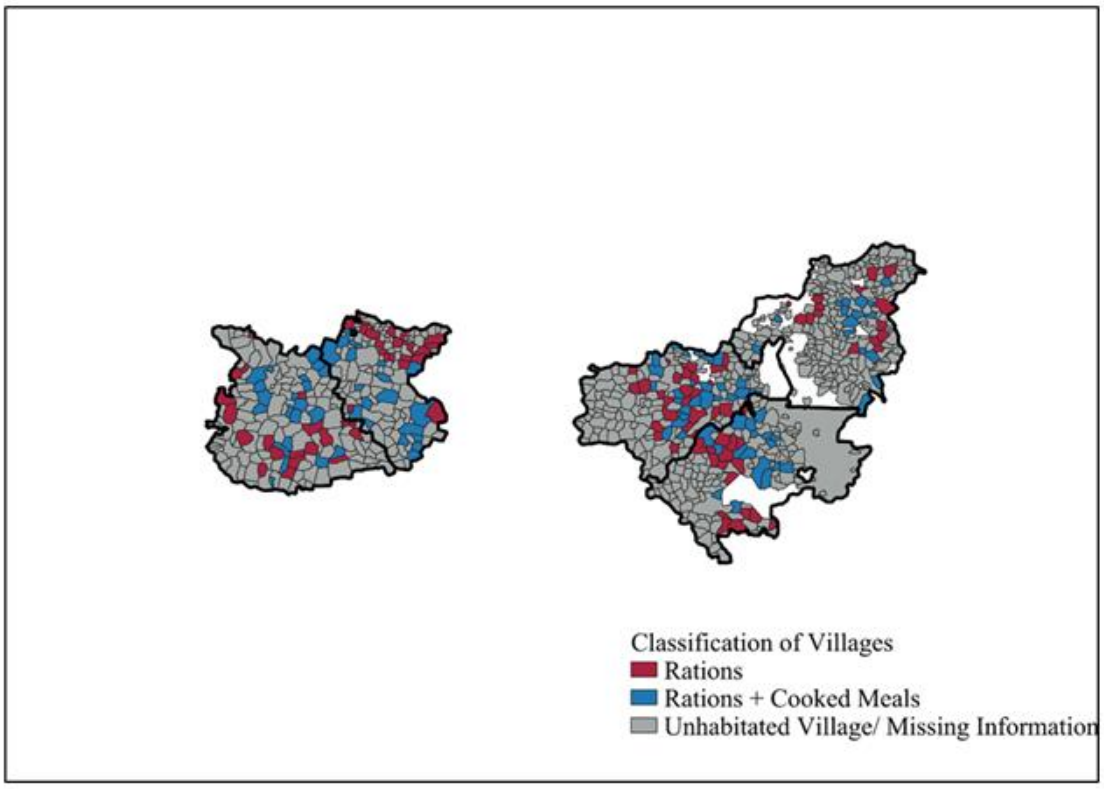
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7. Figures & Tables

7.1 Figures

Figure 1: Final Sample Villages



7.2. Tables

Table 1: Ex-post Individual Sample Balance Test

Variable	Group 1 Mean/SE	Group 2 Mean/SE	Pairwise t-test Mean difference
PW in their third trimester (%)	0.413	0.449	-0.036
	(0.023)	(0.023)	
Current age of PW	24.457	24.348	0.110
	(0.177)	(0.175)	
Age of PW at marriage	21.083	20.976	0.107
	(0.125)	(0.120)	
Number of Children of PW below 6	0.415	0.400	0.014
	(0.024)	(0.025)	
PW's aspiration for male child (%)	0.115	0.094	0.021
	(0.015)	(0.014)	
PW Type of marriage- Arranged (%)	0.796	0.812	-0.016
	(0.019)	(0.018)	
PW Higher Secondary Education (9-12) (%)	0.696	0.670	0.026
	(0.021)	(0.022)	
PW Higher Education (Completed 12th)(%)	0.234	0.223	0.011
	(0.020)	(0.019)	
Occupation of PW- House wife(%)	0.653	0.685	-0.032
	(0.022)	(0.022)	
Occupation of PW- Own Agriculture (%)	0.164	0.140	0.024
	(0.017)	(0.016)	
Occupation of PW- Agriculture labor(%)	0.119	0.129	-0.010
	(0.015)	(0.016)	
Occupation of PW- Other labor(%)	0.004	0.013	-0.009
	(0.003)	(0.005)	
If PW has worked before for income generation (%)	0.586	0.609	-0.023
	(0.026)	(0.026)	
Spouse's Secondary education (9-12) (%)	0.687	0.683	0.005
	(0.021)	(0.022)	
Spouse's Higher Education (Completed 12th)(%)	0.211	0.199	0.012
	(0.019)	(0.019)	
Occupation of Spouse- Own Agriculture (%)	0.362	0.311	0.051
	(0.022)	(0.022)	
Occupation of Spouse- Own business (%)	0.132	0.116	0.016
	(0.016)	(0.015)	
Occupation of Spouse- Agriculture labor (%)	0.155	0.175	-0.020
	(0.017)	(0.018)	
Occupation of Spouse- Other labor(%)	0.138	0.210	-0.072***

	(0.016)	(0.019)	
HH size	5.557	5.499	0.059
	(0.139)	(0.128)	
Total number of working members in HH	2.787	2.766	0.021
	(0.060)	(0.060)	
Religion- Hindu (%)	0.915	0.923	-0.009
	(0.013)	(0.012)	
Caste- Scheduled Caste (%)	0.089	0.081	0.008
	(0.013)	(0.013)	
Caste- Scheduled Tribe (%)	0.334	0.455	-0.121***
	(0.022)	(0.023)	
Caste- Other backward castes (%)	0.385	0.309	0.077**
	(0.022)	(0.022)	
Caste- Other Castes (%)	0.191	0.155	0.036
	(0.018)	(0.017)	
Type of ration card- BPL	0.415	0.545	-0.130***
	(0.023)	(0.023)	
Wealth Index (based on Principle Component	0.111	-0.114	
Analysis)	(0.052)	(0.621)	0.224***
Hygiene Index (based on Principle Component	0.111	-0.114	
Analysis)	(0.044)	(0.058)	0.224***
Number of visits by ASHA	6.22	6.41	-0.19
	(0.13)	(0.13)	
Number of Antenatal Care Visits	6.5	6.3	0.20
	(0.14)	(0.14)	
Antenatal Care Services Index (based on Principle	0.017	-0.017	0.03
Component Analysis)	(0.05)	(-0.08)	
Body weight of PW during first trimester	46.45	45.49	0.96
	(0.45)	(0.41)	
Sample Size	470	457	

