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Endline Assessment of Fortification of Mid-Day Meal Programme in Varanasi, Uttar Pradesh

February-November 2020
Draft Report



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Executive Summary

Background

Prevalence of micronutrient deficiencies (MND) among school aged children of Uttar Pradesh (UP) is high. Varanasi District in the State of Uttar Pradesh (UP) has a population of around 3.68 million¹ and, like any district in the state, the nutritional status of women and children is quite poor. In Varanasi around 45 percent (Rural 49% and Urban 39%) of children under 5 years are chronically malnourished or stunted². Prevalence of stunting is similar among boys and girls (Boys: 46.3%; Girls: 46.2%). Nearly 60 percent of children aged 6-59 months (using WHO cut-off values of Hb < 11.0 g/dl) and more than half (51%) of all women aged 15-49 years (using WHO cut-off values of Hb < 12.0 g/dl for non-pregnant and Hb < 11.0 g/dl for pregnant women) are anaemic³ in the district.

The overall objective of the pilot project was to provide GoUP with an operationally feasible and economically viable model on integrating fortified staples in the MDM to create a positive impact on the micronutrient status and functional performance of school children for potential scale-up across the state.

Assessment purpose and objectives

The purpose of the assessment is to determine how well the pilot has achieved its intended objectives. This was done by using pre and post intervention assessments based on the assessment criteria and a set of indicators for measuring the results. While the baseline study provided an in-depth analysis of the situation and benchmarks against key performance indicators, the end line survey provides an assessment of performance along with the cost-effectiveness, operational-feasibility and scalability analysis.

Overall objectives and sub-objectives of the assessment are as following:

1. To examine the operational feasibility and cost-effectiveness of the project.
 - 1.1. To assess the acceptability of fortified MDM among critical stakeholders, such as students, parents, teachers, Cook cum Helpers (CCH), government officials.
 - 1.2. To assess consumption pattern of MDM among the school children of Varanasi district.
 - 1.3. To study the cooking practices of MDM in schools.
 - 1.4. Assess the capacity of the rice miller built on blending of regular rice with fortified rice kernels and maintaining quality assurance protocols.
 - 1.5. Hygiene and safety practices by the CCH.
 - 1.6. To assess the monitoring mechanism of the project.

¹Census 2011 (www.census2011.co.in/census/district/568-varanasi.html)

²NFHS-4(2015-16)

³Anaemia is characterized by a low level of haemoglobin in the blood. Haemoglobin is necessary for transporting oxygen from the lungs to other tissues and organs of the body. Anaemia usually results from a nutritional deficiency of iron, folate, vitamin B12, or some other nutrients. This type of anaemia is commonly referred to as iron-deficiency anaemia.

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- 1.7. To assess the availability of the adequate infrastructure and human resources.
 - 1.8. To calculate the cost of fortification per child and cost of scaling-up in the state.
 2. To examine the morbidity among the target children during last six months.
 - 2.1. To examine the reporting of illness among the target children in the 15 days prior to survey.
 - 2.2. To calculate the average medical expenditure on child in last 6 months
 3. To evaluate the awareness of the causes, consequences and solutions to micronutrient malnutrition and anaemia
 - 3.1. To assess the awareness about the causes, symptoms and prevention about the anaemia and undernutrition among children and teachers
 - 3.2. To investigate the source of information about the anaemia and undernutrition
 - 3.3. Awareness about the IEC activities under the project among the stakeholders such as children and parents
 - 3.4. To examine the hygiene practices in terms of washing hands among children, parents, teachers, and CCH
 4. To examine the infrastructure of school in terms of availability of safe drinking water, toilet, handwashing facility etc.
 5. To assess the type of health services in terms of distribution of Iron Folic Acid (IFA), deworming, and health check-ups provided at the school
 6. Based on the findings of the assessment, to provide the specific recommendations to concerned authorities

Main expected users

The main expected users of the assessment findings will primarily be the Government of Uttar Pradesh, along with WFP and donors of the pilot programme.

Main features of the methodology

The end line data collection for the assessment of the 'Fortification of MDM Programme in Varanasi District' was carried out in February-March 2020. The assessment methodology was similar to the baseline assessment conducted in October 2018. Using a mixed methods approach, the data and information was collected. The assessment exercise was commissioned by the World Food Programme (WFP) India Country Office.

Assessment objectives and sub-objectives formed the basis for developing the survey tools for administering with the different respondent groups. The assessment questions were formed to address the four assessment criteria namely, Relevance, Efficiency, Effectiveness, and Sustainability. As ample evidence is available on impact of fortified food, 'impact' was not included in the assessment framework.

Due to the discontinuation of the wheat flour fortification component in the initial phase of the programme, the endline assessment focused only on fortification of rice distributed under MDM.

The endline assessment was comprised of three phases: (1) Secondary/Desk Research; (2) Primary Data Collection; and (3) Data Collation, Tabulation, Analysis and Reporting. The endline assessment collected data from all 10 blocks of Varanasi district.

Selection of schools: In order to select the sample schools, stratified sampling method was followed. The schools were divided in three strata- Primary level schools, Upper Primary schools and Primary with Upper Primary level schools. Probability Proportional to Size (PPS) method was used to select schools from each block. Total 63 sample schools from the 10 blocks of Varanasi were selected for this assessment. A school observation checklist was used to capture data and information on enrolment, attendance, absenteeism, school infrastructure and activities related to nutrition and health issues undertaken from the sample schools.

Selection of students and parents: From each of the sample school, using the attendance register, sample children were randomly selected. From the 63 sample schools, total 732 sample students were selected, 356 (49%) were male students and 376 (51%) were female students. Sample students have equal representation from each of the class (1st to 8th class). Detailed quantitative information was collected from the sample students.

In addition to the survey of the 732 sample students, corresponding parent (mother or father) of the selected sample children were also interviewed. Thus, 732 parents were interviewed at their house and detailed information was collected from the parents. The household level survey schedule used to collect end line data from the parents was similar to the one used during baseline round with additional questions related to fortification of MDM programme such as awareness about fortified rice being served during MDM, its benefits, acceptability as well as programme specific Information, Education, Communication (IEC) activities carried out at the school and community levels.

In addition to this, in depth interviews (IDIs) with other stakeholders such as government officials at state, district and block levels, PRI/ward members, school principal/teacher, CCHs for preparing MDM, and with the owner of the mill identified for fortification of rice were conducted.

Key findings

The demographic-and socio-economic profile of the households surveyed in the endline as well as baseline rounds were similar.

Demographic Profile: Similar to the baseline round and Census 2011 data, most of the households of the sample are Hindu (EL: 90%; BL: 88%) while rest were Muslim. The average household size too was the same as the district average-7 members.

Educational status of parents:81 percent fathers (BL: 77%) and around 55 percent of the mothers (BL: 49%) were found to be literate, which is also similar to the Census data for the district.

Occupational status of parents: 42 percent of the fathers (BL: 41%) engaged as skilled labour⁴ and around 33 percent (BL: 37%) as unskilled labour. Among mothers, nearly 85 percent were homemakers (BL: 72%) while 6 percent were engaged in unskilled⁵ services (BL: 15%).

Average monthly household income was around Rs. 12000, in both the rounds.

Access to food: Around 3 percent households (BL: 2%) reported experiencing a situation when a member(s) had to eat less due to household food shortages. The Food Consumption Score (FCS) which is a measure of food frequency and dietary diversity shows that the majority (EL: 94%; BL: 93%) of households have acceptable consumption.

Intra-household food distribution: Comparison of the endline and baseline findings at household level shows that male members (both children and adults) receive preference for food, regarding quantity of food and eating practices within the household. In almost nine out of every ten surveyed households, female adults including elderly females, eat last during the mealtime.

Morbidity status of students: Compared to the baseline, fewer students reported suffering from some sickness in the last 15 days prior to the interview (EL: 31%; BL: 43%) while there was no difference in prevalence of recent morbidity between male and female students. In both endline and baseline, around 2 percent of the parents reported that their child was hospitalized during the six months prior to the survey. The average day of absence, which includes leave due to sickness and/or due to other reasons, was around 1.5 days (BL: 2 days).

Enrolment and Attendance: Out of 63 sample schools, 60 schools were co-educational (BL: 58) and the female to male ratio in these schools was similar in both endline and baseline rounds (1:1). During endline, the average attendance of female students was better (63%) than male students (57%). However, due to peak winter season (Dec-Feb), which is the reference period for endline assessment, as compared to baseline round (July-Sep), the absenteeism rate was higher (EL: 40%; BL: 34%).

MDM related Infrastructure and practices in school: On average all the schools have 1 cook and 2 helpers for preparing and serving MDM. In both endline and baseline rounds, three schools, all located in urban Varanasi, were serving food from centralized kitchen run by NGOs. For the remaining schools where MDM is cooked within the school premises, all schools had a separate room for kitchen and in almost all (93%) the kitchen rooms were *pucca*. More than 92 percent of the schools (BL: 72%) were found to have facility for storage (in covered utensils) of grains and other MDM items.



⁴**Skilled labor** is a segment of the workforce with specialized know-how, training and experience to carry out more-complex physical or mental tasks than routine job functions

⁵**Unskilled labor** is a segment of the workforce associated with a limited skill set or minimal economic value for the work performed.

Cleanliness: More than 90 percent of the schools (BL: 67%) were found to have a properly cleaned kitchen.

Management of solid wastes and MDM wastes: More than half of the sample schools (56%) gave the solid wastes to garbage collectors; compared to 23 percent at baseline. However, around one-fourth schools still throw solid wastes in open space. For MDM-generated waste, most of the schools used a green waste-bin while leftovers are taken home by the cooks-cum-helpers.

Awareness about fortification of MDM programme: Around one-third of the parents were aware that



fortified rice is being served to their children. Regarding IEC activities, around 21 percent of the parents were aware about at least one IEC activities carried out at the community level. Among students, 75 percent were aware of IEC activities, with female students (78%) more likely to be aware than male

students (71%). Nearly 60 percent of the female and male students were aware that 'the rice served during MDM is fortified with nutritive ingredients. This was more common amongst upper primary students (male: 82%; female: 76%).



Availability and Acceptance of MDM: Most of the students reported consuming MDM on all six days in a week. On 'regularity of supply of MDM', teachers gave a rating of 4.6 out of 5 (BL: 4.2) while 'quality of fortified MDM' was rated 5 out of 5. Among the key benefits of fortified MDM identified by the students from both genders included, 'prevents anaemia' and 'better physical and mental growth'. Nearly three-quarters of all students mentioned fortified MDM as better or same as non-fortified MDM. Overall, more than 80 percent of the students and all stakeholders supported the fortification of rice in context of its benefits for the overall growth and development of students. With less than 2 percent of students having a complaint about the quality of fortified MDM, it could be concluded that acceptance and liking for fortified MDM was overwhelming across stakeholders.

Water-tight method for cooking fortified rice: In endline round, all teachers (BL: 84%) were familiar with the rice fortification. Moreover, due to the training and sensitization of teachers and CCHs under the fortification of MDM programme, fortified rice was cooked by practicing 'water-tight' method, wherein, the right amount of water is added to the raw rice before cooking and this water gets completely absorbed into the rice while being cooked and thus prevents the loss of nutrients.

Awareness about anaemia and under nutrition: Among female students awareness about anaemia increased from 24 to 44 percent ($p \leq 0.01$), while awareness among male students increased from 16 to 46 percent ($p \leq 0.01$). The percentage of students who were aware about undernutrition also increased compared to the baseline (female students: from 13 to 28 percent; male students: 11 to 29 percent). Nearly 90 percent of the students (BL:74%) identified 'lack of iron in the diet' as the main cause of anaemia while 87 percent correctly mentioned 'having a diet rich in iron' as a way to prevent being anaemic. More than 70 percent of the students identified 'not getting enough food' (BL:48%) as the key reason of undernutrition while on ways of preventing undernutrition, majority of the students gave two main solutions: 'give attention during meals' (EL: 58%; BL:32%) and 'have more food' (EL: 56%; BL:44%).

IFA Supplements and Deworming: The percentage of students who received weekly IFA supplements at school level increased significantly (EL: 88%; BL: 68%; $p \leq 0.01$). Almost all the students who received IFA supplements and deworming tablets/syrups consumed them.

The distribution of deworming tablets in schools also increased from 80 to 88 percent, with nearly two-third students informing that deworming tablets were distributed every six months, coinciding with the National Deworming Day (NDD) observance. The trend was similar across primary and upper primary schools as well as by gender of the students.

Health check-up at school: During endline, a significantly ($p < 0.01$) higher percentage of students informed about having health check-up at school (EL: 81%; BL: 58%) and mostly by a medical doctor/ health officer. Noticeably, the percentage of girl students who reported having health check-ups was more than boys in both primary and upper primary schools.

The frequency of these health check-ups, as reported by most of the students (EL: 44%; BL: 39%) was 'once in a year'. School headmasters/mistresses were also enquired about the frequency of health check-ups in the school. As informed by the school headmaster/mistress, in more than half of schools health check-ups was conducted 'once in a year', while in more than one-third of the schools (EL: 35%; BL: 34%), it was reported as half-yearly. As per Government Order, GoUP, under *Rashtriya Bal Swasthaya Karyakram* (RSBK), the medical mobile health team should conduct health check-ups of all students (class 1 to 12) of government and government aided schools, once in a year.

Drinking water facility: All students reported availability of drinking water facility in school, which was also observed by the assessment team. Most of the schools used a hand pump to access drinking water (EL: 65%; BL: 76%) while only 27 percent (BL: 19%) had water purification facilities and all were using the reverse osmosis (RO) method. At baseline, only 12 out of 63 schools reported using one of the water purification methods (RO: 8 schools; chlorination: 3 schools and water filter: 1 school).

Sanitation and hygiene facilities and practices in school: Although the percentage of hand washing facilities increased (EL: 56%; BL: 46%), still many schools do not have separate hand washing facility.

In almost three-quarters of the surveyed schools, for both males and females, the hand washing facilities were found near the toilets. In context of current COVID-19 pandemic, hand washing with soap is strongly recommended by the health experts as a preventive measure. A major improvement in using soap for hand washing was noticed among male students (EL: 73%; BL: 38%). Among female students too, the improvement was significant (EL: 78%; BL: 67%).

Operational facility for fortification of MDM: Regular supply of rice and fortified rice kernels (FRK) to the pre-identified mill was reported. Also, regular supply of fortified rice was ensured to schools throughout the programme intervention period. The quality assurance measures like packaging, storage practices and testing by third-party lab agency engaged by WFP was also found in place and observed as per the laid down guidelines. Almost none of the study participants whether teachers, CCHs, PRIs or students reported of any irregularity in supply or had any complaint about the quality of fortified rice supplied for MDM.

High extent of satisfaction with the regularity in supply, quality of fortified rice, observance of storage norms at mill and schools as well as the cooking facility and water-tight method followed for cooking fortified rice suggests that continuance of fortification of rice is viable.

Scaling-up of fortification of MDM programme at state level: In order to scale-up fortification of rice under MDM in UP, the GoUP would have to earmark a budget of nearly Rs 33.43 crore (USD 4.55 million) per annum, which would be in addition to the MDM budget. Additional average cost of Rs 0.15/ meal could be compensated by the lower expenditure on the child's health, as it is expected that the introduction of fortified rice in MDM programme in the state would improve the health status of children. In addition, the scale-up would also lead to the overall positive growth and development of 17.68 million students of the state.

Conclusions and recommendations

Conclusions:

Operational feasibility of the fortification of rice: Evidence generated through the assessment clearly shows that the fortification of rice served under MDM is operationally feasible, as findings illustrates that acceptance of fortified rice was high among the critical stakeholder such as children, parents, teachers and Government officials. Further, children liked the taste of fortified rice, which led to an increase in the consumption of the MDM. Schools have adequate infrastructure and human resource to appropriately store and cook fortified rice. Regarding the quality of fortification, NABL accredited laboratory found that the retention of micronutrients in the raw and cooked fortified rice were as per the norms. Quality control measures were in place and storage norms were appropriately followed at the mill and school level. CCHs were practicing water-tight method for cooking rice. On the supply side too, the assessment findings showed regular supply of rice from FCI warehouse and FRK to the mill

during the programme period. Based on the costing analysis of the project, fortification was done with a nominal cost of Rs 0.22 (during pilot project at Varanasi) per student per MDM meal.

Knowledge and awareness about anaemia and undernutrition: Results of the assessment shows that the awareness about anaemia and under nutrition significantly improved among the students. Among female students awareness about anaemia increased from 24 to 44 percent ($p < 0.01$), while awareness among male students increased from 16 to 46 percent ($p < 0.01$). The percentage of students who were aware about undernutrition also increased compared to the baseline (female students: from 13 to 28 percent; male students: 11 to 29 percent). Nearly 90 percent of the students (BL:74%) identified 'lack of iron in the diet' as the main cause of anaemia while 87 percent correctly mentioned 'having a diet rich in iron' as a way to prevent being anaemic. More than 70 percent of the students identified 'not getting enough food' (BL:48%) as the key reason of undernutrition while on ways of preventing undernutrition, majority of the students gave two main solutions: 'give attention during meals' (EL: 58%; BL:32%) and 'have more food' (EL: 56%; BL:44%).

Morbidity profile of students: Prevalence of illness among the children declined from baseline to endline. As compared to baseline, fewer students reported suffering from some sickness in the last 15 days prior to the interview (EL: 31%; BL: 43%). As compared to baseline, during endline prevalence of sickness significantly declined among Hindus, scheduled caste, other backward class, children of mothers, who are either illiterate or have primary level of education, poor and children of households with no land or have less than .25 hectare.

Hand washing practices: Assessment findings shows improvement in the hand washing practices among the students, teachers and CCHs. A significant improvement in hand washing practices using soap was noticed among female students (EL: 78%; BL: 67%; $p \leq 0.01$). Among male students too, the improvement was noticeable (EL: 73%; BL: 38%; $p \leq 0.01$). The programme activities such as health education sessions may be a contributory factor in this change in hand washing practices of students. Teachers and CCHs were also observed to be washing their hands with water and soap. Nearly 80% of the school staff-teachers and CCHs were observed to be washing hands with soap and water after using toilets. Similar percentage of CCHs were also found to be using soap and water before cooking MDM.

Hand washing facilities in school: Although the percentage of hand washing facilities increased from baseline to endline (EL: 56%; BL: 46%), still many schools do not have separate hand washing facility. In almost three-quarters of the surveyed schools, for both males and females, the hand washing facilities were found near the toilets.