Abbreviations: PW- Pregnant women, HH- Household, BPL: Below Poverty Line
The last four rows are based on different sample size than the rest of the variables. Body weight is based on health records with a sample size of 675, the other three variables are based on sample size of 1185.
**** p<0.01, ** p<0.05, * p<0.1*

Table 2: Consumption of food transfers

	Rations	Cooked Meals
Rations only program	14%	N/A
Rations & Cooked Meals program	16%	52%
Observations (full sample)	598	587

Notes: Based on consumption in the last 24 hours

Table 3: Regression Results for program impact on Energy Intake (kcal/ day), Protein Intake (gm/day) and Protein-Energy Ratio of pregnant women

	Energy Intake (kcal/day)	Protein Intake (gm/day)	Protein-Energy Ratio
Rations & Cooked Meals Program	264.37***	8.15***	0.0005
	(50.47)	(1.59)	(0.001)
Individual, Spouse & Household Controls	Yes	Yes	Yes
Month of survey effects	Yes	Yes	Yes
District Effect	Yes	Yes	Yes
Control Mean	2,387	66.98	0.11
Observations (full sample)	1,185	1,185	1,185
Observations (unique sample)	669	669	669
Observations (repeated sample)	258	258	258

Notes: Base treatment category is rations only program, All standard errors are clustered at village & individual level; unique sample implies women with single observations; repeated sample implies women with two observations across two periods
**** p<0.01, ** p<0.05, * p<0.1*

Table 3: Regression Results for program impact on weight (kg) of pregnant women by trimester of pregnancy

	Body Weight (kg)
Rations & Cooked Meals Program	-0.28
	(0.73)
Trimester 2	1.49***
	(0.44)
Trimester 3	4.46***
	(0.67)
Rations & Cooked Meals*Trimester 2	0.86
	(0.63)
Rations & Cooked Meals*Trimester 3	2.03**
	(1.02)
Individual, Spouse & Household Controls	Yes
Month of survey effects	Yes
District Effects	Yes
Control Mean	47.83
Observations (full sample)	2693
Observations (unique sample)	175
Observations (repeated sample)	728

Notes: Weight data is based on women's health records, Base treatment category is rations only program, Base trimester category is Trimester 1; All standard errors are clustered at village & individual level; Unique sample implies women with single observations; Repeated sample implies women with multiple observations

**** p<0.01, ** p<0.05, * p<0.1*

Table 4: Regression results on program impact of energy intake (kcal/day) and protein intake (gm/day) of existing children (below six years) of pregnant women

	Energy Intake (kcal/day)	Protein Intake (gm/day)	Protein-Energy Ratio
Rations & Cooked Meals Program	53.08 (55.95)	1.14 (1.44)	-0.002 (0.002)
Individual, Spouse & Household Controls	Yes	Yes	Yes
Month of survey effects	Yes	Yes	Yes
District Effects	Yes	Yes	Yes
Control Mean	1130	29.22	0.105
Observations (full sample)	483	483	483
Observations (unique sample)	285	285	285
Observations (repeated sample)	99	99	99

Notes: Base treatment category is rations only program, All standard errors are clustered at village & individual level, Unique sample implies children with single observations; Repeated sample implies children with two observations
**** p<0.01, ** p<0.05, * p<0.1*

Table 5: Regression results on impact of the program on energy intake (kcal/day) and protein intake (gm/day) of pregnant women by food groups

	Grains		Pulses		Vegetables		Eggs & Meat		Fresh & Dry Fruits	
	Energy (kcal/day)	Protein (gm/day)	Energy (kcal/day)	Protein (gm/day)	Energy (kcal/day)	Protein (gm/day)	Energy (kcal/day)	Protein (gm/day)	Energy (kcal/day)	Protein (gm/day)
Rations & Cooked Meals program	157.9***	4.1***	21.39	0.84	54.43***	1.19***	44.83***	2.23***	0.57	0.0018
	(31.62)	(0.80)	(13.13)	(0.76)	(11.43)	(0.27)	(8.3)	(0.75)	(6.46)	(0.14)
Control Mean	1,270	33.97	215.17	13.27	178.69	5.67	33.15	3.39	74.07	1.22
Observations (full sample)	1,185	1,185	1,185	1,185	1,185	1,185	1,185	1,185	1,185	1,185

	Milk		Sugar		Oils		Packaged Food		Snack Items	
	Energy (kcal/day)	Protein (gm/day)	Energy (kcal/day)	Protein (gm/day)	Energy (kcal/day)	Protein (gm/day)	Energy (kcal/day)	Protein (gm/day)	Energy (kcal/day)	Protein (gm/day)
Rations & Cooked Meals program	12.64	0.45	0.35	0.0018	1.99	N/A	-7.82	-0.15	-21.93*	-0.56*
	(9.92)	(0.40)	(1.85)	(0.002)	(9.04)		(9.64)	(0.19)	(11.51)	(0.29)
Control Mean	89.04	3.66	4.36	0.0031	199.14	N/A	191.46	3.63	132.4	2.13
Observations (full sample)	1,185	1,185	1,185	1,185	1,185		1,185	1,185	1,185	1,185

Notes: Base category is rations only program; Regression controls for household, individual, spouse characteristics, district and month of survey effects, All standard errors are clustered at village & individual level, Unique sample (single observation) and repeated sample (two observations) are 669 and 258 respectively; Total impact on energy is 264 kcal/day and protein intake is 8 gm/day