Distribution of IFA Supplements, deworming tablets and health check-ups in schools: Results shows that distribution of IFA Supplements, deworming tablets and health check-ups in schools have improved during end line round, as compared to the time of baseline assessment. The percentage of

students who received weekly IFA supplements at school level increased significantly (EL: 88%; BL: 68%; $p < 0.01$). The distribution of deworming tablets in schools also increased from 80 to 88 percent. During endline, a significantly ($p < 0.01$) higher percentage of students informed about having health check-up at school (EL: 81%; BL: 58%) and mostly by a medical doctor/ health officer.

Hygiene and safety practices by CCHs during MDM preparation: Findings shows that less than half (45%) of the CCHs have undergone health check-up during the last year. As per the government guidelines⁶, cooks and helpers should maintain a high degree of personal hygiene and cleanliness and should undergo biannual health check-ups. The guidelines also mention that CCHs should avoid wearing loose items or watch, ring, jewellery and bangles that might fall into food. Nail polish or artificial nails should not be worn as they may compromise on food safety. Further CCHs are expected to wear aprons while cooking MDM. Though around 75 percent of CCHs were observed to be wearing no jewellery while preparing and serving MDM, only 14 percent of CCHs were found to be wearing aprons on the day of visit by the survey team.

Recommendations:

Recommendation 1: As the findings of the assessment evidently shows that fortification of rice distributed under MDM is an operationally feasible model in terms of high acceptability of fortified rice among the important stakeholders; adherence to quality control measures at all levels; retention of micronutrients as per the norms in the raw and cooked rice; and availability of adequate infrastructure and human resources at the school level. Thus, based on the evidence of this assessment, it is recommended to the Government of Uttar Pradesh to sustain fortification of MDM in Varanasi and scale-up the fortification of rice served under MDM in other districts of the state and WFP should support the government towards scaling-up this model.

Recommendation 2: Although results demonstrate that awareness levels for anaemia and undernutrition among the children have improved from baseline to endline, still there is high scope of further improvement of awareness levels, as more than half of students were not aware of anaemia and almost three-quarter were unaware of undernutrition. Thus, it is recommended to the government to take measures to improve the awareness levels for anaemia and undernutrition among children and WFP should support the government in improving the awareness levels .

Recommendation 3: In spite of a major improvement in using soap for hand washing among students (EL: 73%; BL: 38%), but almost one-fourth of students still do not wash hands using soap. Especially, keeping in mind the current COVID-19 pandemic, hand washing with soap is strongly endorsed by the health experts as a preventive measure. Thus, it is recommended to the government to take adequate steps to improve the awareness about the benefits of washing hands with soap and further take measures to improve the practice of washing hands with soap.

⁶mdm.nic.in/mdm_website/Files/Guidelines/2015/Guidelines%20_Food%20Safety%20and%20Hygiene.pdf

Recommendation 4: A high proportion of schools do not have separate hand washing facility (EL: 56%; BL: 46%). In almost three-quarters of the surveyed schools, for both males and females, the hand washing facilities were found near the toilets. Considering the findings of this assessment and the importance of adequate hand washing facility in schools, especially from the perspective of COVID-19 situation, government is recommended to built separate hand washing facility for the students in the schools.

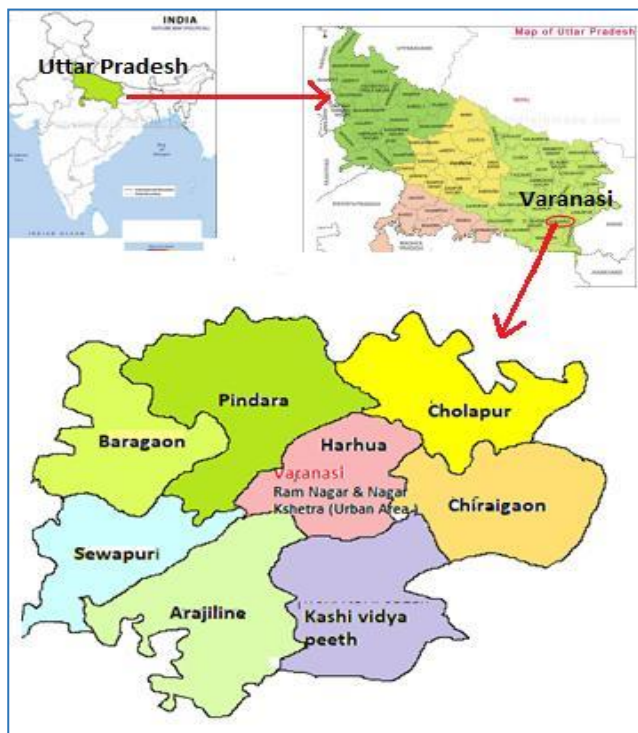
Recommendation 5: Results illustrates that less than half of the CCHs have undergone health check-up during the last year. Nearly 80% of the CCHs were observed to be washing hands with soap water before cooking MDM and after using toilets. As per the government guidelines⁷, cooks and helpers should maintain a high degree of personal hygiene and cleanliness and should undergo biannual health check-ups. As CCHs closely handle food items of MDM and are responsible for cooking MDM, which is distributed to the young children, hence their hygiene and health status is extremely crucial. Therefore, it is recommended to the government to ensure that the CCHs undergo biannual health check-up and follow the prescribed guidelines of government around personal hygiene and cleanliness and if required, efforts to build the capacities of the CCH towards this could be undertaken by the government.

⁷mdm.nic.in/mdm_website/Files/Guidelines/2015/Guidelines%20_Food%20Safety%20and%20Hygiene.pdf

Chapter 1: Introduction

1.1 Overview

Varanasi District in the State of Uttar Pradesh (UP) has a population of around 3.68 million⁸ and, like any district in the state, the nutritional status of women and children is quite poor. Around 45 percent (Rural-49% and Urban 39%) of children under 5 years are chronically malnourished or stunted⁹. The prevalence of stunting was found to be similar among boys and girls (Boys: 46.3%; Girls: 46.2%). Nearly 60 percent of children aged 6-59 months (using WHO cut-off values of Hb <11.0 g/dl) and more than half (51%) of all women aged 15-49 years (using WHO cut-off values of Hb <12.0 g/dl for non-pregnant and Hb <11.0 g/dl for pregnant women) are anaemic.



Considering the poor nutritional status of children not only in Varanasi but across UP, the Government of UP (GoUP) along with the United Nations World Food Programme (WFP), undertook a pilot project on fortification of the mid-day meal (MDM) in Varanasi.

MDM Authority of UP suggested Varanasi as the site for the pilot project. In Varanasi, as per CAB 2014 survey¹⁰, the prevalence of anaemia among 5-9 years old children is 91.5 percent and among children aged 10-17 years old is 91.1 percent. High prevalence of anaemia amongst school children, highlight the urgent need of action. In addition, available evidence suggested that a high number of students consume MDM in the district, which was expected to provide a good ground for piloting the fortification of MDM project. Further, it was assumed that a well implemented project in a high-profile district like Varanasi would have a high potential for scale-up. Thus, keeping all these critical points in mind, Varanasi was identified as the site for the implementation of this pilot project.

⁸Census 2011 (www.census2011.co.in/census/district/568-varanasi.html)

⁹ NFHS-4(2015-16)

¹⁰Clinical, Anthropometric and Biomedical (CAB) Survey, Office of the Registrar General & Census Commissioner, India

1.2 About the Mid-Day Meal programme

The Department of Basic Education implements the MDM Programme in UP and in Varanasi District, the MDM is being provided to 2.92 lakh school children across 1610 government schools.¹¹ The data from the District Information System on Education (DISE) for the district shows that among the students enrolled in primary and upper primary grade nearly 49 percent are girls.¹² However, this data includes both government and private schools. The data for project intervention schools in Varanasi shows the percentage of girls to be around 42 percent in primary and upper primary government schools of Varanasi.

The daily menu for MDM in UP is as follows:

Table 1.1: MDM Menu list in UP		
Day	Menu	Type of dishes
Monday	Roti-sabzi with soya beans or lentils Bari, fresh seasonal fruits	Wheat bread (Roti) and pulse / soya beans, seasonal vegetables and fresh seasonal fruits
Tuesday	Rice and dal	Rice and pulses such as gram / tur / other pulses
Wednesday	Tahri and milk	Mix of rice and seasonal vegetable (Tahri) and 150/200 ml boiled milk
Thursday	Roti and dal	Wheat roti and pulses, (e.g. gram / tur / other pulses)
Friday	Tahri with soya bean	Rice and vegetables (potato, soya bean and seasonal vegetables available that time)
Saturday	Rice-soybean with vegetables	Rice and soya beans & spices & fresh vegetables

Source: Annual Work Plan and Budget, 2018-19 MDM Authority, UP

As per the data and information provided by WFP India Country Office, the project intervention was carried out in all government primary and upper primary schools of Varanasi district. However, post-June 2019, the primary and upper primary schools located in the same vicinity / compounds were merged as one school unit, hence the number of schools reduced to 1360 from 1610.

The various activities undertaken under the project include:

- 1) Production and distribution of fortified rice and wheat flour in MDM;
- 2) Sensitization and capacity building with different stakeholders;
- 3) Information, Education and Communication (IEC) activities;
- 4) Quality assurance and quality control; and
- 5) Monitoring the implementation of activities.

Fund flow and food grains management for MDM: The Government of India releases funds in three instalments to the state. After seeking credit confirmation from the State Finance Department, the state government releases funds to the Basic Education Department of UP. The funds thereafter flow from Basic Education of UP to the District Magistrate in all the Districts.

The funds from the District Magistrate is transferred to “*Madhyanh Bhojan Nidhi*” (MDM) Fund in each school of the district in the rural areas; and in urban areas funds is released to Municipal bodies. In urban areas where NGOs are engaged for providing MDM to schools, the conversion cost and

¹¹http://www.upmdm.org/qpr/Apr_Jun_2017_18_30082017.pdf

¹²DISE Data District Report Card, 2016-17

honorarium to cooks-cum-helpers is given to NGOs according to the bills raised by them after verification from the Education Department. For state-and district-wise number of schools, MDM meals served and budget allocation for MDM refer to Annexure Tables 1.1 to 1.3.

The Food Corporation of India (FCI) provides food grains to regional godowns from where it goes to block level godowns and finally to fair price shops. In turn, the fair price shop owners make it available to gram pradhans/ ward members/NGOs. The transportation cost is paid to the Civil Supplies Department/Food & Essential Commodity Supply Corporation by the respective district administration. The cost of the food grains, including transportation cost, meant for MDM is borne by the Central Government.

1.3 Specific objectives and sub-objectives of endline assessment

Overall objectives and sub-objectives of the assessment are as following:

S.No.	Objectives	Sub-Objectives
1.	To examine the operational feasibility and cost-effectiveness of the project	1.1 To assess the acceptability of fortified MDM by different stakeholders, such as students, parents, teachers, CCHs, government officials 1.2 To assess consumption pattern of MDM among the school children of Varanasi district. 1.3 To study the cooking practices of MDM in schools. 1.4 Assess the capacity of the rice miller built on blending of regular rice with fortified rice kernels and maintaining quality assurance protocols. 1.5 Hygiene and safety practices by the CCH 1.6 To assess the monitoring mechanism of the project 1.7 To assess the availability of the adequate infrastructure and human resource 1.8 To calculate the cost of fortification per child
2.	To examine the morbidity among the target children during last six months.	2.1 To examine the reporting of illness among the target children in the 15 days prior to survey. 2.2 To calculate the average medical expenditure on child in last 6 months
3.	To evaluate the awareness of the causes, consequences and solutions to micronutrient malnutrition and anaemia	3.1 To assess the awareness about the causes, symptoms and prevention about the anaemia and undernutrition among children and teachers 3.2 To investigate the source of information about the anaemia and undernutrition 3.3 Awareness about the IEC activities under the project 3.4 To examine the hygiene practices in terms of washing hands among children, parents, teachers, and CCH
4.	To examine the infrastructure of school in terms of availability of safe drinking water, toilet, handwashing facility etc.	4.1 Availability of safe drinking water in the school 4.2 Main source of drinking water in the school 4.3 Solid waste (garbage) from the school disposed of 4.4 School have toilet facilities for boys and girls and hand wash for students 4.5 School have a place where students can wash their hands with soap 4.6 Availability of building, electricity etc.
5.	To examine the type of health services provided at the school	5.1. To assess the distribution of IFA and deworming medication at the school 5.2. To assess the consumption of IFA and deworming medication among the school children 5.3. To examine the health check-ups conducted at the school

6.	To provide, recommendations to the Government	Based on the findings of the assessment, to provide the specific recommendations to concerned authorities
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The assessment questions and sub-questions which constituted the area of enquiry are presented in the Assessment Matrix enclosed as Annexure 4 and Annexure 5.

1.4 Stakeholders during endline assessment

The expected users of the endline assessment findings will primarily be WFP, GoUP and donors of the fortification of MDM programme. The key stakeholders in MDM fortification programme intervention are given in the table below:

Table 1.2: Stakeholder Involvement during Programme Implementation and Assessment			
Stakeholder	Interest in the Fortification of MDM Programme	Involvement in Assessment and likely use	Who (specifically for the Assessment)
Internal (WFP) stakeholders			
WFP Programme Team	Programme implementation activities- Lead partner	Guidance at all steps to CMS (evaluating agency) and Use of findings for implementation purpose	M&E Officers
External stakeholders			
GoUP at State/District/block	Programme implementation partner at school, block, PDS levels; Ensure regular supply of MDM food grains Support for logistics	Informing schools about assessment study being undertaken	District Basic Shiksha Adhikari (Varanasi) Director, MDM Authority
Teachers	MDM supply and distribution among children; Creating awareness about benefits of fortified MDM; Participate in capacity building on MDM fortification; Supervision of quality assurance during cooking of MDM	As assessment participants, sharing of information and data as desired under assessment process	Teachers of Sample school
Cook-cum-helpers (CCHs)	Responsible for cooking MDM at school; Participate in capacity building sessions on MDM fortification and cooking methods; Practice quality assurance protocol while cooking MDM	Participate as respondent during assessment exercise	CCHs of sample schools
Miller	Fortification of rice as per specification guidelines shared by WFP; Follow quality assurance protocol; Ensure regular supply of fortified MDM food grains	Participate as respondent during assessment exercise	Representative of M/s Kayess Flour Mills Pvt. Ltd
Implementing partner (NGO)	Conduct capacity building and awareness activities with different stakeholders	Participate as respondent during assessment exercise	Shambhunath Singh Research Foundation
Monitoring partner (NGO)	Monitoring of implementation activities	Participate as respondent during assessment exercise	Shambhunath Singh Research Foundation

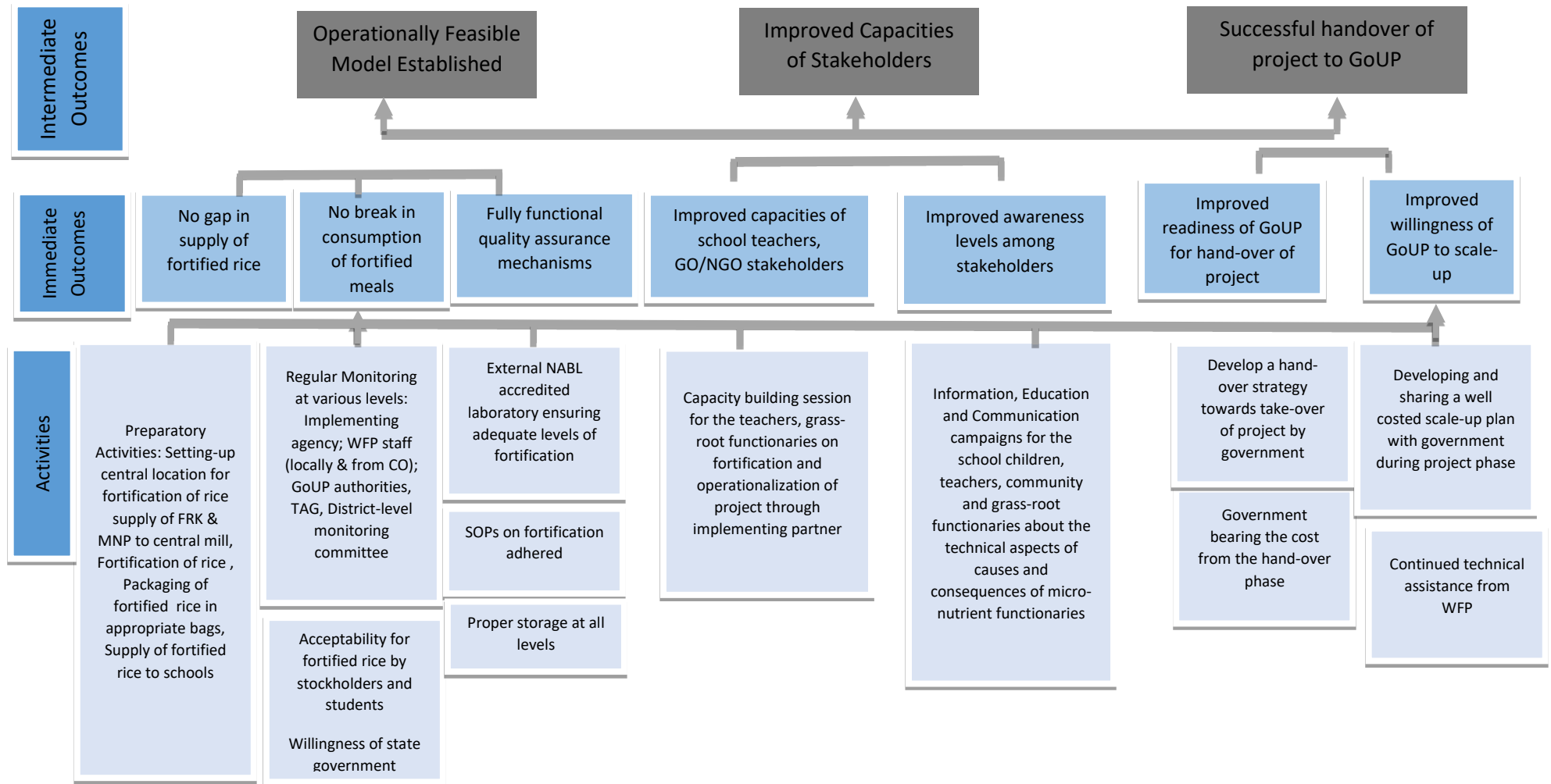
Communities including beneficiary parents and students	Acceptance and consumption of MDM by students at school level; Participate in awareness activities undertaken on MDM fortification; Encourage children to attend school regularly and consumption of MDM	Participate as respondent during assessment exercise	Parents of identified school children; Students
Frontline health worker	Awareness creation about benefits of fortified MDM; Participate in capacity building sessions on MDM fortification	Participate as respondent during assessment exercise	Frontline workers in catchments of sample schools
PRI/ULB/SMC member	Support awareness activities undertaken to create awareness about benefits of fortified MDM; Overall supervision of MDM preparation and distribution; Motivate parents to send their wards to school regularly and take MDM	Participate as respondent during assessment exercise	PRI member in catchments of sample schools

For the programme assessment, the assessment team during the endline phase interacted with the above listed stakeholders. These stakeholders were also interacted with during the baseline round.

1.5 Theory of Change for Fortification of MDM Programme

The Theory of Change developed for the project (flow diagram below) has presented the broad activities and expected outcomes, both immediate and intermediate. The assessment will discuss the findings in its context.

Flow Diagram: Theory of Change for Fortification of MDM Programme in Varanasi, UP



1.6 Assessment methodology

Similar to the baseline, in endline round too, the mixed methods approach was used for collecting the data and information. Assessment objectives and sub-objectives formed the basis for developing the survey tools for administering with the different respondent groups.

Quantitative data has been collected from the school children selected from sample schools and their parent (mother or father). A School Observation Checklist was used to capture data and information at the school level.

Sampling Approach

Selection of Blocks: The endline assessment covered all 10 programme blocks of Varanasi district.

Selection of schools: Stratified sampling method was followed. The school was divided in three strata- Primary level schools, Upper Primary schools and Primary with Upper Primary level schools. Probability Proportional to Size (PPS) method was used to select schools from each programme intervention block. In all, 63 sample schools in Varanasi were covered. (For block wise distribution of sample schools, see Annexure 1.4).

Selection of students and parents: In each sample school, using the attendance register, children were randomly selected from each class. Effort was made to have equal representation of male and female students, though at school level, this proportion varied depending upon the female/male student enrolment ratio and whether school is a co-ed or not. Corresponding parent (mother or father) of the selected sample children were interviewed. During selection of parents for the survey, it was observed that more mothers were available during the time of survey (daytime) and fathers were generally out of home for livelihood activities or for some other work. In case both the parents were available, preference was given to mother of the child, as she is mainly the one responsible for food preparation and its distribution at the household level.

In the endline round, out of 732 students covered, 356 (49%) were male students and 376 (51%) were female students. As per the enrolment register of the surveyed schools, the enrolment percentage of male student and female students was nearly similar i.e. 47 and 53, respectively.

In order to collect the qualitative data, in Depth Interviews (IDIs) were conducted with relevant respondents at state, district, village and school level: One miller, who has been identified by WFP for the fortification of rice and wheat, was interviewed. In addition to it, from each sample school, the teacher in-charge for MDM and a CCH responsible for preparing MDM was interviewed. Similarly, in each catchment village¹³, two health workers such as ANM and ASHA were interviewed along with a PRI/SMC representative. At state/district and block levels, concerned nodal officials were identified in consultation with WFP team and interviewed.

¹³ School catchment area is the geographic area from which students are expected to attend a local school.

Sample Distribution

A total sample of 1785 persons across different respondent groups was covered in addition to 63 school checklists filled through observation and from records/registers in the sample schools.

Sample distribution in each block is presented in the table below:

Table 1.3: Block wise and respondent group wise distribution of sample covered												
S.No.	Block	Sample schools (school checklist)	Students			Parents	PRI /Ward members	Principal/Teacher /CCH	Grass root level worker	Government officials	Miller	Total
			Category-1	Category-2	Total							
State level										*		-
District level										2	1	3
Block level										2		2
1	Arajiline	8	50	48	98	98	8	16	16			244
2	Baragaon	7	50	32	82	82	7	14	14			206
3	Chiraigaon	6	50	16	66	66	6	12	12			168
4	Cholapur	6	50	16	66	66	6	12	12			168
5	Kashi Vidya Peeth	8	50	48	98	98	8	16	16			244
6	Harhua	6	50	16	66	66	6	12	12			168
7	Pindara	7	60	16	76	76	7	14	14			194
8	Sewapuri	5	50	0	50	50	5	10	10			130
9	Ram Nagar	2	10	16	26	26	2	4	4			64
10	Urban Area /Nagar Kshetra	8	40	64	104	104	8	16	16			256
Total		63	460	272	732	732	63	126	126	5	1	1847
<i>Category 1 (up to primary): @ 10 students per school ; Category 2 (upper primary): @ 16 students per school *could not interact due to COVID-19 pandemic lockdown</i>												

Research tools employed during the endline round were the tools used in the baseline round with additional questions on programme related activities. All tools were pre-tested and finalized during baseline round hence no pre-test was conducted before the endline round. During baseline, a team of two field researchers visited the schools and catchment locations and pre-tested the survey tools in two schools, one primary and one upper primary school and their catchment locations to judge the flow of questions, language of the questions, consistency of responses and time duration to complete one interview/survey schedule. Paper assisted personal interviews (PAPI) version of data collection tools was used.

Training of field staff for main survey was conducted before initiating the data collection by senior assessment team members. From WFP India team, officials from Delhi and Varanasi participated during the orientation of team. Interactive training sessions were conducted using PowerPoint presentation, mock sessions, and field visit for practice followed by debriefing sessions. A separate session on ethical do's and don'ts was conducted.

Data Processing and Analysis

Quantitative data was entered, validated and transferred to SPSS software for analysis. The data was analyzed, as per the mutually agreed analysis plan developed in consultation with WFP team, to answer the assessment questions. For qualitative data collected through IDIs, a Parameter/Thematic Matrix was developed in MS Excel sheet to enter responses of different stakeholders on areas of enquiry. The spread sheet was helpful to collate responses on the basis of similarity as well as to identify the reasons cited for variation.

Broadly, household level survey findings are cross tabulated and presented by age group and sex of school children. The age group was primary level (class 1 to 5) and upper primary level (class 6 to 8). For both age groups, the findings were further disaggregated by gender. Data collected through school checklists analyzed and presented by type of schools i.e. Only Primary School; Only Upper Primary School; and Primary+ Upper Primary School. The data outputs are presented in tables and graphs along with the key findings discussed in detail. The qualitative data gathered through IDIs with different stakeholders are used to supplement and complement the quantitative findings and provide insights for intervention.

1.7 Ethical Considerations

Assessment protocols were reviewed and approved by CMS Institutional Review Board (CMS-IRB), a duly recognized and accredited body.¹⁴ Individual consent was obtained from parents for their participation in the survey as well as consent for interviewing their children, who are minors. With sample students, assent was taken to participate in the survey. Individual informed consent was obtained from the concerned authorities of each selected school before the interview. No discrimination was made in selection of any respondent on the basis of gender of the respondent. All collected and entered data was kept in a password protected computer with access to only core team members for the study. Hard copies of the filled-in survey schedules and IDI guidelines/notes were also kept in a locked cabinet.

1.8 Quality Assurance Measures

The following steps were ensured towards quality assurance measures:

- Senior professionals in team: Core team members involved for the assessment were full time senior professionals of CMS.
- Regular monitoring by Field Manager and Supervisors: The Field Manger was the focal point of co-ordination between the assessment team and the field teams. The supervisors, on a sample basis, made accompanied calls, spot-checks and back-checks in 20 per cent of the household level survey.

¹⁴CMS-IRB is duly recognized by OHRP, DHHS, USA

- **Data Confidentiality & Protection:** All entered data was kept in a password protected computer while hard copy of the filled in assessment tools was kept in a locked cabinet, with access to only assessment team core members. All PCs at CMS are well protected with anti-virus software.
- **Social distancing and hygiene practices due to COVID-19 pandemic:** The validation of entered data got delayed due to lockdown by the government. As paper-based tools were used for data collection, the validation of data started only after partial upliftment of lockdown in the first week of May 2020 and followed the safe distancing guidelines by the government.

1.9 Timeline

The endline assessment was originally planned to be completed in a span of a three-month period starting from February-end, 2020. The data collection was carried out between February 22 and March 8, 2020. However, due to the COVID-19 pandemic and subsequent lockdown by the government, the post-data collection activities got delayed.

1.10 Limitations of the Assessment

There were some limitations of the assessment, mostly around the impact of COVID-19 and the subsequent lockdown across the country, including closure of schools. Specific limitations include the following:

- Secondary data available in the public domain was not of the last financial year i.e. 2019-20 but of previous years. Hence all estimations have been made using the available data on school enrolment, drop-outs, and MDM meals served for the FY 2018-19.
- Due to Covid-19 pandemic and subsequent lockdown, meetings with the state level officials as well as follow-up for the latest secondary data and information could not be carried out.

Chapter2: Profile of Programme District and Respondent Groups

2.1. District Profile

Varanasi, with a population of 36.77 lakh persons¹⁵, is densely populated having 2399 persons per sq. km., as against the state average of 828 persons per sq. km. About 19.2 lakh (52%) are male and around 17.5 lakh (48%) are female, spread across 5.6 lakh households with an average household size of 7 persons. Around 57 percent of the population lives in rural locations of Varanasi. Hindus constitute 85 percent of the total population with Muslims constituting the remaining population. Eighty-six percent of the whole population belong to the general caste, 13 percent are from scheduled castes and 1 percent is scheduled tribes. As per 2011 census, there are 913 females per 1000 males in the district. Literacy rate (children under 6 excluded) of Varanasi is 76 percent (male: 84%; female: 67%). Between 2001 and 2011, overall literacy rate in the district has increased by 10 percent- 6 percent formalised 14 percent for females.

In Varanasi, the MDM is being provided to 194 thousand school children across 1610 government schools¹⁶. The data of District Information System on Education (DISE) for Varanasi district shows that among the students studying in primary and upper primary grade nearly 49 percent of the students enrolled are girls¹⁷. However, this data includes both government and private schools. The project document data for project intervention schools in Varanasi shows the percentage of girls to be around 42 percent in primary and upper primary government schools of Varanasi.

As per Census 2011, the total working population of Varanasi district is 12,20,708, which is around 33.20 percent of the total population of the district. Female constitute around 25 per cent of the total workforce. Within the Primary Sector, agriculture and livestock have been contributing significantly. Agriculture is largely dominated by small and marginal land holdings, with sugarcane, rice and wheat being the main crops sown. In the secondary Sector, manufacturing is one of the important components which gives employment to both organized and unorganized workforce. There are nine large scale private and public sector undertakings. Among the micro and small enterprises, cotton textile, woollen and silk, readymade garments and embroidery, wooden based furniture, chemical based units and repairing and servicing are the major contributors. The silk products, one of the Geographical Indicators (GIs) of Varanasi gives huge employment opportunity to a large number of weaver's group from the unorganized sector (approx. 58000 weavers' group). The religious and cultural tourism at Varanasi has also evolved over a period of time¹⁸.

¹⁵ Census 2011

¹⁶ http://www.upmdm.org/qpr/Apr_Jun_2017_18_30082017.pdf

¹⁷ DISE Data District Report Card 2016-17

¹⁸ <https://eaindustry.nic.in/ddp/Varanasi>

Around 45 percent (Rural-49% and Urban 39%) of children under 5 years are chronically malnourished or stunted¹⁹ in Varanasi. Nearly 60 percent of children aged 6-59 months and more than half (51%) of all women aged 15-49 years are anaemic in the district.

2.2. Profile of Surveyed Households

The section elaborates on the socio-demographic profile followed by economic profile of the surveyed households. The key indicators like standard of living, food consumption score and monthly per capita expenditure on food and other relevant indicators important to understand the socio-economic status of the households from the programme intervention perspective are discussed in this chapter. For a comparative analysis of the change the findings of the endline (EL) assessment has been compared with the baseline (BL) findings.

2.2.1 Parents and Students' profile

Findings shows that during both endline and baseline rounds, age of sample students for specific class was found to be in consonance with the expected age of a child for the class. All sample students were in the age group of 6-15 years. Average age of sample students was around 10 years. In both endline and baseline rounds, the average age of the parents of surveyed children are similar i.e. the average age of fathers was 38 years while that of mothers was 34 years.

Literacy status of parents helps to gauge the extent and quality of development within the target population. In the endline assessment, among the surveyed households, 81 percent (BL: 77%) fathers while less than 55 percent (BL: 49%) of the mothers were found to be literate. However, majority of them had not attained educational qualification more than upper primary level.

Indicators	Father		Mother		Combined	
	BL	EL	BL	EL	BL	EL
Surveyed households, N	732	732	732	732	1464	1464
Educational qualification						
Illiterate	23	19	51	45	37	32
Primary	20	18	17	17	18	18
Upper primary	20	26	15	17	18	21
High school	19	18	5	9	12	14
Intermediate	10	9	4	6	7	7
Diploma /Degree & above	3	7	1	2	2	5
Not Completed	5	3	6	4	2	1

Occupational Status of Parents: Most of the fathers were engaged in skilled labour such as in a production unit or transport sector or as an artisan (EL: 42%; BL: 41%). Around 33 percent of the fathers were earning their livelihoods from the unskilled labour (BL: 37%). Among mothers, 85 percent

¹⁹ NFHS-4(2015-16)

were homemakers (BL: 72%). Compared to baseline round findings, women engaged in unskilled labour has come down to 6 percent from 15 percent.

Table 2.2: Occupational Status of Parents (in %)

Occupational category	Father		Mother		Total	
	BL	EL	BL	EL	BL	EL
Surveyed households, N	732	732	732	732	1464	1464
Homemaker(Mother)/Unemployed/Irregular (Father)	0	2	72	85	36	43
Unskilled Service (including Agricultural Labour)	37	33	15	6	26	20
Skilled Labour (Production/ Transport/ Artisan)	41	42	6	0	24	21
Micro, small, medium enterprise	15	14	3	2	9	8
Cultivators	2	3	3	4	2	3
Sales	3	3	0	0	2	2
Clerical and Managers	3	2	1	0	2	1

2.2.2 Socio-demographic characteristics of households

Household size and social composition

The survey findings were similar to Census data at household level, such as, the average household size was 7 members. Also, majority of the families follow Hindu religion (EL: 88%; BL: 90%). As per endline survey data, around 60 percent (BL: 57%) belonged to the Other Backward Castes (OBC) while 31 percent (BL: 37%) were from the Scheduled Castes (SC) and rest from general social group (EL: 9%; BL: 6%).

Homestead and access to basic facilities

Of the surveyed households 49 percent were made of pucca²⁰ (BL: 42%), while 41 percent were semi-pucca houses²¹ (BL: 43%). Nearly all (EL and BL: 92%) owned the houses.

Drinking water facility: Piped water was the main source of drinking water (EL: 49%; BL: 47%), followed by hand pump (EL: 47; BL: 51%). The improved drinking water source in the sample locations was 96 percent (BL: 98%), which commensurate with NFHS-4 (2015-16) district factsheet of Varanasi(96%). The percentage of households having a source of drinking water within the household or community-owned sources in the vicinity of their houses has significantly increased (EL: 45%; BL: 35%; $p < 0.01$). Amongst the households, which had to fetch drinking water from outside, the average time taken to fetch water was around 5 minutes (EL: 4 min; BL: 7 min).

Household access to sanitation: Nearly 9 out of every 10 surveyed households had a toilet (EL: 88%; BL: 80%; $p < 0.01$). As per NFHS-4, the sanitation coverage was less than 50 percent which indicates that there is a significant improvement in sanitation coverage since then.

Place of cooking and sources of fuel: Majority of the surveyed households had a separate room as a kitchen (EL: 62; BL: 58 %). Clean fuel (LPG) was the major fuel for cooking (EL: 49%; BL: 39 %) followed

²⁰ Houses made with high quality materials throughout, including the floor, roof, and exterior walls

²¹ A semi pucca structure is one of which either the roof or the walls but not both is made of pucca materials like burnt bricks, stone, cement, concrete or timber

by dung-cakes (EL: 31%; BL: 37%). As per NFHS-4 too, around 50 percent of the households in Varanasi district were using clean fuel.

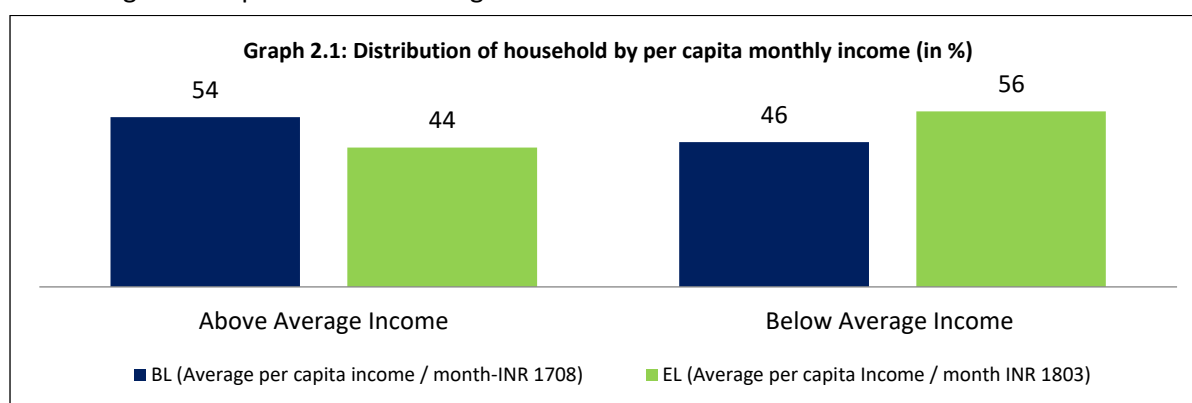
Land holding pattern

Land holding status is an important indicator of a household's economic status. Among the surveyed households, 42 percent (BL: 41%) owned an agricultural land.

The average land holding of these households was similar in both the rounds (EL: 0.23 ha; BL: 0.19ha), suggesting that almost all of them were marginal farmers. In baseline, 79 percent had ownings of less than 0.25 ha compared to 75 percent at endline. Fifteen percent of households at baseline had land holdings of between 0.25 to 0.50 ha, compared to 18 percent at endline. The rest of landholding farmers had plots greater than 0.5 ha.