**** p<0.01, ** p<0.05, * p<0.1*

Table 6: Regression results on impact of the program on energy intake (kcal/day) and protein intake (gm/day) of pregnant women by source of food

	Home-cooked meals		Cooked Meals Program		Rations Program		Outside		Other	
	Energy	Protein	Energy	Protein	Energy	Protein	Energy	Protein	Energy	Protein
Rations & Cooked Meals Program	-81.55**	-1.98	369.06***	10.51***	-0.20	0.03	-36.8*	-0.9*	13.87	0.49
	(40.9)	(1.31)	(25.36)	(0.73)	(10.58)	(0.24)	(21.48)	(0.52)	(12.86)	(0.42)
Control Mean	1,876	54.76	0	0	51.1	1.15	297.9	6.37	154.16	4.46
Observations (full sample)	1,185	1,185	1,185	1,185	1,185	1,185	1,185	1,185	1,185	1,185

Notes: Base category is rations only program; Regression controls for household, individual, spouse characteristics, district and month of survey effects; All standard errors are clustered at village & individual level; Unique sample (single observation) and repeated sample (two observations) are 669 and 258 respectively; Total impact on energy is 264 kcal/day and protein intake is 8 gm/day; Other sources include foods like milk, fruits & nuts, etc which are not cooked but consumed at home

**** p<0.01, ** p<0.05, * p<0.1*

8. Appendix

8.1. Appendix Notes

Appendix Note 1: Variables used for logistic regression for propensity score matching

Following were the variables used in regression, based on observable differences across extended tribal areas and non-tribal areas:

1) Deciles based on percentage of scheduled tribe population

2) Deciles based on percentage of farming households

3) Village Size- Total population

4) Agriculture Infrastructure & Services Index: Distance to government seed center, Availability of watershed development project, Availability of rainwater harvest system/pond/dam/check dam etc, Availability of farmer producer organizations or cooperatives, Availability of food grain storage warehouse, Availability of primary processing facilities, Availability of custom hiring center for agricultural equipments, Availability of irrigation through canal, Surface water or groundpump

5) Livestock Infrastructure & Services Index- Availability of extension services, Availability of milk collection centers/ routes/ chilling centers, Availability of poultry development project, Availability of goatary development project, Availability of piggery development project, Distance to veterinary hospital, Availability of community ponds for fishing/ fish farming, Distance to aquaculture extension services, Availability of common pastures for grazing

6) If the village has minor forest produce

7) Village Infrastructure & Services Index: Distance to piped tap water, Distance to all weather roads, Availability of internal solid road, Distance to nearest public transport, Hours of electricity availability, Availability of panchayat bhawan, Availability of community service center, Availability of recreational centers, Distance to banks, Distance to post offices, Availability of telephonic services, Availability of broadband, Distance to public distribution services facility, Distance to primary school, Distance to middle school, Distance to high school, Distance to senior secondary school, Distance to pubic health center/ community health center, Availability of drainage system, Availability of community waste disposal system

8) Distance to market

9) Household Deprivation Index: Percentage of households with unirrigated land, Percentage of household with non-solid house structures, Percentage of households that do not have piped water

facility, Percentage of households using non clean energy sources, Percentage of households with unsanitary latrines.

10) Welfare Programs Coverage Index: Percentage of households that get housing under PMAY scheme, Percentage of households that get housing under state specific scheme, Percentage of households benefiting from Saubhagya scheme, Percentage of households get benefit under Pradhan mantri Ujwala yojana, Percentage of households having bank accounts under jan dhan yojana, Percentage of households with bpl cards, Percentage of households with health insurance through various schemes, Percentage of households getting pension benefits

11) Per capita approved labor budget for 2018-19

12) Per capita expenditure on labor budget 2018-19

13) Mobilization through self- help or producer groups

Appendix Note 2: Sample Size Calculations for primary data collection

The sample size was calculated ex-ante, assuming a significance level of 0.05 and statistical power of 80%. The standard deviation for the main outcome variables, calories & protein intake for women, was estimated at 440 kcal and 12 grams respectively, which was based on Maharashtra sample from Household consumer expenditure surveys (Government of India n.d.). The intra-cluster correlation was assumed to be 0.25 for both calories and protein intake respectively, which was based on the same data. I consider a difference in mean calories and protein intake across the two groups as 150 kcal and 4 grams respectively. This is based on what I consider as a minimum meaningful impact of the cooked meals program, given the nutrient requirements during pregnancy, additional nutrients provided by the cooked meals program, expected program participation and that some women could potentially be substituting the meals consumed at home with the meals provided through the program. I assumed a cluster size of 4 in the sample size calculations, which was based on pilot testing. This gives a sample size of roughly 500, but we add an additional 20% to account for contingency, making the final sample size as 600 for each round. Note that in the second round, I roughly re-interviewed half of these women, who had transitioned from second to third trimester whereas also included new women to increase statistical power. This makes the total sample size approximately 930 pregnant women, with a subsample of around 250 women for which we have data for both second and third trimester. Ex-post, we recalculated the power based on the test statistics of our study sample and find a power > than 0.95. This is based on a difference of 265 kcal across the two groups and standard deviation of 800 kcal for calories intake, and a difference of 8.2 grams across the two groups and standard deviation of 12 grams for protein intake.

Appendix Note 3: Food measurements and Nutrient Intake

For all food measurements, a set of locally purchased utensils were used, which included 2 bowls (small and big), 2 glasses (small and big), oil spoon, tablespoon, serving spoon and a vessel. The bowls, glasses and vessel were marked at 0.25, 0.5 and 0.75 levels for providing better visualization of measurements although the data was reported in decimals. There were also options for measurement units other than utensils like number of bunches, number of units, number of packets, grams and kilograms. For example, for reporting the recipes that contained green vegetables, the most preferred unit for it's measurement in raw form was 'number of bunches', while for onions and tomatoes was 'number of units'. All the measurement units were converted into weight of food that the utensil could hold in grams using a food weighing machine. For example, 1 small bowl of raw rice measured approximately 135 grams. However, for the measurements noted in units and bunches, standard weight of the products was used, which was based on the samples collected from the study sites. Food measurements were done for raw ingredients used in recipes, final cooked amount and consumption amount.