Average household income

Among the households surveyed during endline round, 56% had per capita monthly income less than the average as compared to 46% during baseline round.



Savings account

To understand whether households do some monetary savings, they were enquired about whether any member of the household has a savings account in bank or post office. Almost all the households in surveyed locations reported having a savings account in a bank or post office (EL: 99%; BL: 97%).

India's unbanked population has been the target of the Government of India's flagship programme Pradhan Mantri Jan Dhan Yojana (PMJDY), launched in 2014. It has been largely responsible for the rapid increase in percentage of the households owning bank savings accounts.

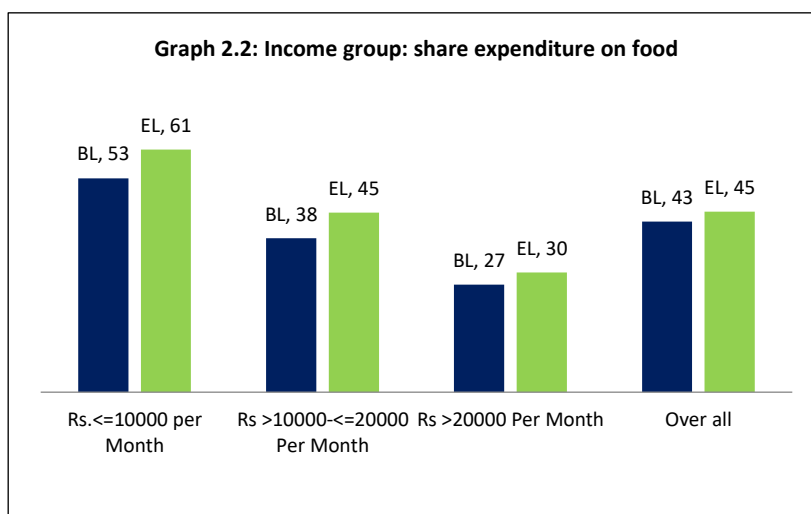
Type of ration card

The Public Distribution System (PDS) plays an important role in providing subsidized food grains and thereby playing an important role in improving the nutritional status of the households. Nearly 87 percent (BL: 83%) households have a ration card, and out of them, majority (EL: 88%; BL: 78%) had Priority HH type of card.

Household expenditure on food

To assess the household's well-being, their share of total monthly expenditure on food was calculated. From each surveyed household, detailed information on food item-wise monthly consumption and expenditure was gathered.

In all, the households allocated around 45 of total monthly expenditure for food (BL: 43%). As per the Government of India's Ministry of Statistics and Programme Implementation Report in 2016- 17 (at current price), around 35 percent of the total expenditure is for food. As expected, the share of total expenditure on food decreases



with increase in income, which is reflected from the findings of both the rounds as well.

Prevalence of sickness and expenditure on treatment

During endline survey, a lower percentage of parents reported that their child had been ill in the 15 days prior to the survey (EL: 31%; BL: 43%; $p < 0.01$). Thus, as compared to baseline there is a significant decline in the prevalence of illness among the children during end line round. As compared to baseline, during endline prevalence of sickness significantly declined among Hindus, scheduled caste, scheduled tribes, children of mothers, who are either illiterate or have primary level of education, poor and children of households with no land or have less than .25 hectare. Details of prevalence of sickness by household background characteristics is provided in the annexure table 2.19.

Among the students who reported falling sick in last 15 days, two-thirds (EL: 63%; BL: 66%), remained absent from school at least for a day. There was slightly less absenteeism reported by the female students. As the endline round was conducted in Feb-March, the change of season from winter to spring, expectedly the most common cause of sickness reported included fever (81%), cough (72%) and cold (69%). By sex of the students, no major difference in terms of expenditure made by the households on their treatment was observed.

Parents were enquired about the average medical expenditure on child in last 6 months. Regarding Out-Patient Department (OPD), parents reported of incurring Rs. 292 (BL: Rs. 475) for male child and Rs. 261 (BL: Rs. 359) in case of female child. In context to In-Patient Department (IPD), number of male child (BL: 8; EL: 13) who were given IPD services were much higher as compared to girls (BL: 4; EL:2). Probably, a girl child is provided IPD services during serious illness, that could be the reason why a

much higher amount of money is incurred on a girl (BL: Rs. 3168; EL: Rs. 3201) for IPD than boys (BL: Rs. 2106; EL: Rs. 1894).

Table 2.3: Average Medical Expenditure on child in last 6 months (in %)

Medical Expenditure sub-heads	OPD (in %)				IPD (in %)				Total (in %)			
	Male		Female		Male		Female		Male		Female	
	BL	EL	BL	EL	BL	EL	BL	EL	BL	EL	BL	EL
N	220	179	246	198	8	13	4	2	228	192	250	200
Transportation	3	7	4	6	12	7	1	6	5	7	3	6
Medicine	80	79	76	80	40	54	82	64	75	71	77	79
Diagnostic/Pathological test	3	3	6	4	11	13	5	11	4	6	6	5
Consultation fee	13	7	13	7	13	10	4	6	13	8	12	7
Room charge (if admitted as in patient)	Not Applicable				15	13	6	6	2	4	1	1
Food	0	4	1	2	9	4	2	3	2	4	1	2
Total	100	100	100	100	100	100	100	97	100	100	100	100

In both endline and baseline rounds, around 2 percent of the parents reported that their child was hospitalized during the last six months prior to the survey.

As per the endline assessment findings, around half of the child-patients (8 out of 15) admitted, were put in a private nursing home and paid room charges rather than opting for government hospital, where in-patients don't have to pay for room. As per the baseline findings (October 2018), only a little more than one percent of the surveyed households had a health insurance scheme. The endline assessment shows a significant ($P < .01$) increase with nearly 16 percent households subscribed to a health insurance scheme and noticeably, more than 90 percent had opted for *Ayushman Bharat scheme*, which gives treatment coverage up to Rs. 5 lakhs annually to a household.

Intra-household food distribution

Among various efforts made to improve nutritional status of the population by the government and supporting agencies include creating awareness about no discrimination in intra-household food distribution on the basis of gender. Households in both endline and baseline rounds were enquired on a few aspects to assess the prevailing practices in this regard.

Table 2.4: Member 'who eats last' at household level (in %)		
Member who usually eats last in household	HHs in %	
	BL	EL
Female Adult	87	93
Male Adult	8	4
Elderly female	5	2
Girl Child	3	0
Boy Child	1	0
Elderly male	1	0

Household member who usually eats first in the family:

In 60 percent households (BL: 71%) parents informed that boy child 'eats first' among the family members while in 50 percent households, the girl child 'eats first' (BL: 55%), followed by the male adult (EL:26%; BL:39%). In both the rounds, key reasons cited for eating first is either the person has to go to school or to work. More specifically, among the key reasons stated by the parents for a particular member eating first in the family include, 'person (child in the family) has to go to school' (EL: 53%; BL: 76%) or 'person has to go to work' (EL: 26%; BL: 40%).

Member who eats last in the family: In almost nine out of every ten surveyed households in both the rounds, female adults including old age female member ‘eat last’, reflecting the continuation of years of customs and traditions prevailing in the families.

Member who eats most: Male adults eating most was cited by majority of the households during endline as well as baseline rounds (EL: 69%; BL: 57%). Among the reasons cited for a member in the family ‘eating most’ were, the person had to do physical labour 67 percent (BL-63%) or ‘due to growing age more diet is needed’ (22%).

Member who usually eats most in the family	HHs in %		Reasons for family member(s) eating most in the household	HHs in %	
	BL	EL		BL	EL
Male Adult	57	69	Had to do more physical labour	63	67
Boy Child	25	18	Growing age/more requirements	32	22
Girl Child	8	5	Is head of household	6	16
Female Adult	6	7	Is male member	6	24
Lactating	1	-	Is pregnant/lactating	1	1
Male Old	2	1			
Female Old	1	-			

Less than one out of every ten surveyed households reported adult women eating most in the family and ironically, women continue to be the ones in the households deciding the menu of the meals(EL: 79%; BL: 74%).

Faced food shortage and coping strategy: Around 3 percent (25) households reported coming across a situation where a member(s) eats less due to the food shortage in the family. Whenever the households faced food shortage, in almost all such situations, the adult women of the household sacrificed by eating less.

Household Food consumption score

The household Food Consumption Score (FCS) is a measure of household food security based on food frequency and dietary diversity, using a 7-day recall period, irrespective of quantity and quality. This is a good indicator to see the variety of food consumed and higher value indicates consumption of balanced diet²².

²²Food Consumption Score Nutritional Quality Analysis Guidelines (FCS-N), UNWFP, 2015
<https://www.wfp.org/publications/food-consumption-score-nutritional-quality-analysis-fcs-n-technical-guidance-note>

As evident from the analysis of FCS shown in *Table 2.8*, majority 94 percent (BL: 93%) of the households continue to be in the ‘acceptable’ category.

Parameter	FCS Category		
	Poor -Up to 28	Borderline –above 28 to 42	Acceptable - Above 42
	Households (in %)		
BL-Surveyed Households (N=732)	0	7	93
EL-Surveyed Households (N=732)	0.4	6	94
BL-Average FCS	54 (Acceptable)		
EL-Average FCS	54 (Acceptable)		

Quantity of cereal intake per capita is an important indicator of food security status of the population. Recommended Dietary Allowances (RDI) for intake of cereals/millet is 400 gm per capita, however, among the surveyed households, the intake is around 300 gm in both baseline and endline rounds while the intake of pulses is also much below RDI norms of 80 gms per capita (EL: 22 gm; BL: 26 gm).

As far as another important category of food items i.e. milk and milk products (curd, paneer etc. is concerned, on an average a household spent Rs. 433 (BL: Rs. 520) per month, which was around 4 percent of the total income of a household in both the rounds. In terms of per capita consumption of milk/milk products, it is also found to be similar in both the rounds (EL: 100 gm; BL: 110 gm) much lower than RDI’s recommended intake of 300 gm.

Use of iodized salt in food was in practice across all sample households, as was also the findings of NFHS-4 (2015-16), which showed that 97percent of the households had the availability of iodized salt in Varanasi district. The usage of iodized salt in food was also found to be in practice before the programme intervention with more than 95 percent of the sample households reported using iodized salt for more than a year.

2.3 Profile of surveyed schools – In terms of Entrollment, Attendance, Infrastructure and Health Services provided at School

The section based on school observation checklist which collated data from different records available at school level such as enrolment, attendance, MDM distribution along with the observation made by the assessment team, discusses the surveyed schools’ profile.

In the endline as well as baseline rounds, a sample of 63 schools, representing all types of management governing state government’s primary and upper primary schools was covered across 10 blocks of Varanasi. For sample schools by type of management refer Annexure Table 2.1.

School in vicinity: One of the measures taken by the government to ensure enrollment of all school-going-age children and to minimize dropouts is to make schools available in the vicinity. The average distance travelled by a student to reach their school was around half a kilometre (0.6 km).

Classrooms: Similar to 7th All India School Education Survey findings on the average number of classrooms available in Uttar Pradesh, the average number of rooms in schools with only primary, primary with upper primary and only upper primary grades was 4,13 and 5 respectively (BL: 4, 15 and 5 respectively). Refer Annexure Table 2.2.

The **main source of drinking water** in the schools was hand pump (EL: 67%; BL: 75%). Around 27 percent of the schools (BL: 19%) had facility for purification of water for drinking purpose. As most of the schools had hand pump, only one-third of the surveyed schools (BL: 25%) store drinking water (refer Annexure 2.3).



Drinking water facility at school

Toilet facility in school has seen improvement after the Supreme Court of India directive in 2011 to all states/union territories to build toilets in schools, particularly for girls. School Sanitation & Hygiene Education (SSHE) programme also mentioned about separate toilet unit for girls. The assessment found that nine out of every ten surveyed had separate toilets for male and female students (EL: 97%; BL: 92%).

Moreover, compared to the baseline findings on the number of toilet facilities as recommended under SSHE programme, the endline assessment shows a better picture as far as overall toilet-student ratio is concerned (EL=1:51; BL=1:63).

As far as availability of toilet facility for female students is concerned almost similar picture emerges in both the rounds (EL= 1:52; BL=1:51). Refer Annexure Table 2.4.

It is pertinent to mention that though fortification of MDM programme did not have any component of infrastructure creation, better facilities have positive impact on students' retention as well as attendance in the school.

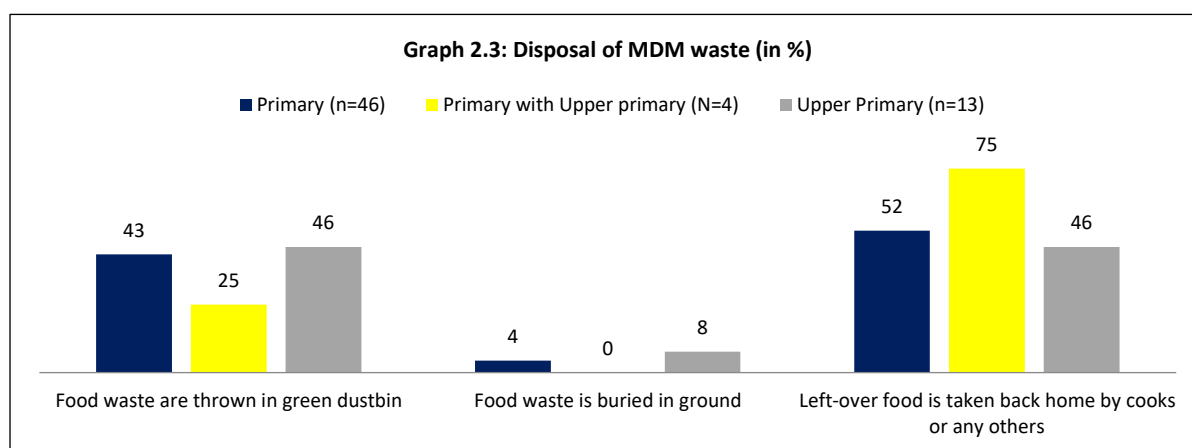
Hand washing facility in school: Hand washing with soap and water after using toilet and before eating food is an important practice for reducing risk of diarrhoea by more than 42-47%²³ as well as other diseases. In context of current prevailing pandemic due to COVID-19 too, hand washing with soap is strongly recommended by the health experts as a preventive measure. A significant percentage of schools do not have separate hand washing facility. However, compared to baseline, the percentage of schools with the hand washing facilities had improved (EL: 56%; BL: 46%). Refer Annexure Table 2.5.

²³Curtis & Cairncross, London School of Hygiene and Tropical Medicine (2003)

CMS team during their visit to the schools made an observation of hand washing practices among the students, teachers and CCHs. A significant improvement in hand washing practices using soap was noticed among female students (EL: 78%; BL: 67%; $p < 0.01$). Among male students too, the improvement was noticeable (EL: 73%; BL: 38%; $p < 0.01$). The programme activities such as health education sessions may be a contributory factor in this change in hand washing practices of students. Refer Annexure Table 2.6.

Teachers and CCHs were also observed to be washing their hands with water and soap. Nearly 80% of the school staff-teachers and CCHs were observed to be washing hands with soap and water after using toilets. Similar percentage of CCHs was also found to be using soap and water before cooking MDM.

Management of Solid wastes and MDM wastes: Students spend around 25 to 30 percent of their daytime in schools and clean surroundings make positive impact on students, both physically and mentally. Majority of the sample schools (56%) gave the solid wastes to garbage collectors; compared to the baseline findings (23%), the improvement is significantly high ($p < 0.01$). However, around one-fourth schools threw solid wastes in open space. Refer Annexure Table 2.7.



As far as wastes generated during preparation of MDM and left-over cooked food is concerned, it is thrown in green dustbin and taken home by CCHs, respectively.

Human resource: All 63 sample schools had sanctioned provision for Principal/Head Teacher, but in around 16 percent schools (BL: 19%), the position is vacant; a large number of these vacancies exist at upper primary levels.

The Right of children to free and compulsory education (RTE) Act 2009 lays down pupil-teacher ratio at primary level as 30:1 and at upper primary level as 35:1. As per the assessment findings, in both primary and upper primary level schools, the ratio was better than prescribed- 23:1 in primary schools (BL= 25:1) and 26:1 (BL=28:1) in upper primary schools. Almost all the sample schools had the required number of CCHs in-position, as per the sanctioned position. Refer Annexure Table 2.8.

Enrollment, Drop out and Absenteeism rate of students: Out of the total enrolled 8947 students (BL: 9607) in surveyed schools, 53 percent were female students (BL: 40%). One of the reasons for increase in the proportion of female students was two sample schools being 'only girls' schools in the endline round while in baseline round, two sample schools were 'only boys' school. Overall, in the co-educational schools in the sample (EL: 60 nos.; BL: 58 nos.), the enrollment ratio of female and male students was similar in both endline and baseline rounds (1:1).

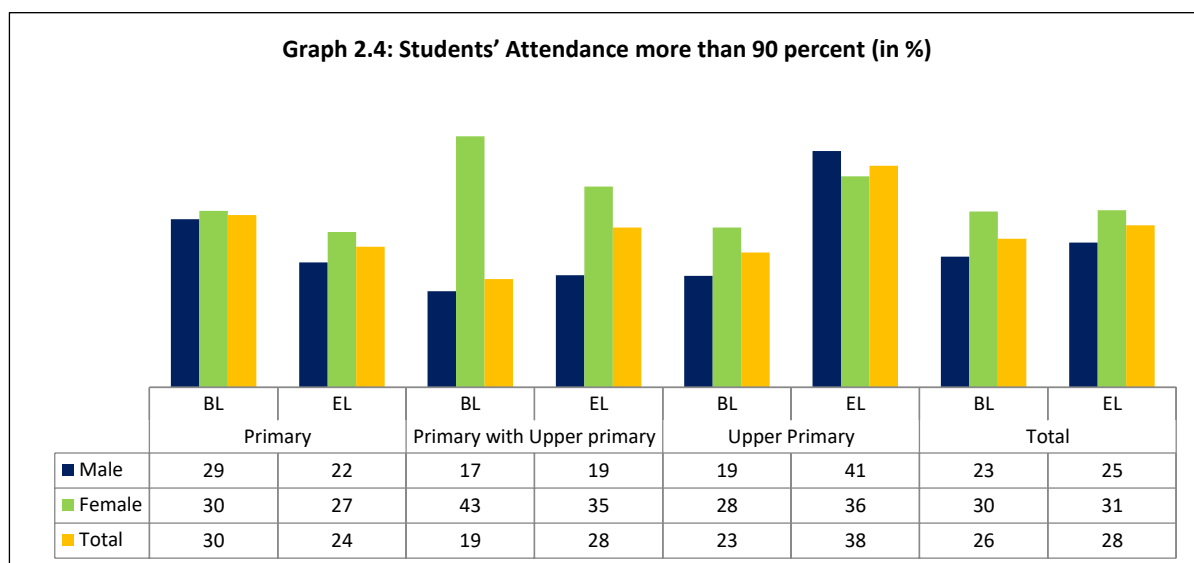
As far as dropout rate among students is concerned i.e. from class 5 (primary level) to class 6 (upper primary level), it was around 8 percent between baseline and endline rounds.; slightly more among girls (15%) than boys (10%). However, it is pertinent to mention that the dropout rate may be further low as these figures are based on sample co-educational schools and it is possible that many students might have enrolled in class VI of only boys or only girls schools or joined a private school in the vicinity. As per the secondary data, out of total 1610 government/government-aided schools in Varanasi, the ratio of government schools having class V and schools having class VI is 2:1. Refer Annexure Tables 2.9-2.10.

The **rate of absenteeism** between November 2019 to January 2020, the reference period for the endline assessment, was slightly higher among the male students (43%) as compared to female students (37%). An increase in absenteeism rate was noticed on comparing with the baseline data (8% among male students and 4% among female students). One of the likely reasons, as emerged from discussion with the school teachers, for increase in absenteeism was the peak winter season during November-January. On the other hand, the reference period was July-September 2018 for the baseline round, which is comparatively a pleasant period of the year in Varanasi. Refer Annexure 2.11.

Students having more than 90 percent attendance: Average attendance was around 62 percent in all types of schools. During IDIs, most of the Headmasters mentioned that enrollment and attendance have increased significantly after the introduction of the MDM scheme in the schools.

Government officials also agreed that the MDM scheme continues to have a positive effect on attendance and enrollment. Fortification of MDM programme too was well received at all levels, as emerged from parents and students survey and interviews with different stakeholders and is expected to have favourable impact on attendance of the students in schools.

Further looking at the percentage of children who attended school regularly (with attendance 90% or more), endline findings show that around 28 percent of the enrolled students were present in schools for 90 percent or more school working days; the percentage of female students in this category was better than male students.



Availability of Record book and Register: Record keeping was found satisfactory as records/registers were available in most of the sample schools, and to add to it, all available registers were found to be updated. In particular registers related to MDM stock and supply of fortified rice was found in almost all the surveyed schools except a few schools. Refer Annexure Table 2.12.

IFA supplementation: As per the norms of National Iron Plus Initiative for Anaemia Control, IFA tablet/syrup should be distributed once in a week. The endline assessment too showed that the frequency of distribution of IFA tablets as 'weekly' as more than three-fourth of the students informed during the survey. The distribution of IFA supplements has shown a significant increase ($P < .01$) when compared with the baseline findings. More than 88 percent students received IFA supplementation at school (BL: 68%). Almost all students who received IFA consumed it. Insignificant gender-wise difference was noticed across the three categories of schools, as far as distribution or consumption of IFA supplement is concerned. Refer Annexure Table 2.13 and 2.14.

Deworming Medication too was reported by an overwhelming percentage of students. Almost nine out of every ten students surveyed across primary and upper primary levels as well as by gender of the students, reported receiving deworming tablets/syrups in the school (EL:88%; BL: 80%; $p < 0.01$) and all of them reportedly consumed these tablets. The frequency of receiving deworming medication was half yearly (71%), as reported by majority of them. This is in line with the National Deworming Day (NDD) observance, which happens twice in a year, mostly during February and August every year. Refer Annexure Table 2.15 and 2.16.

Health check-ups in school: Besides distribution of IFA and deworming tablets/syrups, health check-ups were also conducted in the schools. A significantly higher percentage of students, with percentage of female students more than male students, in the endline round informed about receiving health check-up at school (EL:81%; BL: 58%, $p < 0.01$). Noticeably, the percentage of girl students who reported receiving health check-ups was more than boys, and important to note is the fact that these health check-ups were conducted by a medical doctor/health officer, as confirmed by nearly ninety percent of the students as well as teachers.

The frequency of these health check-ups, as reported by most of the students (EL: 44%; BL: 39%) was 'once in a year' while in more than one-third of the schools (EL: 35%; BL: 34%), it was reported as half-yearly. As per the Government Order, GoUP, under *Rashtriya Bal Swasthaya Karyakram* (RSBK), the medical mobile health team should conduct health check-ups of all students (class 1 to 12) of government and government aided schools, once in a year. Refer Annexure Table 2.17 and 2.18.

Chapter3: Operational Feasibility of Fortification of Rice, Awareness Activities and Scaling up

3.1. Introduction

The chapter focuses on various aspects related to the cost and operational feasibility of the fortification of rice distributed under MDM in Varanasi district. Further, this chapter also discusses the level of awareness about different IEC activities undertaken as part of fortification of MDM project among children, parents, teachers, cooks and other stakeholders at community and school levels. Lastly, chapters present a brief analysis on scaling-up of fortification of rice served under MDM in other districts of UP.

3.2. Operational Cost

About the mill: Based on a set of defined criteria and terms of reference, the mill was pre-selected by WFP for the fortification of rice, well before the start of the programme in the district. The assessment team interacted with the key decision-making persons in the mill in both the rounds to understand the aspects related to operationalization of fortification of rice and its supply.



Fortification equipments at mill

The mill selected by WFP prior to the programme intervention for the fortification of rice and wheat was Kayess Flour Mills Private Limited²⁴. Based on the observation and information shared by the miller, details about the capacity of the mills, equipment installed for fortification in the mill, total cost, including fixed and recurring costs for fortification of rice are mentioned in the table below.

Parameter	Unit	Remarks
Expected quantity of rice to be fortified (as per agreement)	4104 MT	
Actual production of fortified rice (as on Jan 2020)	3272 MT	
Quantity of rice fortified against expected	80%	
Capacity of fortification plant (currently operating on single shift basis)	50 MT/day	
Production process	Continuous	
Equipment	Cost (in Rs)*	
Vibratory feeder (manufacturer-M/s Kunstwerk)for FCI rice	100,000	@Rs 50,000/ per feeder, cost of two feeders
Blending equipment (manufacturer– M/s Orion fabricators)	890000	
Bucket elevator	100000	These equipments were not procured for this project, as it was already available at the mill.
Storage hopper	35000	
Screw conveyor		
Conveyer belt with stitching unit	5500	
UPS and Electrical Panel	100000	
Weighing equipment	8000	
Total estimated cost of equipment for fortification of rice	12,38,500²⁵	
* based on discussion with the Miller		
Note: Blending equipment was installed to provide additional blending efficiency, but not essential as a requirement. Similar blending efficiency may be achieved with conveyer belts		

²⁴Established in 1990, a private Indian company classified as 'company limited by shares', with authorized capital stands at Rs. 400 lakhs (Rs. 40 million) and has 71.37 percent paid-up capital. The mill is mainly into manufacturing and processing of food items and registered with FSSAI (Food Safety and Standards Authority of India), the apex body in India to maintain and promote public health by regulating and supervising food safety across the country.

The total cost of equipment needed for fortification of rice and wheat flour is estimated to be around Rs 12.38 lakhs.

For fortification of rice, the mill had not hired any additional human resource. The existing employees of the mill are managing the line of operation as per the specifications for fortification of rice. The type and number of staffs engaged for operationalizing, packaging and loading/unloading are listed in Table 3.2.

Position	Number
Head Technician	2
Supervisor	4
Skilled labour	12
Non-Skilled labour	6

Further information was gathered on packaging of fortified rice, which is important from the aspect of quality assurance. The mill was found to be following the compliance status, as per the terms of operation and delivery.

Specifications	Unit/Compliance status
Capacity of each bag	25 kg
Material used for packing bag (HDPE/Polypropylene)	Yes
Separate inner layer	Yes
Nutrition & Health Education message printed	Yes
Date of manufacture printed on bag	Yes
Batch number printed on bag	Yes

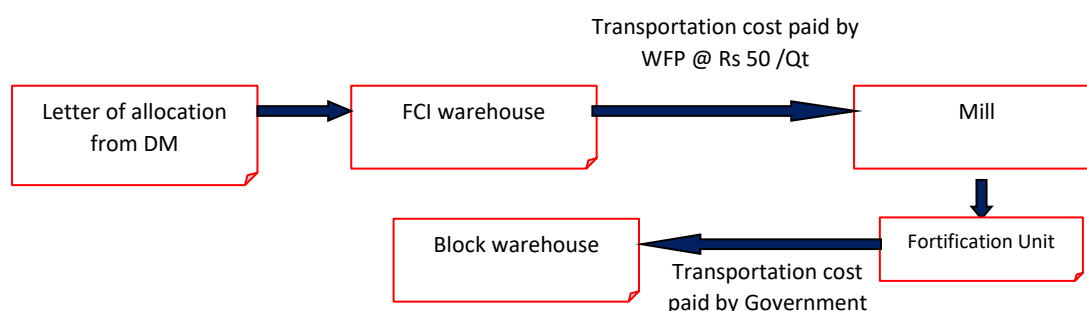
In order to assess the compliance status of storage facility, storage of rice received from FCI, fortified rice kernel (FRK) and fortified rice was observed and enquired at the mill. It was observed that storage facility was satisfactory, and mill had followed the given specifications for the same. Place of storage was under lock and key, well maintained and dry. Labels and boards with details of the project were displayed: “*FCI Rice for WFP project on Rice Fortification for Mid-Day Meals, Varanasi*” and “*Fortified rice Kernels for WFP project on Rice Fortification for Mid-Day Meals, Varanasi*”. As observed by the assessment team, rice bags were stacked vertically and away from walls, which were as per specifications. Clearance of inventory reportedly followed the first-in-first out and first expiry-first out principle. Refer Annexure Table 3.1.



Storage of fortified rice

Supply chain management of fortified rice: As depicted in the flow diagram (below), the additional level in supply of MDM was inclusion of miller for fortification of rice. The cost of transporting of

food grains from FCI warehouse to the miller was borne by WFP while the government ensured supply of fortified rice from miller to the block warehouse and onwards.



During discussion with the representative at the mill, it emerged that they consider the fortification of rice as a unique project and were willing to continue this project in future, as well. On the supply of FRK, the miller shared that *the supply of FRK was always on time and no short supply of FRK was ever faced by them during the project period. He further added that the supply of rice from the government was also on time and as per specified quantity.* The high satisfaction level at the supply side is encouraging from the operationalization aspect for scaling up the project.

3.3. Rice fortification cost per student

Based on the information shared by WFP and miller on the operational cost for fortification of rice, the fortification cost per student has been calculated for Varanasi district (see Table 3.4). The different components under which data was collected could be broadly categorized as

- Miller Cost includes costs of transportation & handling; storage and insurance; packing and marking; direct and indirect processing cost and margin of profit.
- Quality control cost include sample testing cost for Iron in fortified rice, both in store and under production
- FRK cost mainly include costs of raw material; processing; packaging and analytical tests
- Equipment cost include expenditure on purchase of vibratory feeder and conveyor belt
- Meal served under MDM in Varanasi district

Based on the costing analysis of pilot project at Varanasi, fortification cost per student per MDM meal is estimated to be Rs 0.22 (during the pilot).

Cost Components	Source	Amount (in Rs)*
Miller Cost ¹		6518054
Quality Control Cost ²		10800
FRK Cost** ³		2277925
Equipment Cost ⁴		990000
Total Cost		9796779
Meal served under MDM in Varanasi district as on 31.03.2018 (in number)	Annual Work Plan and Budget, 2018-19 MDM Authority, UP	44564741
Cost/ Meal		0.22
Cost/Kg		2.9
Cost /100 gm		0.29
<p>1,2,3,4: For detailed cost incurred under each component, please see Annexure Table 3.2, 3.3, 3.4, 3.5 respectively *Duration of pilot project was 18 months hence all calculation is based on the same. **It has been assumed that during scaling-up, GoUP would proceed with FRKs consisting of 3 micronutrients. Hence costing for 3 micronutrients has been considered in the analysis.</p>		

3.4. Operational feasibility

Operational feasibility is a measure of how well the solution meets the system requirements. The operational feasibility for the pilot was determined by assessing the following indicators:

- Availability of infrastructure and human resource
- Acceptability by different stakeholders
- Quality control measures
- Monitoring

3.4.1. Availability of infrastructure and human resource

Availability of infrastructure and human resource is critical for smooth operation of the programme on a regular basis. Assessment findings clearly showed availability of kitchen room and sufficient storage facility in almost all the sample schools. In all the schools, where MDM is prepared within the school premises, CCHs were also in-position. All CCHs reported of practicing 'water-tight' method²⁶ of cooking fortified rice, as recommended under the programme. During the data collection activity of end line round, assessment team also observed CCH using water-tight method for cooking rice. On the supply side too, the assessment findings showed regular supply of FRK and rice from FCI warehouse for extruded fortified rice, during the programme period. Detailed findings about the (A) availability of kitchen and storage facility in schools, and (B) cooking method of rice for MDM have been discussed in following sections.

²⁶ In the water-tight method of cooking rice, the rice is cooked in a measured amount of water so that by the time the rice is cooked, all the water has been absorbed and nutrients are retained.

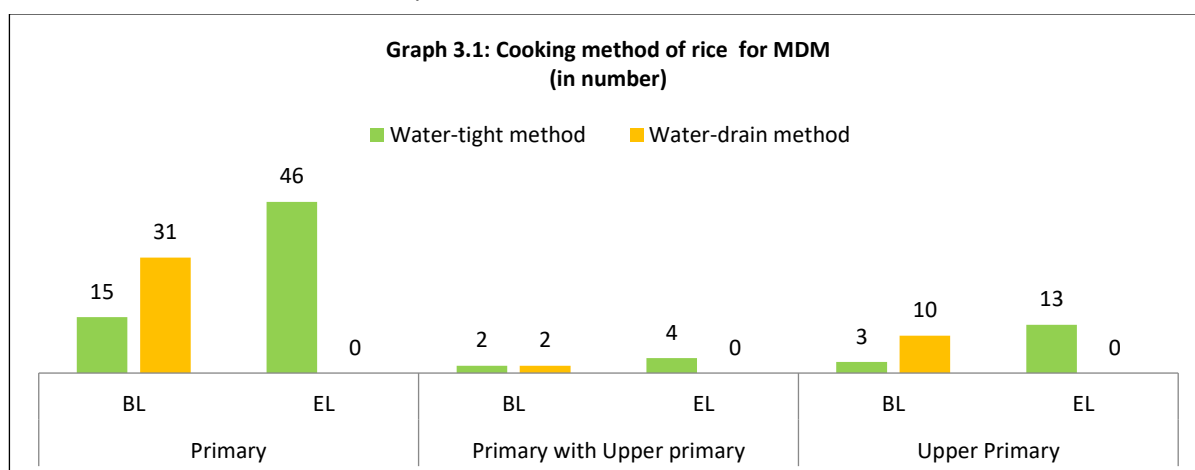
A. Availability of Kitchen

Across the district in all the surveyed schools, except three schools, which were in urban locations of Varanasi, MDM is cooked within the school premises. In the three schools, the cooked MDM was supplied by the two NGOs (Tarun Child and Women Development Society, Varanasi and Janseva Kalyan Sansthan Varanasi) from their centralized kitchen. Some schools being supplied MDM through centralized kitchen was also reported during baseline round. Of 60 schools, where MDM is cooked within the school premises, all schools except two had a separate room for kitchen. All kitchen rooms were pucca, except two, and 90 percent of the schools had facility for storage (in covered utensil) of food grains and other MDM items.

B. Cooking method of rice for MDM

As part of WFP’s fortification of MDM programme activities, teachers from all schools of the district were guided about the correct method of cooking rice. Teachers in turn, oriented CCHs. It was observed that CCHs in all the schools followed the recommended ‘water-tight’ method of cooking fortified rice for MDM, wherein, the right amount of water is added to the raw rice before cooking and this water gets completely absorbed into the rice and thus prevents the loss of nutrients.

None of the CCHs reported any difficulty in practicing the water-tight method. As a matter of fact, CCHs strongly felt that the fortification of MDM should continue as it adds nutritive value. Further, CCHs mentioned that they have not received any complaints from the students with regard to the taste of MDM and fortified rice in particular.



3.4.2. Quality control measures

Quality control measures were observed and reported to be in place, both at the mill level and in schools. Storage practices were observed to be as per norms and in majority of cases CCHs were also observing the prescribed cooking and storage practices, which were informed to them during the project training sessions. From time to time quality check of fortification at mill and of cooked fortified rice at schools was done by an NABL accredited lab engaged by WFP for the project. Below sections provide the detailed findings about the (A) storage practices of MDM food grains in schools, and (B) hygiene and safety practices by CCH during MDM preparation.

A. Storage practices of MDM food grains in school

Nearly three-fourth of the schools were found to be practicing the specific advice given during the programme activities with regard to the storage practices of fortified rice grain bags.

Recommended storage practices	Primary (n=46)	Primary with Upper primary (n=4)	Upper Primary (n=13)	Total (N=63)
Fortified rice bags stored at least 1 Ft. away from the walls	78	100	85	81
Fortified rice bags stored at least 6-8 inches above the ground	72	100	85	76
Storage area free from pests/rodents etc.	76	100	69	76
Visible damage/leakage from the bags kept in storage.	22	25	31	24

As shared by the principals and teachers, the supply of fortified rice and other MDM items was regular and was on a monthly basis. The food grains stock was mostly kept under the supervision of village head (Pradhan) to avoid any loss and spoilage and only the quantity sufficient for around two weeks was kept in the school kitchen's storage place. Cooks during interviews in a few schools opined that for ease of storage and less spoilage, the fortified rice should be sent in 5kgs packs. **A few CCHs mentioned that school principal and teacher in-charge should ensure to store fortified rice within school premises to avoid any kind of pilferage or spoilage.**

As found during the data collection activity of the assessment, good hygiene and upkeep practices were followed during the preparation of MDM in almost all the surveyed schools. Further, as far as storage facility of the fortified rice is concerned, in less than one-fourth of the surveyed schools, any visible damage or spill overs from rice bags was observed.