While the consumption data was collected for the respondents, the recipes were collected for the whole dish and conversion factors were used to approximate the nutrient values of the food consumed by the respondent. For example, if a vegetable gravy was cooked in vessel and the consumption was measured in small bowl, then we took the ratio of small bowl to vessel as the conversion factor. Due to their use in small quantities, the ingredient list for recipes excluded any powdered spices, ginger, garlic and chilies.

Appendix Note 4: Construction of Indices

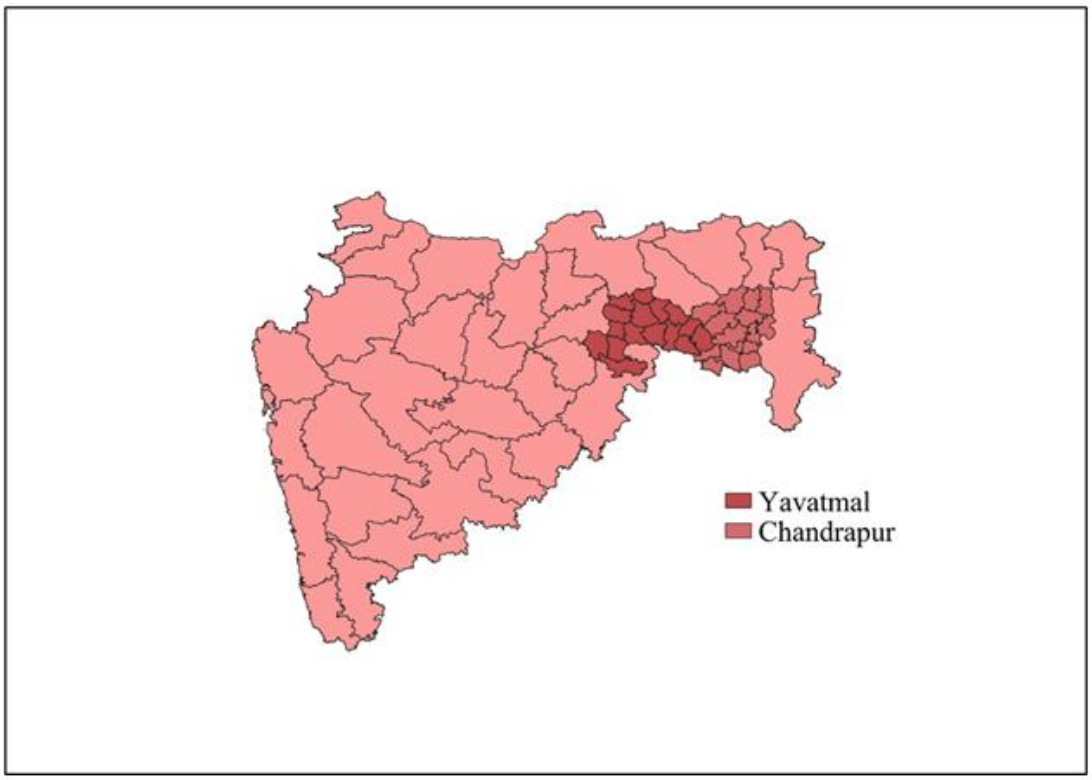
1. Wealth Index: The wealth index is constructed using principal component analysis (PCA) of two sub-indices: (i) an asset index based on ownership of 31 commonly held household items (e.g., table, bed, livestock), and (ii) a housing quality index based on the materials of the floor, exterior walls, and roof. Higher values indicate higher socioeconomic status.

2. Hygiene Index: This index is generated using PCA of indicators capturing household sanitation and energy use: access to an improved toilet, access to improved drinking water, and use of clean cooking fuel. Higher values denote better hygiene and environmental conditions.

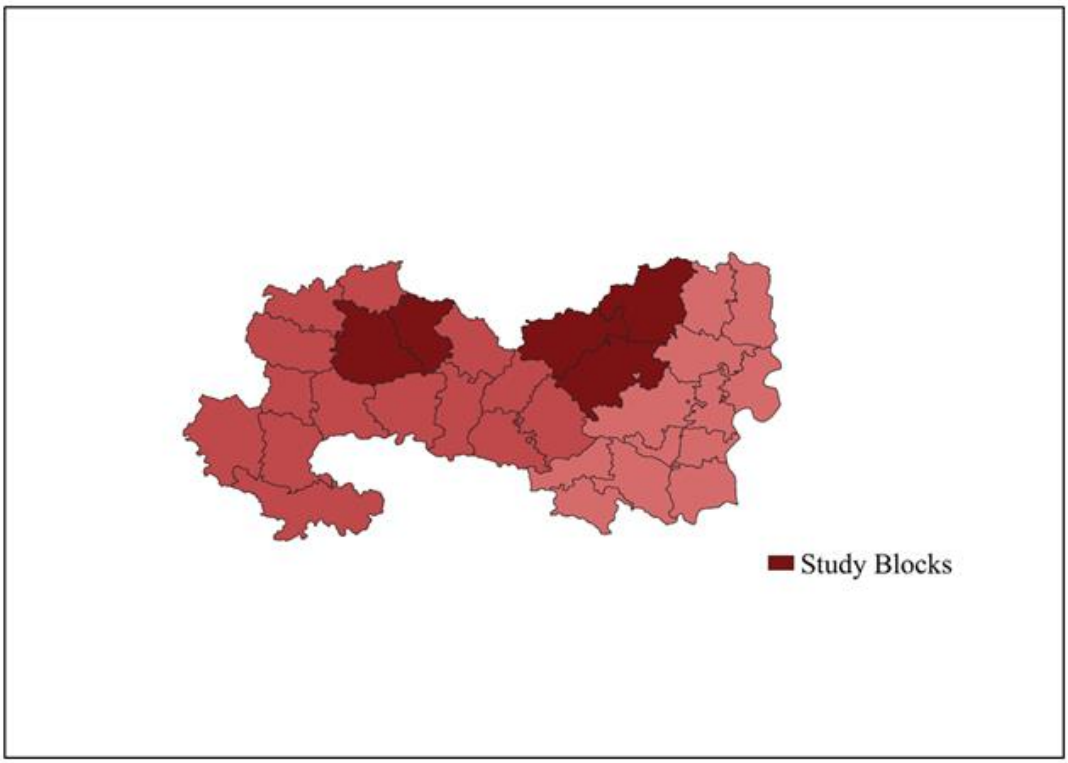
3. Antenatal Care Services Index: This index is based on PCA of key ANC service components, specifically receipt of at least one blood pressure check, at least one urine sample collection, at least one blood sample collection, at least one abdominal examination, at least one weight measurement, at least one ultrasound, and counseling related to delivery planning, maternal nutrition, and iron and calcium supplementation. Higher values reflect greater access to or utilization of ANC services