The cleanliness of the kitchen and the post-cooking storage facility of cooked food items were found to be satisfactory in almost all the surveyed schools as compared to the schools visited during the baseline round (67%). In majority of the schools, the utensils were washed just outside kitchen (EL: 68%; BL: 52%) or in open ground (EL: 30%; BL: 44%). In less than 2 percent of the schools the utensils were washed inside kitchen. Refer *Annexure Table 3.6*.

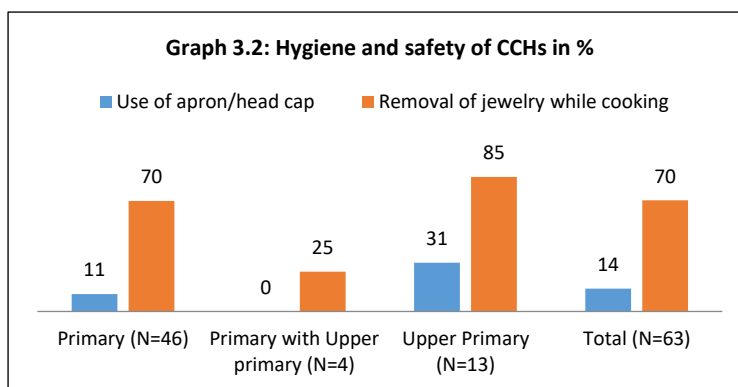
B. Hygiene and safety practices by CCHs during MDM preparation

As per the government guidelines²⁷, cooks and helpers should maintain a high degree of personal hygiene and cleanliness and should undergo biannual health check-ups. Around 45 percent CCHs reported that they had gone for health check-up during the last year.

The guidelines also mention that

CCHs should avoid wearing loose items or watch, ring, jewellery and bangles that might fall into food. Nail polish or artificial nails should not be worn as they may compromise on food safety. Further CCHs are expected to wear aprons while cooking MDM.

Though around 75 percent of CCHs were observed to be wearing no jewellery while preparing and serving MDM, only 14 percent of CCHs were found to be wearing aprons on the day of visit by the survey team.



3.4.3. Acceptance by different stakeholders

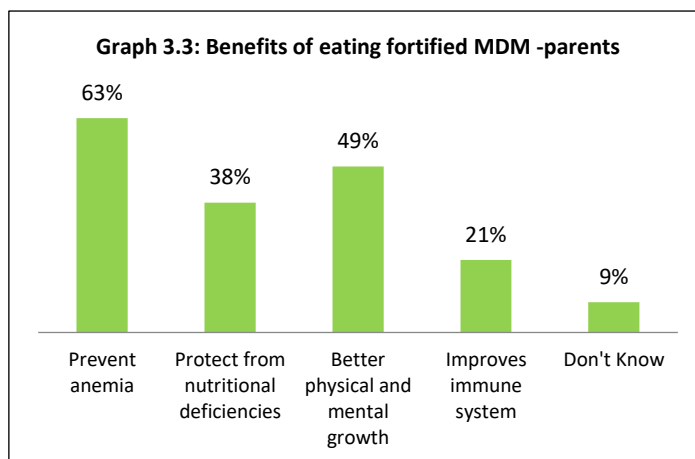
Fortification of rice served under MDM was well received, as well as the standard of practice were followed at the mill and in schools for storage and cooking of fortified rice. Findings of the assessment clearly shows high level of awareness about the benefits of fortified rice among the parents and children. Further results highlight that children liked the taste of fortified rice, which led to an increase in the consumption of the MDM. In addition to children, parents, teachers and Government officials had very positive opinion about the fortification of MDM. The block level government officials mentioned that fortified rice is beneficial. Block officials explained that during their visits to schools at the time of health check-ups or NHED sessions, they have observed that students were active, which reflect student's overall good status of health. Most of the cooks had similar opinion, that fortification of rice is a good initiative taken by the government for the benefit of students. In fact, one of the teachers observed, "health of students has improved".

PRI members too opined that fortified rice in mid-day meal is a good initiative and it will be helpful in long run to improve nutritional status of the children. Importantly, among students as well, an overwhelming percentage were satisfied with the quality of fortified MDM served to them. Informally many students admitted that they eagerly wait for meals to be served in school. Below sections shows detailed findings about the (A) awareness about fortified rice among the parents and children, (B) taste of fortified rice, and (C) perception about MDM among teachers, government officials, children and parents.

²⁷mdm.nic.in/mdm_website/Files/Guidelines/2015/Guidelines%20_Food%20Safety%20and%20Hygiene.pdf

A. Awareness about fortified rice served under MDM

Majority of the students (61%) were aware about fortified rice being served in MDM; expectedly the awareness was higher among upper primary students. Among parents, around 33 percent were aware that fortified rice is served under MDM.



Further, on the benefits of fortified MDM, majority of these parents (63%) opined that it will be helpful to prevent

anaemia while 49 percent felt that fortified MDM will ensure better physical and mental growth of their children.

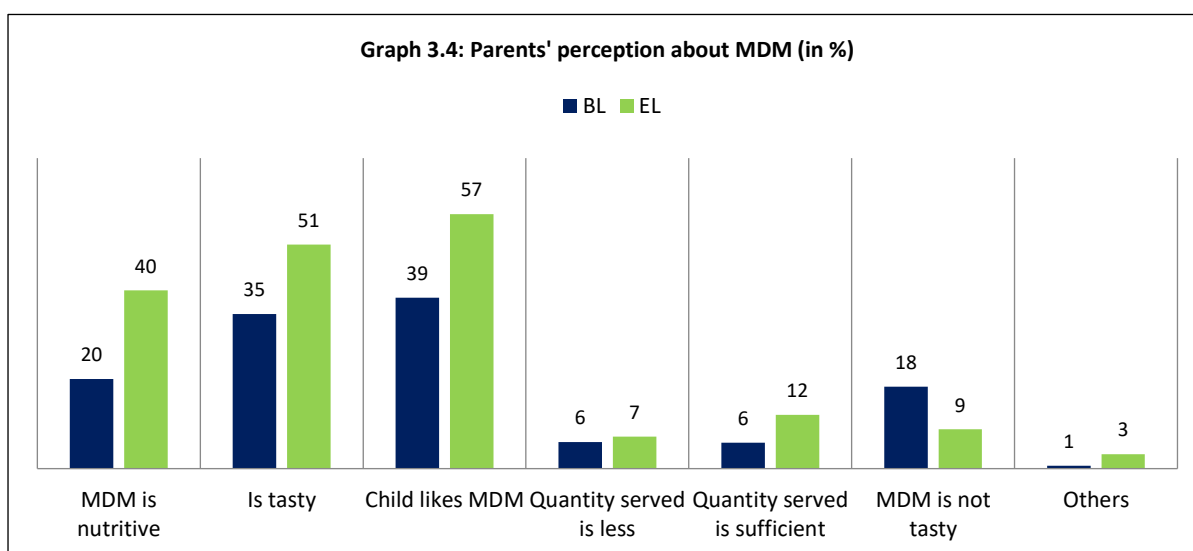
Similar to the parents, majority of the students (63%) mentioned that fortified rice 'prevents from anaemia' while 40 percent and 35 percent felt that fortified rice will help in 'better physical and mental growth' or will 'protects from nutritional deficiencies' respectively.

B. Taste of fortified rice

During end line, students were enquired about the difference (if, any) in the taste of pre-fortified MDM and post-fortified MDM, nearly 75 percent opined that fortified rice served under MDM tastes better than non-fortified rice distributed earlier through MDM. Further, two-third of the sample students felt that the consumption of MDM after fortification has increased as compared to pre-project time when non-fortified MDM was served. Refer Annexure Table 3.7.

C. Perception about MDM

During endline survey, significantly high ($P < .01$) percentage of the parents (57%) opined that their children 'like MDM', which was fortified MDM, as compared to 39% saying so at the time of baseline, when MDM was not fortified. More specifically, 51 percent parents felt that 'MDM is tasty' (BL: 35%) and another 40 percent held the opinion that 'MDM is nutritive' (20%). During survey, parents clearly favoured the fortification of MDM as they felt that particularly for the poor people; it is not just providing meals to students but a nutritive food by making a fortified MDM which is very essential for



overall growth and development of children of this age group. In other words, the parents wholeheartedly supported the fortification of MDM programme.

As far as students are concerned, both endline and baseline rounds show similar trend, with reference to their intake and preference of meals, including MDM is concerned. Overall, on an average, all students reported taking at least 3 meals- one (MDM) at school and two (breakfast and dinner) at home. In endline, a much higher percentage of students than those in baseline mentioned having evening snacks as well at home. The students opined satisfaction with the portions for meals and snacks served to them at their homes. *Refer Annexure Table 3.8.*

With regard to intake of MDM, almost all the students in both the rounds reported consuming MDM given in the school and for 6 days in a week i.e. on all school days. More than 90 percent of the students reported finishing MDM served to them as against 80 percent saying so during baseline round. *Refer Annexure Table 3.8.*

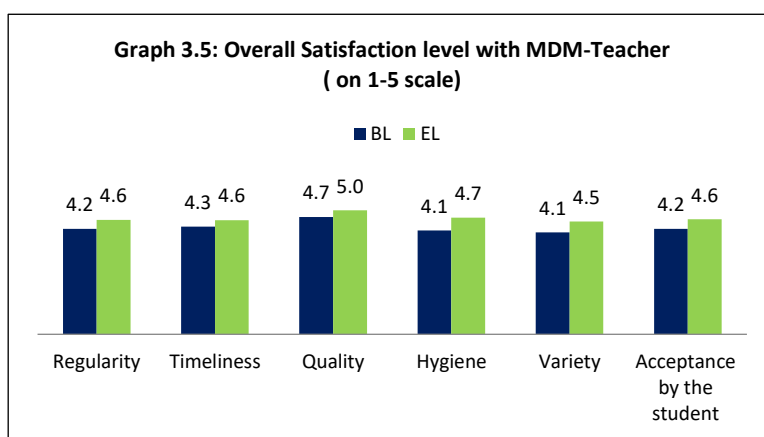
The MDM register at the schools too showed a significant increase in the number of MDM beneficiaries. Significantly high, nearly three-fourth of the students had taken MDM at school (endline) as compared to only 45 percent students during the baseline round. As per MDM register, around 78 percent female students and 69 percent male students are beneficiaries of MDM (BL: 51% and 41% respectively). *Refer Annexure Table 3.9.*

In both the rounds, more than 84 percent of the students liked the MDM served to them. Both girls and boys students had similar liking for MDM, in terms of quality and quantity served. More than 80 percent of the surveyed students reported receiving second helpings of MDM.

From the MDM fortification programme perspective, encouragingly, an overwhelming percentage of students regularly consumed fortified MDM and also liked the taste, as less than 2 percent surveyed students reported not taking MDM at school in both endline and baseline rounds, mainly due to 'lack of taste' and 'monotony of menu'.

Teachers-in-charge of MDM across all 63 sample schools reported receiving food grains regularly. Also, all schools received food grains on time and the quality of food grains was reported as good.

The teachers as well as the government officials had very positive opinion about the fortification of MDM. They strongly felt that this should continue as it will have good impact on growth and development of students. None reported any adverse effect of fortified rice on health of the



students. However, with regard to fortified wheat flour, teachers and CCHs mentioned about quality issues due to its low-shelf life.

Overall, in both baseline and endline rounds, an overwhelming percentage of the teachers see the utility of MDM. Rating on the different parameters (Graph 3.5) was taken from the teachers to understand their perception about MDM programme. The ranking was taken on a 5-point scale (1= Very Poor, 2= Poor, 3= Average, 4= Good and 5= Excellent). The quality of MDM was rated as excellent. On other parameters like variety; hygiene; acceptance by the students; regularity in terms of supply of ingredients; and timeliness, the overall rating was better than 'good'.

3.4.4. Monitoring of implementation activities

In addition to the existing monitoring mechanism for MDM programme in UP, under fortification of MDM programme, UN WFP had engaged a monitoring and implementing agency and an NABL accredited lab, M/s Eurofins Analytical Services India Pvt. Ltd.²⁸ for sample collection and analysis to

²⁸accredited, certified and recognized by BIS, NABL, FSSAI and APEDA

ensure quality control of blended fortified rice to check retention of micronutrients especially Iron and Vitamin A in samples of fortified rice during production and storage in the mill, as well cooked rice samples from 5% randomly selected schools in each quarter. Reportedly, samples were collected from mill (10 times) and schools (54 nos.) and were found to be as per norms.

Further, WFP programme team and monitoring *agency*, were reportedly taking regular stock of the supply, storage and practices associated with fortification of rice.

As emerged from the assessment findings, all project implementation activities were carried out successfully by various stakeholders. **Thus, based on the detailed findings discussed in this section, it can be concluded that the fortification of rice served under MDM is operationally feasible.**

3.5. Knowledge about anaemia and undernutrition

Among various activities undertaken as part of fortification of MDM, students were made aware about anaemia and undernutrition, their symptoms, causes and preventive measures.

3.5.1. Knowledge about anaemia

Heard of anaemia: During endline round a significantly higher percentage of students had heard of anaemia (EL: 45%; BL: 20%; $p < 0.01$). As expected, as compared to primary students, awareness levels were higher among upper primary students. Higher levels of awareness at upper primary level could be attributed to the teachers discussing about anaemia and undernutrition with students of class 4 and above. However, no difference in awareness by gender of the students was observed during the endline assessment (boys: 46%; girls: 44%). Analysis was conducted to examine the awareness of anaemia by household characteristics. Findings shows that irrespective of the background characteristics of the household in terms of religion, caste, mothers level of education and household's monthly income as compared to baseline, during end line there is a significant increase in the percentage of students who have heard of anaemia. *Refer Annexure Table 3.10.*

Source of information: During endline and baseline rounds, nearly 80 percent of the students, both girls and boys, had come to know about anaemia through their teachers. In endline round, a significant percentage of students (13%) also mentioned 'school health/education sessions' as a source of information about anaemia as against less than 3 percent of the students identifying it as a source during baseline. It is pertinent to mention that organizing such sessions at schools was one of the project's IEC activities.

Causes, symptoms and prevention of anaemia: Nearly 90 percent of the students (BL: 74%) identified lack of iron in the diet as the main cause of anaemia. While 92 percent students mentioned 'less energy/weakness' as a symptom of anaemia (BL: 81%). Nearly 87 percent students correctly identified 'having a diet rich in iron' as a way to prevent being anaemic. *Refer Annexure Table 3.10.*

3.5.2. Knowledge about undernutrition

Heard about undernutrition: Compared to the extent of awareness about anaemia, the awareness level about undernutrition among students was lower. However, compared to baseline, awareness level was significantly higher (EL: 28%; BL: 12%; $p \leq 0.01$). More than half of the students, both male and female in upper primary schools were aware about undernutrition.

Source of information: Similar to source of information of anaemia, for undernutrition too, teachers emerged as the key source of information among students (EL: 79%; BL: 84%) while 'health/education sessions at school' was another important source of information (EL: 14%; BL: 9%).

Causes, symptoms and preventions of undernutrition: More than 70 percent of the students identified 'not getting enough food' (BL: 48%) as the key reason of undernutrition followed by 'food does not contain nutrients' (EL: 53%; BL: 40%). As far as symptoms of undernutrition are concerned, more than 67 percent (BL: 51%) mentioned 'lack of energy/weakness' and 'loss of weight/thinness' (EL: 64%; BL: 48%). On ways of preventing undernutrition, majority of the students gave two solutions- one, 'give attention during meals' (EL: 58%; BL: 32%) and two, 'have more food' (EL: 56%; BL: 44%). Refer Annexure Table 3.11 and 3.11.1.

Expectedly, all surveyed teachers had heard about anaemia. The common symptoms of anaemia identified by the teachers include fatigue and weakness. Compared to baseline round, the number of teachers aware about symptoms as well as causes of anaemia had improved. In endline round, nearly 95 percent teachers (BL: 75%) reported 'iron deficiency' as one of the key causes of anaemia, followed by 'poor nutrition' (EL: 86%; BL: 71 %).

Irrespective of the gender of the teachers, the overall awareness level about symptoms, causes and preventive behaviours for anaemia was similar across teachers. On preventive behaviours for anaemia, an overwhelming percentage of teachers during the endline round were able to identify eating iron rich vegetables (EL: 97%; BL: 68%) and nearly 80 percent also mentioned intake of fruits or animal proteins like meat/fish/eggs for preventing anaemia. Awareness activities to encourage the intake of meal with a mix of food items having green (vitamins and minerals), orange (protein) and white (carbohydrates/energy) colour was conducted. During endline round, around one-third of the teachers (BL=0), mostly male teachers, identified a meal mix of food items from different colour to be effective in preventing anaemia.

As in baseline, during endline too all teachers were aware with the term 'undernutrition'. No difference in awareness level by gender of the teachers was noticeable. On symptoms of undernutrition, the most identified ones include, 'lack of energy/weakness' and 'loss of weight/thinness'. On causes of undernutrition, most teachers felt that lack of enough food or lack of nutritive food items, leads to undernutrition. Refer Annexure Table 3.12.

Among the preventive behaviours for undernutrition suggested measures by the teachers included 'give attention during meals' and 'feed frequently'. Teachers opined that regular health check-ups will also help in diagnosing and thereby taking measures for improving undernutrition condition.

All ANMs and ASHA workers were aware about anaemia and undernutrition as they have been made aware through training programmes at block levels on anaemia and undernutrition. Most of the PRI members were also aware about the prevalence of anaemia and undernutrition in children as well as the importance of nutritive diet to address the same. Encouragingly, majority of the PRI members (82%) were aware about the fortification of MDM programme, where school children are served fortified rice. As one of them shared that the rice being served in the school contains more proportion of nutrients.

3.6. Awareness about IEC activities under fortification of MDM programme

As part of fortification of MDM programme, various activities were undertaken to spread awareness and to sensitize stakeholders on various health and nutrition related aspects such as, balanced diet, dietary diversity, intake of micro-nutrients, fortified food products. Various IEC activities adopted during the project were:

- wall posters
- focus group discussions
- movement of Nutrition Kiosks Van (*Poshan chetna rath*) at community levels
- nutrition and health related sessions
- snakes and ladders game with messages on good food, health and hygiene practices,
- letter from District Administration to the parents of students of upper primary level was adopted.

Among parents, the awareness about at least one IEC activities undertaken during fortification of MDM programme in the district was around 21 percent. Though, the extent of awareness about different IEC activities is observed to be low among parents but most of the parents, who came across any of the IEC activities, could recall the key message(s). Refer Annexure Table 3.13.

Type of activities	HHs in %
Community wall poster on fortified rice/atta and its benefits	11
Nutrition kiosk van (<i>Poshan chetna rath</i>)	7
Attended focus group discussion on MDM served in schools	12
Received letter from District administration about the programme*	10
Empty bags of food grains with message on fortification programme	7
*letter sent to parents of upper primary class students only (n=232)	

Unlike parents, nearly 75 percent of the students were aware about at least one of the IEC activities carried out under the programme.

Type of activities	Primary	Primary with upper primary	Upper primary	Total

	Male (N=230)	Female (N=230)	Male (N=32)	Female (N=32)	Male (N=94)	Female (N=114)	Male (N=356)	Female (N=376)
Snakes & Ladders game	65	68	9	22	49	54	56	60
Wall poster	49	44	28	38	57	67	49	44
Empty bags of food grains with message on fortification programme	37	36	3	-	70	72	42	44
Participate in any session, apart from classroom teaching, on NHED	27	26	9	19	31	38	26	29
Received letter from District administration about the programme	NA	NA	25	17	31	25	30	24
Nutrition kiosk van	3	4	-	3	9	7	4	5

The percentage of female students, who were aware about at least one IEC activities were significantly higher than male students (Female student: 78%; male student: 71%; $P \leq .05$).

Further, the students were enquired about the messages seen or heard in different type of IEC activities. Most widely recalled messages by majority of the students, both female and male include, 'washing hands with soap after defecation or before intake of food', 'use fortified rice and wheat flour', 'intake of MDM is good for health and growth' among others. Refer Annexure Table 3.14.



Some IEC materials

Snakes and ladders games organized by WFP's implementing agency at the schools and wall posters in the schools were the two main IEC activities, which were identified by the students as the main source of information on the above mentioned issues.

In addition to these IEC activities, special education sessions regarding health and hygiene were held in around 78 percent of schools, mostly in upper primary schools (BL: 57%). According to the teachers of sample schools and implementing partner of the programme, NHED sessions for the students were conducted both by the school teachers and WFP's implementing agency focusing on healthy and nutritious diet practices, handwashing and importance of regularly consuming fortified rice served under MDM in schools.



Wall painting at school

As shared by the implementing partner, under the programme, between March 2019 and March 2020, around 9000 sessions were conducted across all schools and nearly 6.30 lakh (0.63 million) students have participated in these sessions, which shows that many students participated in more than one session. On an average, 70 students participated in each session. In each of the sample schools, around 2 sessions were organized and nearly 60 percent of the

total enrolled students in these schools were reported to have attended these sessions. *Annexure Table 3.15.*

During field visit, assessment team observed display of IEC material(s) on health, nutrition and hygiene in the schools. In around 75 percent of the schools, IEC materials like wall posters were found displayed in different locations of the school like in principal office (37%) followed by in class room (29%). In some schools (17%), the materials were also displayed at MDM eating place.

Ninety five percent of the parents reported washing hands with water and soap after defecation and around 87 percent of the parents have been following this practice even before the programme intervention started.

Among students, all except five students reported washing hands before MDM at school. The most common cleanser for hand washing at school, as reported by the students, was soap and water. During endline, a significant percentage of students reported doing so as compared to the baseline round findings (EL: 74%; BL: 57%; $p < 0.01$).

Overall, the awareness, practices and acceptance of fortified rice under MDM programme was found to be very high across stakeholders, particularly among students, their parents, teachers and CCHs. Other activities under the pilot project also showed favourable results in terms of increase in awareness about various aspects of anaemia and undernutrition among students. IEC materials were also observed to be displayed within the school premises.

3.7. Scaling up of fortification of rice programme

The positive outcomes of the WFP supported project on fortification of rice served under MDM in the schools of Gajapati district of Odisha encouraged the state government of Odisha to scale up the rice fortification to other districts. Also, some other states have started distribution of fortified rice under public distribution system (PDS) and MDM programmes. Government of India has also approved the Centrally Sponsored Pilot Scheme on “Fortification of Rice and its Distribution under Public Distribution System”, under which rice is fortified with Iron, Folic Acid and Vitamin B-12. The Pilot Scheme has been approved for a period of three year beginning 2019-20 and focus on 15 districts of the country. For this pilot scheme from Uttar Pradesh, Chandauli, a neighbouring district of Varanasi has been selected.

Keeping in mind the positive results of the several studies on fortification, WFP’s successful experience of fortification of rice distributed under MDM in Odisha and also the results of this pilot project in Varanasi, the government of UP should introduce fortified rice in MDM of all government schools across 75 districts of UP.

Fortification of wheat flour: The fortification of wheat flour as envisaged in the project plan, however, had to be discontinued due to the quality related concerns. As shared by the WFP programme team, one of the key reasons for discontinuance of wheat fortification was shorter shelf life of fortified wheat flour and need of very stringent monitoring due to poor storage conditions in interim government godowns, supply and use of wheat flour on the principle of *First In - First Out*. As shared by some school teachers and CCHs also, the use of fortified wheat flour in MDM was stopped due to the presence of flour weevils, if wheat flour is not consumed within a fortnight from the date of processing.

The operational feasibility of fortified wheat in MDM was not enquired by the assessment team in detail, as it was discontinued in initial phase of the project. However, based on the observations made by the school teacher in-charge for MDM, it can be concluded that stringent monitoring of usage of fortified wheat flour is critical.

To calculate the cost of scaling up of fortification of rice under MDM in the UP, government's 'state wise rice productivity analysis' for categorizing the districts of UP as per their rice productivity status (source: <http://drdpat.bih.nic.in/PA-Table-24-Uttar%20Pradesh.htm>) has been used. Based on the district's rice productivity status, the districts have been classified as high (07 nos.); medium (29 nos.); medium-low (26 nos.); low (5 nos.); and very low (3 nos.) productivity districts. For cost estimation, two models: Model-1 and Model-2 have been proposed and following assumptions have been made.

Assumptions

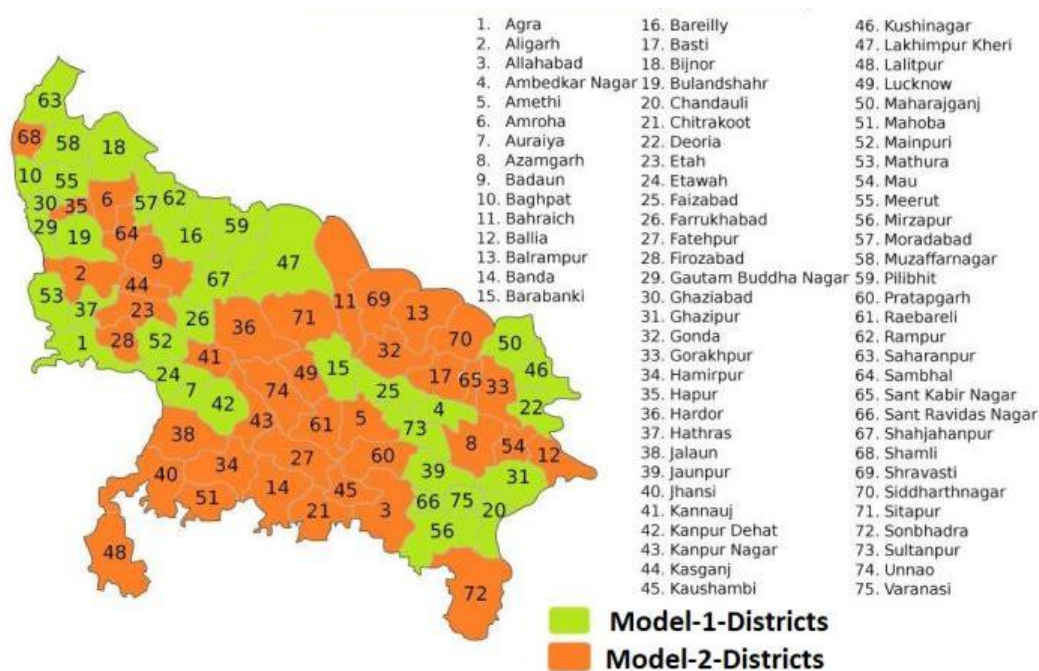
- Model-1 include High and Medium Rice Productivity Districts, whereas it is assumed that rice fortification is done at the rice mill during paddy processing and milling.
- Model-2 include Medium-Low, Low and Very Low Rice Productivity Districts
- In Model-1, the transportation & handling costs as well as storage and insurance cost have not been included, as it is assumed that the fortification at point of rice milling, prior to FCI depot will be done. However, these costs will be included in Model-2 districts, where fortification on rice would be done at the warehouse. In Model 2, the machinery cost exclusively required for rice fortification is included for costing, whereas it is assumed that other existing machines available with the miller / warehouse (such as bucket elevator, silo, weighing machine, stitching machine) would be repurposed, hence not included in the costing.
- Management / Admin costs to be paid as per Government norms
- Earnest money Deposit (EMD) (Refer Rule 157 of GFR) between 2 to 5 percent of the estimated value to be taken from the prospective bidders. For the estimation purpose interest on EMD @5% has been considered.
- During scale-up, GoUP is expected to go ahead with FRKs consisting of 3 micronutrients hence costing for 3 micronutrients has been considered. The cost of FRK @Rs 55505 / MT (excluding GST) has been considered for estimation.
- The cost of Vibratory feeder and Conveyor belt screw have been considered. It has been assumed that the other equipment will be available in the mill.

- GST has not been included in any of the costing analysis.

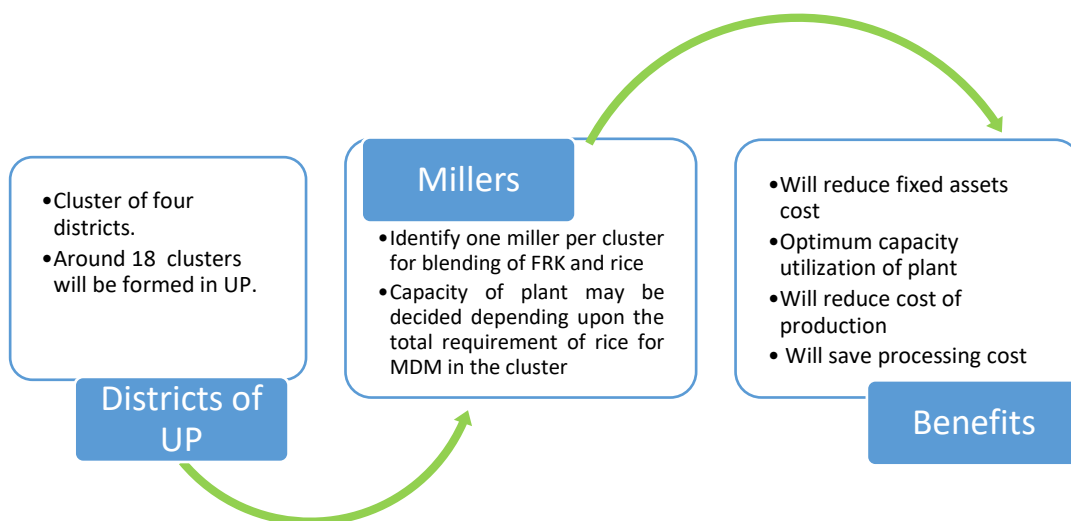
Using the above listed assumptions and cost estimation for the pilot district, Varanasi, the fortification cost per meal served during MDM is estimated as Rs 0.11 (Model-1); Rs 0.18 (Model-2) and Rs 0.15 (Overall) Table 3.8.

Table 3.8: Cost estimation for fortification of MDM rice in all districts of UP (in Rs)					
Basis of calculation	During scaling up				
Number of months considered	12				
Cost Components	Model-1		Model-2		Overall Cost all districts (In Lakh)
	Cost/ District (In Rs)	Cost all districts (In Lakh)	Cost/ District (In Rs)	Cost all districts (In Lakh)	
Number of district	1	36	1	39	75
Miller Cost	1736551*	625	3903452*	1522	2148
Quality Control Cost	10800	4	10800	4	8
FRK Cost	1255117**	452	1310380**	511	963
Equipment Cost	300000***	108	300000	117	225
Total Cost	3302468	1189	5524632	2154	3344
Total in Number Meal ****		1069339813		1209975884	2279315697
Cost/ Meal in Rs		0.11		0.18	0.15
Cost/Kg in Rs		1.46		2.3	1.9
Cost /100 gm in Rs		0.15		0.23	0.19
*Please refer Annexure-3.16 and 3.17					
** Please refer Annexure-3.18					
*** Please refer Annexure-3.5 A					
****Source- MDMA Annual Work Plan and Budget 2018-19					

In order to scale-up fortification of rice under MDM in UP, the GoUP would have to earmark a budget of nearly Rs 33.43 crore (USD 4.55 million) per annum, which would be in addition to the MDM budget. Additional average cost of Rs. 19/student/year could be compensated by the lower expenditure on the child's health, as it is expected that the introduction of fortified rice in MDM programme in the state would improve the health of children. In addition, the scale-up would also lead to the overall positive growth and development of 17.68 million students of the state.



Another option could be clustering of districts to be served by a single mill. This is expected to reduce the operational fixed cost and the unit cost may get reduced by 5 to 10 percent depending upon the location of the mill(s) selected for fortification of rice, from the district and quantity of rice to be fortified for the district. However, a detailed district wise mapping of mills and spread of block warehouse within the district will help to estimate the actual cost. The state government of UP may plan the following strategy for expansion of fortification of rice in MDM across the state.



Chapter 4: Conclusions and Recommendations

This chapter describes the main conclusions of the assessment. The conclusions are organized as per the assessment objectives. This is followed by recommendations of how the government and other programme partners can act to build on the key findings.

4.1. Conclusions:

Operational feasibility of the fortification of rice: Evidence generated through the assessment clearly shows that the fortification of rice served under MDM is operationally feasible, as findings illustrate that acceptance of fortified rice was high among the critical stakeholder such as children, parents, teachers and Government officials. Further, children liked the taste of fortified rice, which led to an increase in the consumption of the MDM. Schools have adequate infrastructure and human resource to appropriately store and cook fortified rice. Regarding the quality of fortification, NABL accredited laboratory found that the retention of micronutrients in the raw and cooked fortified rice were as per the norms. Quality control measures were in place and storage norms were appropriately followed at the mill and school level. CCHs were practicing water-tight method for cooking rice. On the supply side too, the assessment findings showed regular supply of rice from FCI warehouse and FRK to the mill during the programme period. Based on the costing analysis of the project, fortification was done with a nominal cost of Rs 0.22 (during pilot project at Varanasi) per student per MDM meal.

Knowledge and awareness about anaemia and undernutrition: Results of the assessment show that the awareness about anaemia and under nutrition significantly improved among the students. Among female students awareness about anaemia increased from 24 to 44 percent ($p < 0.01$), while awareness among male students increased from 16 to 46 percent ($p < 0.01$). The percentage of students who were aware about undernutrition also increased compared to the baseline (female students: from 13 to 28 percent; male students: 11 to 29 percent). Nearly 90 percent of the students (BL:74%) identified 'lack of iron in the diet' as the main cause of anaemia while 87 percent correctly mentioned 'having a diet rich in iron' as a way to prevent being anaemic. More than 70 percent of the students identified 'not getting enough food' (BL:48%) as the key reason of undernutrition while on ways of preventing undernutrition, majority of the students gave two main solutions: 'give attention during meals' (EL: 58%; BL:32%) and 'have more food' (EL: 56%; BL:44%).

Morbidity profile of students: Prevalence of illness among the children declined from baseline to endline. As compared to baseline, fewer students reported suffering from some sickness in the last 15 days prior to the interview (EL: 31%; BL: 43%). As compared to baseline, during endline prevalence of sickness significantly declined among Hindus, scheduled caste, other backward class, children of mothers, who are either illiterate or have primary level of education, poor and children of households with no land or have less than .25 hectare.

Hand washing practices: Assessment findings shows improvement in the hand washing practices among the students, teachers and CCHs. A significant improvement in hand washing practices using soap was noticed among female students (EL: 78%; BL: 67%; $p < 0.01$). Among male students too, the improvement was noticeable (EL: 73%; BL: 38%; $p < 0.01$). The programme activities such as health education sessions may be a contributory factor in this change in hand washing practices of students. Teachers and CCHs were also observed to be washing their hands with water and soap. Nearly 80% of the school staff-teachers and CCHs were observed to be washing hands with soap and water after using toilets. Similar percentage of CCHs were also found to be using soap and water before cooking MDM.

Hand washing facilities in school: Although the percentage of hand washing facilities increased from baseline to endline (EL: 56%; BL: 46%), still many schools do not have separate hand washing facility. In almost three-quarters of the surveyed schools, for both males and females, the hand washing facilities were found near the toilets.

Distribution of IFA Supplements, deworming tablets and health check-ups in schools: Results shows that distribution of IFA Supplements, deworming tablets and health check-ups in schools have improved during end line round, as compared to the time of baseline assessment. The percentage of students who received weekly IFA supplements at school level increased significantly (EL: 88%; BL: 68%; $p < 0.01$). The distribution of deworming tablets in schools also increased from 80 to 88 percent. During endline, a significantly ($p < 0.01$) higher percentage of students informed about having health check-up at school (EL: 81%; BL: 58%) and mostly by a medical doctor/ health officer.

Hygiene and safety practices by CCHs during MDM preparation: Findings shows that less than half (45%) of the CCHs have undergone health check-up during the last year. As per the government guidelines²⁹, cooks and helpers should maintain a high degree of personal hygiene and cleanliness and should undergo biannual health check-ups. The guidelines also mention that CCHs should avoid wearing loose items or watch, ring, jewellery and bangles that might fall into food. Nail polish or artificial nails should not be worn as they may compromise on food safety. Further CCHs are expected to wear aprons while cooking MDM. Though around 75 percent of CCHs were observed to be wearing no jewellery while preparing and serving MDM, only 14 percent of CCHs were found to be wearing aprons on the day of visit by the survey team.