8.2 Appendix Figures

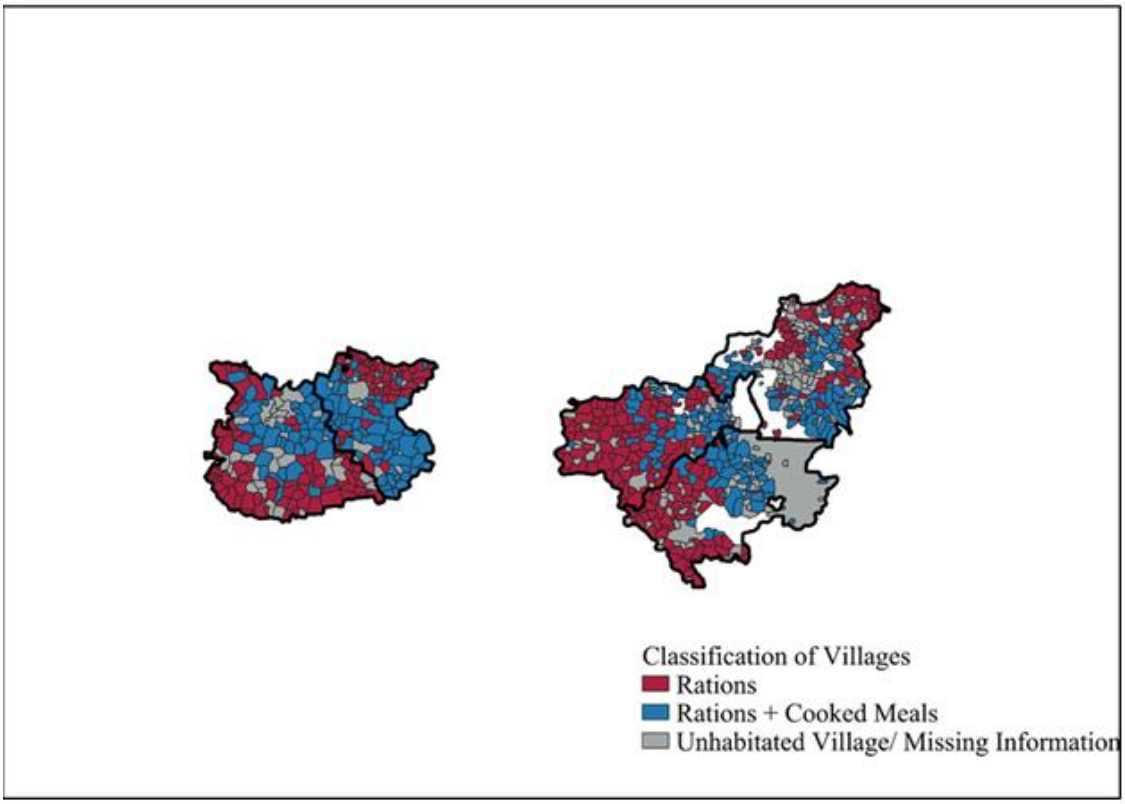
Appendix Figure 1: Study Districts in Maharashtra



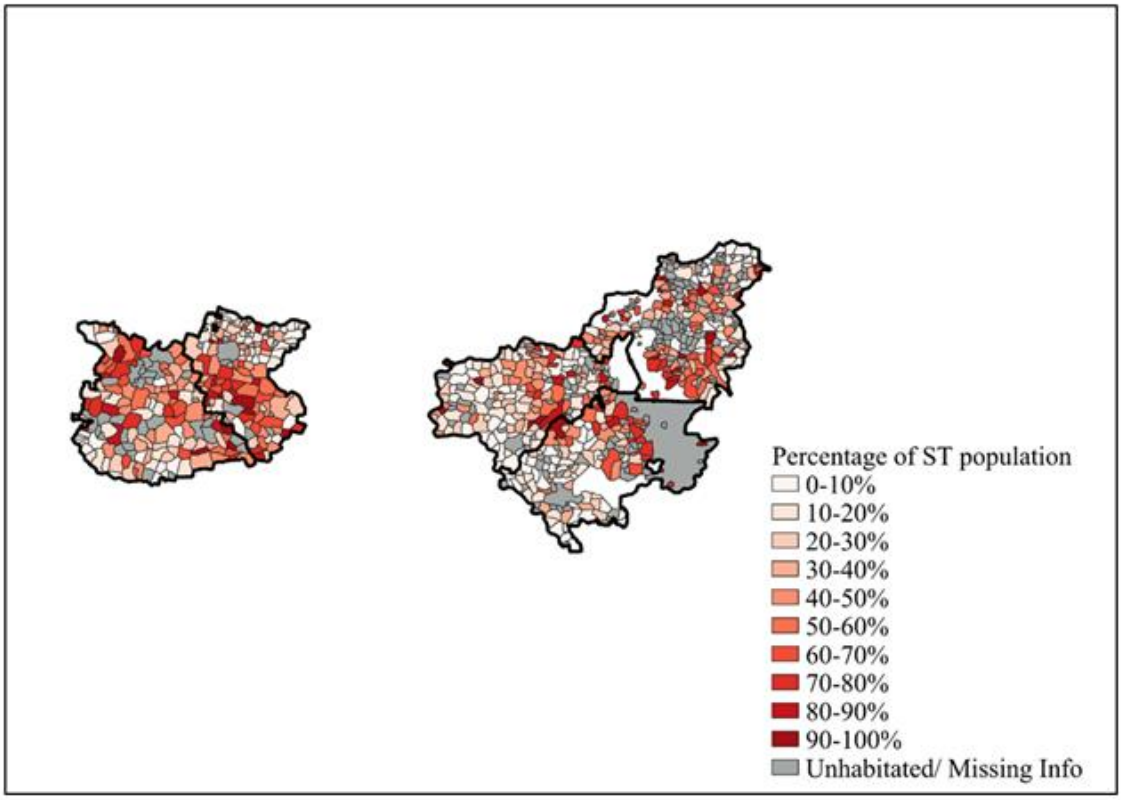
Appendix Figure 2: Study Blocks/ projects within study districts



Appendix Figure 3: Classification of villages by treatment status in the study blocks



Appendix Figure 4: Percentage of scheduled tribe population variation at village level in study blocks



8.3. Appendix Tables

Appendix Table 1: Results of logit regression for matching

Variables	Village is in Extended Tribal area[#]
Deciles based on percentage of scheduled tribe population	0.686***
	(0.0913)
Deciles based on percentage of farming households	-0.227***
	(0.0872)
Village Size	-0.000471
	(0.000356)
If village has minor forest produce	0.710**
	(0.334)
Agriculture Infrastructure & Services Index	-0.111*
	(0.0615)
Livestock Infrastructure & Services Index	-0.0799
	(0.0629)
Distance to nearest market	-0.0870
	(0.0653)
Village Infrastructure & Services Index	-0.0207
	(0.0645)
Household Deprivation Index	-0.266**
	(0.108)
Welfare Programs Coverage Index	-0.0679
	(0.0672)
Per capita approved labor budget for 2018-19	-2.94e-05
	(2.69e-05)
Per capita expenditure in labor budget for 2018-19	3.24e-05
	(4.17e-05)
Mobilization through self- help or producer groups	0.228***
	(0.0867)
Constant	-0.925**
	(0.399)
Observations	637

Notes: # base category for outcome variable is village in non-tribal area
**** p<0.01, ** p<0.05, * p<0.1*

Appendix Table 2: Total observation count

1. Main data for pregnant women

	Only Rations	Cooked Meals & Rations	Total
Round 1	315	306	621
Round 2	283	281	564
Total	598	587	1,185

Notes: Unique and repeated sample is 669 and 258 respectively.

2. Health records data for pregnant women

	Only Rations	Cooked Meals & Rations	Total
Trimester 1	345	330	675
Trimester 2	769	719	1488
Trimester 3	259	271	530
Total	1,373	1,320	2693

Notes: Unique and repeated sample are 175 and 728 respectively

3: Sample Size for existing children (below six years) of pregnant women

	Only Rations	Cooked Meals & Rations	Total
Round 1	132	125	257
Round 2	115	111	226
Total	247	236	483

Notes: Unique and repeated sample are 285 and 99 respectively

Appendix Table 3: Ex-ante Sample Balance at Village Level using secondary data

Variable	Group 1 Mean/SD	Group 2 Mean/SD	Pairwise t-test Mean difference
Percentage of scheduled tribe population	0.299	0.393	-0.094***
	(0.222)	(0.206)	
Percentage of Farming households	0.550	0.509	0.041
	(0.286)	(0.297)	
Village Size	373.257	304.745	68.513
	(528.016)	(216.752)	
If village has minor forest produce	0.099	0.061	0.038
	(0.300)	(0.241)	
Agriculture Infrastructure & Services Index	-0.492	-0.711	0.219
	(1.945)	(1.965)	
Livestock Infrastructure & Services Index	-0.389	-0.672	0.282
	(1.673)	(1.814)	
Distance to nearest market	3.020	2.857	0.163
	(1.871)	(1.650)	
Village Infrastructure & Services Index	-1.586	-1.732	0.146
	(2.152)	(1.830)	
Household Deprivation Index	-0.564	-0.516	-0.048
	(1.041)	(0.987)	
Welfare Programs Coverage Index	0.397	0.391	0.005
	(1.522)	(1.558)	
Per capita approved labor budget for 2018-19	369.238	675.379	-306.141
	(1220.89)	(2107.27)	
Per capita expenditure in labor budget for 2018-19	284.839	418.828	-133.989
	(1063.74)	(1591.70)	
Mobilization through self- help or producer groups	0.171	0.314	-0.143
	(0.858)	(1.136)	
Sample Size	101	98	

*Notes: *** p<0.01, ** p<0.05, * p<0.1*

Appendix Table 4: Regression results on impact of gestational weight (kg) of pregnant women by month of pregnancy

	Body Weight (kg)
Rations & Cooked Meals*Month 3	1.42
	(1.18)
Rations & Cooked Meals*Month 4	0.7
	(1.09)
Rations & Cooked Meals*Month 5	0.89
	(1.26)
Rations & Cooked Meals*Month 6	2.33*
	(1.28)
Rations & Cooked Meals*Month 7	2.03
	(1.37)
Rations & Cooked Meals*Month 8 & 9	3.5**
	(1.44)
Individual, Spouse & Household Controls	Yes
Month of Survey Effects	Yes
District Effects	Yes
Control Mean	47.83
Observations	2693

Notes: The weight data is based on health records; Only interaction terms are presented; Base treatment category is rations only program; Base category for pregnancy duration is month 2; Unique sample (single observation) and repeated sample (multiple observations) are 175 and 728 respectively; All standard errors are clustered at village & individual level

**** p<0.01, ** p<0.05, * p<0.1*

Appendix Table 5: Impact of program or extended tribal area on uptake and benefit amount (Rs) of cash transfer programs during pregnancy

	Uptake of cash transfer program	Benefit Amount of cash transfer program (Rs)
Rations & Cooked Meals Program	-0.17 (0.15)	-32.21 (28.20)
Individual, Spouse & Household Controls	Yes	Yes
Month of survey effects	Yes	Yes
District Effects	Yes	Yes
Control Mean	0.22	72.83
Observations (full sample)	1,185	1,185

Notes: Base category is rations only program; Regression controls for household, individual, spouse characteristics, district and month of survey effects; All standard errors are clustered at village & individual level; Unique sample and repeated sample are 669 and 258 respectively
**** p<0.01, ** p<0.05, * p<0.1*

Appendix Table 6: Regression Results for program impact on Energy Intake (kcal/ day) of pregnant women

	(1)	(2)	(3)	(4)
Rations & Cooked Meals Program	264.37***	271.34***	267.99***	252.97***
	(50.47)	(50.81)	(52.38)	(53.87)
Individual, Spouse & Household Controls	Yes	Yes	Yes	No
Month of survey effects	Yes	Yes	No	No
District Effect	Yes	No	No	No
Control Mean	2,387	2,384	2,385	2393
Observations (full sample)	1,185	1,185	1,185	1,185

Notes: Base treatment category is rations only program; All standard errors are clustered at village & individual level; Unique sample and repeated sample are 669 and 258 respectively
**** p<0.01, ** p<0.05, * p<0.1*

Appendix Table 7: Regression results for impact on Protein Intake (gm/day) of pregnant women

	(1)	(2)	(3)	(4)
Rations & Cooked Meals Program	8.15***	8.26***	8.13***	7.55***
	(1.59)	(1.58)	(1.61)	(1.65)
Individual, Spouse & Household Controls	Yes	Yes	Yes	No
Month of survey effects	Yes	Yes	No	No
District Effects	Yes	No	No	No
Control Mean	66.98	66.92	66.99	67.27
Observations (full sample)	1,185	1,185	1,185	1,185

Notes: Base treatment category is rations only program; All standard errors are clustered at village & individual level; Unique sample and repeated sample are 669 and 258 respectively
**** p<0.01, ** p<0.05, * p<0.1*

Appendix Table 8: Regression results for impact on Protein-Energy Ratio of pregnant women

	(1)	(2)	(3)	(4)
Rations & Cooked Meals Program	0.0005	0.0004	0.0003	0.00009
	(0.001)	(0.001)	(0.001)	(0.001)
Individual, Spouse & Household Controls	Yes	Yes	Yes	No
Month of survey effects	Yes	Yes	No	No
District Effects	Yes	No	No	No
Control Mean	0.11	0.11	0.11	0.11
Observations	1,185	1,185	1,185	1,185

Notes: Base treatment category is rations only; All standard errors are clustered at village & individual level; Unique sample and repeated sample are 669 and 258 respectively
**** p<0.01, ** p<0.05, * p<0.1*

Appendix Table 9: Heterogenous Impact by trimester for energy intake (kcal/day) and protein intake (gm/day) for pregnant women

	Energy Intake (kcal/day)	Protein Intake (gm/day)
Rations & Cooked Meals Program	289.81***	8.14***
	(60.28)	(1.98)
Trimester 3	201.96***	5.34***
	(51.30)	(1.75)
Rations & Cooked Meals*Trimester 3	-53.27	-0.10
	(79.27)	(2.69)
Individual, Spouse & Household Controls	Yes	Yes
Month of survey effects	Yes	Yes
District Effects	Yes	Yes
Control Mean	2,389	67.01
Observations	1,185	1,185

Notes: Base treatment category is rations only program, Base trimester category is trimester 2; All standard errors are clustered at village & individual level; Unique sample and repeated sample are 669 and 258 respectively

**** p<0.01, ** p<0.05, * p<0.1*

Appendix Table 10: Regression Results for impact on measured weight (kg) of pregnant women

	Body Weight (kg)
Rations & Cooked Meals Program	-0.75
	(0.81)
Trimester 3	2.76***
	(0.63)
Rations & Cooked Meals*Trimester 3	2.52**
	(1.01)
Individual, Spouse & Household Controls	Yes
Month of survey effects	Yes
District Effects	Yes
Control Mean	51.83
Observations	1185

Notes: Base treatment comparison is rations only program; Base trimester comparison is trimester 2; Unique sample and repeated sample are 669 and 258 respectively
**** p<0.01, ** p<0.05, * p<0.1*

Appendix Table 11: Heterogenous impact of the program on energy intake (kcal/day) and protein intake (gm/day) of pregnant women for different food groups by Vegetarian Status

	Grains		Pulses		Vegetables		Eggs & Meat		Fresh & Dry Fruits	
	Energy (kcal/day)	Protein (gm/day)	Energy (kcal/day)	Protein (gm/day)	Energy (kcal/day)	Protein (gm/day)	Energy (kcal/day)	Protein (gm/day)	Energy (kcal/day)	Protein (gm/day)
Rations & Cooked	-9.12	-0.17	18.63	1.37	-19.68	0.006	-41.46***	-2.21**	26.44	0.78**
Meals program*Vegetarian	(77.81)	(2.05)	(30.41)	(1.87)	(25.27)	(0.66)	(11.93)	(1.01)	(14.53)	(0.36)
Control Mean	1270	33.97	215.24	13.28	178.6	5.67	32.96	3.38	74.2	1.23
Observations	1,185	1,185	1,185	1,185	1,185	1,185	1,185	1,185	1,185	1,185

	Milk		Sugar		Oils		Packaged Food		Snack Items	
	Energy (kcal/day)	Protein (gm/day)	Energy (kcal/day)	Protein (gm/day)	Energy (kcal/day)	Protein (gm/day)	Energy (kcal/day)	Protein (gm/day)	Energy (kcal/day)	Protein (gm/day)
Rations & Cooked	17.96	0.63	3.90	0.006	28.94	N/A	-12.77	-0.03	-38.61	-0.70
Meals Program*Vegetarian	(25.97)	(1.02)	(6.99)	(0.006)	(28.95)		(22.81)	(0.42)	(33.93)	(0.88)
Control Mean	89.12	3.66	4.38	0.003	199	N/A	191	3.63	132	2.12
Observations (full sample)	1,185	1,185	1,185	1,185	1,185		1,185	1,185	1,185	1,185

Notes: Only interaction terms are presented; Base treatment category is rations only program; Base category for vegetarian status is non-vegetarians; Regression controls for household, individual, spouse characteristics, district and month of survey effects; All standard errors are clustered at village & individual level; Unique sample and repeated sample are 669 and 258 respectively; Total impact on energy is 264 kcal/day and protein intake is 8 gm/day

**** p<0.01, ** p<0.05, * p<0.1*

Appendix Table 12: Heterogenous impact of the program on energy intake (kcal/day) and protein intake (gm/day) of pregnant women for different sources of food by Vegetarian status

	Home-cooked meals		Cooked Meals Program		Rations Program		Outside		Other	
	Energy (kcal/day)	Protein (gm/day)	Energy (kcal/day)	Protein (gm/day)	Energy (kcal/day)	Protein (gm/day)	Energy (kcal/day)	Protein (gm/day)	Energy (kcal/day)	Protein (gm/day)
Rations & Cooked Meals*Vegetarian	-0.62	0.97	-76.22	-2.65*	31.08	0.74	-20.33	-0.55*	36.33	1.15
	(108.14)	(3.44)	(48.65)	(1.38)	(23.98)	(0.58)	(52.54)	(1.28)	(31.2)	(1.08)
Control Mean	1876	54.76	0	0	51	1.15	297	6.37	154	4.46
Observations (full sample)	1,185	1,185	1,185	1,185	1,185	1,185	1,185	1,185	1,185	1,185

Notes: Only interaction terms are presented; Base treatment category is rations only program; Base category for vegetarian status is non-vegetarians; Regression controls for household, individual, spouse characteristics, district and month of survey effects; All standard errors are clustered at village & individual level; Unique sample and repeated sample are 669 and 258 respectively; Total impact on energy is 264 kcal/day and protein intake is 8 gm/day; Other sources include foods like milk, fruits & nuts, etc which are not cooked but consumed at home
**** p<0.01, ** p<0.05, * p<0.1*

Appendix Table 13: Regression results for program impact on energy intake (kcal/day) and protein intake (kcal/day) of pregnant women's existing children for different food groups

	Grains		Pulses		Vegetables		Eggs & Meat		Fresh & Dry Fruits	
	Energy (kcal/day)	Protein (gm/day)	Energy (kcal/day)	Protein (gm/day)	Energy (kcal/day)	Protein (gm/day)	Energy (kcal/day)	Protein (gm/day)	Energy (kcal/day)	Protein (gm/day)
Rations & Cooked Meals program	71.31*	1.72*	-11.5	-0.31	5.27	0.18	8.56	-0.05	9.59	0.24
	(31.91)	(0.75)	(15.53)	(0.69)	(7.09)	(0.17)	(7.6)	(0.57)	(6.19)	(0.14)
Control Mean	493.4	12.56	104.76	5.79	48.07	1.44	19.64	1.84	28.44	0.48
Observations (full sample)	483	483	483	483	483	483	483	483	483	483

	Milk		Sugar		Oils		Packaged Food		Snack Items	
	Energy (kcal/day)	Protein (gm/day)	Energy (kcal/day)	Protein (gm/day)	Energy (kcal/day)	Protein (gm/day)	Energy (kcal/day)	Protein (gm/day)	Energy (kcal/day)	Protein (gm/day)
Rations & Cooked Meals Program	0.33	0.023	-0.78	0.0007	-1.66	N/A	-3.73	-0.19	-40.7**	-0.91**
	(11.28)	(0.44)	(1.41)	(0.001)	(8.69)		(19.71)	(0.31)	(17.33)	(0.41)
Control Mean	53	2.08	1.8	0.0006	59.29	N/A	254	3.99	105.05	1.98
Observations (full sample)	483	483	483	483	483		483	483	483	483

Notes: Only interaction terms are presented; Base treatment category is rations only program; Regression controls for household, individual, spouse characteristics, district and month of survey effects; All standard errors are clustered at village & individual level; Unique sample and repeated sample are 285 and 99 respectively

**** p<0.01, ** p<0.05, * p<0.1*

Appendix Table 14: Regression results for program impact on energy intake (kcal/day) and protein intake (gm/day) of pregnant women's existing children for different sources of food

	Home-cooked meals		Cooked Meals Program		Rations Program		Outside		Other	
	Energy (kcal/day)	Protein (gm/day)	Energy (kcal/day)	Protein (gm/day)	Energy (kcal/day)	Protein (gm/day)	Energy (kcal/day)	Protein (gm/day)	Energy (kcal/day)	Protein (gm/day)
Rations & Cooked Meals Program	-56.34	-1.85*	113.57***	3.26***	10.96	0.23	-38.52	-1.04*	7.08	0.18
	(36.98)	(1.04)	(21.08)	(0.55)	(7.5)	(0.17)	(28.38)	(0.63)	(12.51)	(0.44)
	667.53	19.56	0	1.06	19.78	0.45	349	6.6	80.44	2.5
Observations (full sample)	483	483	483	483	483	483	483	483	483	483

Notes: Only interaction terms are presented; Base treatment category is rations only program; Regression controls for household, individual, spouse characteristics, district and month of survey effects; All standard errors are clustered at village & individual level; Unique sample and repeated sample are 285 and 99 respectively; Other sources include foods like milk, fruits & nuts, etc which are not cooked but consumed at home
**** p<0.01, ** p<0.05, * p<0.1*