4.2. Recommendations:

²⁹mdm.nic.in/mdm_website/Files/Guidelines/2015/Guidelines%20_Food%20Safety%20and%20Hygiene.pdf

Recommendation 1: As the findings of the assessment evidently shows that fortification of rice distributed under MDM is an operationally feasible model in terms of high acceptability of fortified rice among the important stakeholders; adherence to quality control measures at all levels; retention of micronutrients as per the norms in the raw and cooked rice; and availability of adequate infrastructure and human resources at the school level. Thus, based on the evidence of this assessment, it is recommended to the Government of Uttar Pradesh to sustain fortification of MDM in Varanasi and scale-up the fortification of rice served under MDM in other districts of the state and WFP should support the government towards scaling-up this model.

Recommendation 2: Although results demonstrate that awareness levels for anaemia and undernutrition among the children have improved from baseline to endline, still there is high scope of further improvement of awareness levels, as more than half of students were not aware of anaemia and almost three-quarter were unaware of undernutrition. Thus, it is recommended to the government to take measures to improve the awareness levels for anaemia and undernutrition among children and WFP should support the government in improving the awareness levels .

Recommendation 3: In spite of a major improvement in using soap for hand washing among students (EL: 73%; BL: 38%), but almost one-fourth of students still do not wash hands using soap. Especially, keeping in mind the current COVID-19 pandemic, hand washing with soap is strongly endorsed by the health experts as a preventive measure. Thus, it is recommended to the government to take adequate steps to improve the awareness about the benefits of washing hands with soap and further take measures to improve the practice of washing hands with soap.

Recommendation 4: A high proportion of schools do not have separate hand washing facility (EL: 56%; BL: 46%). In almost three-quarters of the surveyed schools, for both males and females, the hand washing facilities were found near the toilets. Considering the findings of this assessment and the importance of adequate hand washing facility in schools, especially from the perspective of COVID-19 situation, government is recommended to built separate hand washing facility for the students in the schools.

Recommendation 5: Results illustrates that less than half of the CCHs have under gone health check-up during the last year. Nearly 80% of the CCHs were observed to be washing hands with soap water before cooking MDM and after using toilets. As per the government guidelines³⁰, cooks and helpers should maintain a high degree of personal hygiene and cleanliness and should undergo biannual health check-ups. As CCHs closely handle food items of MDM and are responsible for cooking MDM, which is distributed to the young children, hence their hygiene and health status is extremely crucial. Therefore, it is recommended to the government to ensure that the CCHs undergo biannual health

³⁰mdm.nic.in/mdm_website/Files/Guidelines/2015/Guidelines%20_Food%20Safety%20and%20Hygiene.pdf

check-up and follow the prescribed guidelines of government around personal hygiene and cleanliness and if required, efforts to build the capacities of the CCH towards this could be undertaken by the government.

Annexure 1: Chapter 1-Introduction

Parameter	Management Type	Uttar Pradesh			Varanasi		
		Primary	Upper Primary	Total	Primary	Upper Primary	Total
No. of Existing Institutions for 2017	Govt. schools*	0.0	9.5	0.1	0.0	1.0	0.4
	Local body schools**	99.0	5.8	97.9	98.8	60.5	84.9
	Govt. aided schools	0.5	51.3	1.1	1.2	35.0	13.5
	Special Training Centres	0.4	0.0	0.4	0.0	0.0	0.0
	Madarasas/ Maqtabs	0.1	33.5	0.4	0.0	3.4	1.2
	Total in number	114460	1299	115759	1025	585	1610
Enrollment (As on 30.09.2017)	Govt. schools	0.2	1.6	0.6	1.5	2.7	1.9
	Local body schools	96.4	65.8	86.7	84.8	57.1	74.9
	Govt. aided schools	2.2	31.1	11.3	4.4	36.2	15.7
	Special Training Centres	0.0	0.3	0.1	0.0	0.0	0.0
	Madarasas/ Maqtabs	1.3	1.2	1.3	9.3	4.0	7.4
	Total in number	12094277	5589011	17683288	188180	104419	292599
Children Availed MDM	Govt. schools	0.2	1.6	0.6	1.2	3.0	1.9
	Local body schools	96.8	70.5	89.0	76.8	52.1	68.2
	Govt. aided schools	1.8	26.4	9.0	5.2	38.5	16.8
	Special Training Centres	0.0	0.2	0.0	0.0	0.0	0.0
	Madarasas/ Maqtabs	1.3	35.3	11.3	16.8	6.4	13.2
	Total in number	7092792	2961291	10054083	129688	69262	198950
Meals served	Govt. schools	0.2	1.6	0.6	1.2	3.0	1.9
	Local body schools	96.8	71.2	89.3	76.8	52.1	68.2
	Govt. aided schools	1.8	25.8	8.8	5.2	38.5	16.8
	Special Training Centres	0.0	0.2	0.0	0.0	0.0	0.0
	Madarasas/ Maqtabs	1.3	1.2	1.3	16.8	6.4	13.2
	Total in number	1610063830	669251867	2279315697	29050082	15514659	44564741

Source: Annual Work Plan and Budget, 2018-19
 * Govt. schools- Managed by Director, Basic Education
 **Local body schools-Managed by Uttar Pradesh Board of Basic Education" was constituted under chairmanship of the Director, Basic Education

Annexure 1.2-Item wise Cost per Student and Cost sharing Agency						
S.N	Food Items	Cost Share	Primary		Upper Primary	
			Quantity (in gms.)	Cost (In Rs.)	Quantity (in gms.)	Cost (In Rs.)
1	Food grains (Wheat/Rice/Coarse grain)	Centre	100	Free of cost	150	Free of cost
2	Pulses	State	20	1.36	30	1.81
3	Vegetables	Centre	50	1.36	75	1.89
4	Oil &Fats	Centre	5	0.59	7.5	1.44
5	Salt & Condiments	State	6	0.29	9	0.31
6	Fuel	Centre	-	0.53	-	0.73
7	Any other item (Milk)*	State	100 ml	-	150 ml	-
8	Total			4.13		6.18

Source: Annual Work Plan and Budget, 2018-19
 *It has been managed from the conversion cost of food

Annexure 1.3-Budget Allocation for MDM Programme in UP for FY 2017-18						
S.N.	Component	Budget Provision (Rs in Lakh) 2017-18	Budget Released till 31.03.2018 (Rs in Lakh)			Fund utilization in %
			For Central Share	For State Share	Total	
	Recurring Assistance	208565.23				76
1	Cost of food grains		10293.72	0	10294	
2	Cooking Cost		63980.18	42653.45	106634	
3	Transportation Assistance		1978.36	0	1978.4	
4	MME		1909.23	0	1909.2	
5	Honorarium to cook-cum-Helpers		22313.59	14875.72	37189	
A	Total		100475.1	57529.17	158004	
	Non-Recurring Assistance					
6	Kitchen-cum-stores		0	0	0	
7	Kitchen appliances		0	0	0	
B	Total	0	0	0		
	Grand Total		100475.1	57529.17	158004	

Source: Annual Work Plan and Budget, 2018-19

Annexure 1.4-Block wise distribution of sample schools									
S. No.	Block	Primary Schools		Upper Primary Schools			Primary +Upper Primary		Total
		Parishad Primary	Samaj Kalyan	Parishad Upper Primary	Aided schools (6-8 std)	Madhya-mikintermediate College (6-8 std)	Aided Madarsa (1-8)	Madhya-mik inter College (1-8 std)	
1	Arajiline	5		1		1		1	8
2	Baragaon	4	1	1	1				7
3	Chiraigaon	5		1					6
4	Cholapur	4	1	1					6
5	Kashi vidya peeth	4	1	1	1		1		8
6	Harhua	5		1					6
7	Pindara	5	1	1					7
8	Sewapuri	5							5
9	Ram Nagar	1		1					2
10	Urban Area /Nagar Kshetra	4		1		1	1	1	8
	Total	42	4	9	2	2	2	2	63

List of sample school enclosed as Annex-4
 Management body: Parishad (Council)= UP Education for all Project Board; Samaj Kalyan= Social Welfare; Madhyamik(Intermediate)= UP Secondary Education Board

Annexure 2: Chapter 2-Profile of Programme District and Respondent Groups

Type of School Management	PS		P+UP		UP		Total	
	BL	EL	BL	EL	BL	EL	BL	EL
Govt	42	42	-	-	9	9	51	51
Madarsa	-	-	2	2	-	-	2	2
Samaj kalyan School	4	4	-	-	-	-	4	4
Government aided	-	-	-	-	3	2	3	2
Madhyamik Intercollege	-	-	2	2	1	2	3	4
Total	46	46	4	4	13	13	63	63

PS-Primary, P+UP-Primary with Upper primary, UP-Upper Primary

Indicator	Primary (N=46)		Primary with Upper primary (N=4)		Upper Primary (N=13)	
	BL	EL	BL	EL	BL	EL
Total number of rooms in surveyed school	179	188	61	52	64	59
Average number of room/school	4	4	15	13	5	5
% age of school having electricity and fan	78	74	75	100	62	100
% age of classroom having electricity and fan	76	80	87	100	94	100

Indicator	Primary		Primary with upper primary		Upper primary	
	BL	EL	BL	EL	BL	EL
<i>Sample schools, N</i>	46	46	4	4	13	13
Main source of drinking water available throughout the year						
Tap	3	3	1	0	0	3
Bore well	5	10	2	3	4	3
Hand pump	38	33	1	1	9	7
Main source of drinking water during last 15 days						
Tap	3	3	1	0	0	3
Bore well	5	10	2	3	4	3
Hand pump	38	33	1	1	9	7
Availability of facility to purify drinking water at school level (in number)	7	10	2	2	3	5
Method used to purify water						
Reverse Osmosis(RO)	0	10	0	2	1	5
Chlorination	1	0	2	0	0	0
<i>Sample schools, N</i>	46	46	4	4	13	13
Store drinking water	10	16	3	3	3	3
Provision for storing drinking water						
Covered Jars/pots	7	10	1	2	2	1
Overhead tank	2	5	2	1	1	2
Water filter fitted at source	1	1	0	0	0	0

	Primary				Primary with Upper primary				Upper primary				Total			
	Enrollment		Functional Toilet		Enrollment		Functional Toilet		Enrollment		Functional Toilet		Enrollment		Functional Toilet	
	BL	EL	BL	EL	BL	EL	BL	EL	BL	EL	BL	EL	BL	EL	BL	EL
Boys	2565	2582	49	49	2131	754	16	18	1089	826	13	17	5785	4162	78	84
Girls	2630	2761	51	56	151	872	2	13	1008	1152	22	23	3789	4785	75	92
Total	5,195	5,343	100	105	2,282	1,626	18	31	2,097	1,978	35	40	9,574	8,947	153	176
Student-Toilet Ratio																
Male			52	53			133	42			84	49			74	50
Female			52	49			76	67			46	50			51	52
Total			52	51			127	52			60	49			63	51

Annexure 2.5: Separate hand washing facility near toilet facility- school checklist (in number)						
	Primary		Primary with Upper primary		Upper Primary	
	BL*	EL	BL*	EL	BL*	EL
Sample schools, N	46	46	4	4	13	13
Availability of Hand washing facility	10	21	2	4	4	10
Separate hand washing facility near toilet for...						
Male students	21	34	2	3	6	11
Female students		34		3		11
*During baseline round, separate hand washing facility near toilet for female and male students was not asked						

Annexure 2.6: Hand washing practice in Schools-Observation (in number)						
Hand washing practices	Primary (n=46)		Primary with Upper primary (n=4)		Upper Primary (n=13)	
	BL	EL	BL	EL	BL	EL
Male students						
With soap	17	34	2	2	5	10
Without soap	27	11	2	0	7	2
No	2	1	0	0	1	0
Total	46	46	4	2*	13	12*
Female students						
With soap	35	35	2	3	5	11
Without soap	6	10	0	0	7	2
No	5	1	0	0	1	0
Total	46	46	2*	3*	13	13
School staff- teachers and CCHs						
With soap	28	38	3	1	5	11
Without soap	2	8	0	0	1	2
No	4	0	1	0	3	0
Not Observed	12	0	0	3	4	0
Total	46	46	4	4	13	13
Students wash hands before eating						
Male	44**	45	4**	2	12**	12
Female		45		3		13
* In EL, 2 schools were only girls while 1 school was only boys; in BL, 2 schools were only boys ** in baseline, observation was not recorded separately for male and female students; in 3 schools observation could not be made						

Annexure 2.7: Methods of solid wastes collection in schools (in %)						
	Primary		Primary with Upper primary		Upper Primary	
	BL	EL	BL	EL	BL	EL
Collected by rag picker	22	50	75	75	23	69
Thrown in open space	39	28	0	0	38	15
Burnt	39	22	25	25	38	15

Annexure 2.8: Staff Position and Pupil-Teacher Ratio							
	Position	Total (N=63)					
		Sanctioned		In-position		Vacancy	
		BL	EL	BL	EL	BL	EL
1.	Headmaster/ Headmistress/Principal	60	69	48	59	12	10
2.	Teachers	345	409	291	320	54	89
	Total Teacher available	405	478	339	379	66	99
	Total Enrollment			9,607	8,947		
	Pupil-Teacher Ratio			28	24		
	Average number of Teacher/ School			5	6		
	Pupil-Teacher Ratio -As per Ministry of Human Resource Development			24			
3.	Sweeper	5	6	4	4	1	2
4.	Cook-cum-helpers (CCHs)	166	166	165	166	1	0
Source: School Records and CMS Analysis							

Annexure 2.9: Number of students enrolled in sample co-educational school (in number)								
	Primary		Primary with Upper primary		Upper Primary		Total	
	BL	EL	BL	EL	BL	EL	BL	EL
<i>Surveyed co-ed schools, n</i>	46	46	2	2	10	12	58	60
Boys	2,565	2,582	305	551	817	826	3,687	3,959
Girls	2,630	2,761	183	538	835	827	3,648	4,126
Total	5,195	5,343	488	1,089	1,652	1,653	7,335	8,085

Gender	Grade	Dropout rate between BL and EL (in %)
Male students	From Class-V to VI	10
Female students	From Class-V to VI	15
Total	From Class-V to VI	8

Annexure 2.11: Absenteeism rate (in %)									
		Primary		Primary with Upper primary		Upper Primary		Total	
		BL	EL	BL	EL	BL	EL	BL	EL
Male	Total Enrolment	2,565	2,582	2,132	754	1,089	826	5,786	4,162
	Average days school open	25	19	24	23	25	19	24	20
	Total Enrolment in last three month	1,89,029	1,46,164	1,51,905	51,084	80,586	46,764	4,21,520	2,44,011
	Attendance in last three month	1,25,741	83,830	99,464	23,873	50,799	30,289	2,76,004	1,37,992
	Absenteeism rate In %	33%	43%	35%	53%	37%	35%	35%	43%
Female	Total Enrolment	2,630	2,761	183	872	1,008	1,152	3,821	4,785
	Average days school open	25	19	24	23	25	19	24	20
	Total Enrolment in last three month	1,93,820	1,56,297	13,039	59,078	74,592	65,221	2,81,450	2,80,596
	Attendance in last three month	1,31,054	97,070	10,037	36,359	47,911	42,765	1,89,002	1,76,194
	Absenteeism rate In %	32%	38%	23%	38%	36%	34%	33%	37%
Total	Total Enrolment	5,195	5,343	2,315	1,626	2,097	1,978	9,607	8,947
	Average days school open	25	19	24	23	25	19	24	20
	Total Enrolment in last three month	3,82,849	3,02,460	1,64,944	1,10,162	1,55,178	1,11,985	7,02,971	5,24,607
	Attendance in last three month	2,56,795	1,80,900	1,09,501	60,232	98,710	73,054	4,65,006	3,14,186
	Absenteeism rate In %	33%	40%	34%	45%	36%	35%	34%	40%

Annexure 2.12: Availability of Registers and Records in School (in number)							
Type of Register/Record book for...	Primary		Primary with Upper primary		Upper Primary		
	BL	EL	BL	EL	BL	EL	
<i>Surveyed schools, N</i>	46	46	4	4	13	13	
Enrollment	33	46	3	4	9	13	
Attendance	46	46	4	4	13	13	
MDM Raw material procurement	43	46	2	1	12	13	
Rice supply	26	46	2	1	11	13	
MDM consumption	45	46	2	4	12	13	
Stock	35	43	2	4	11	12	
IFA administration	39	38	2	1	9	10	
Deworming	44	35	3	1	10	10	
Health check-up	26	27	1	1	7	3	
Health/nutrition education sessions	12	31	2	1	3	6	
SMC activity	39	40	3	2	9	9	

Annexure2.13: Distribution and Consumption of IFA supplements by students (in %)												
Indicator	Primary				Primary with upper primary				Upper primary			
	Male		Female		Male		Female		Male		Female	
	BL	EL	BL	EL	BL	EL	BL	EL	BL	EL	BL	EL
<i>Sample students, N</i>	230	230	246	230	51	32	13	32	99	94	93	114
Received Iron Folic Acid (IFA) supplement/ tablets in school	76	93	66	92	22	25	-	75	69	90	84	91
<i>Students who received IFA supplements, n</i>	175	214	163	212	11	8	0	24	68	85	78	104
Frequency of receiving IFA in school(in %)												
Weekly	64	79	72	76	55			67	59	74	58	81
Monthly	13	10	9	13	27				29	22	22	13
Yearly	1		2	0		75		13	3		4	
Not fixed	4	8	7	5				8		2	4	5
Don't know	5	1	5	1	18	25		8	1		1	
Consumed IFA tablets distributed in school (In %)	98	97	98	96	82	100		88	97	100	97	100
<i>Students consumed IFA supplements, n</i>	172	207	160	204	9	8		21	66	85	76	104
Frequency of consuming IFA supplement in school												
Weekly	65	81	70	79	67			76	64	74	57	81
Monthly	13	11	10	13	33				27	22	22	13
Quarterly	1		1							1	3	1
Half Yearly	2	0	2	1				5			3	
Yearly	1		1	0		75		10	3		4	
Not fixed	8	6	12	4		25		10		2	5	5

Annexure2.14: Iron Folic Acid (IFA) Administration related Information- School checklist (in number)									
	Primary		Primary with Upper primary		Upper Primary		Total		
	BL	EL	BL	EL	BL	EL	BL	EL	
<i>Surveyed schools, N</i>	46	46	4	4	13	13	63	63	
Students administered supplements	44	46	3	3	13	13	60	62	
Frequency of administration of IFA tablets/syrup									
Daily	1	0	0	0	0	0	1	0	
Weekly	37	46	2	4	13	13	52	63	
Every month	4	0	0	0	0	0	4	0	
In 3 months	1	0	0	0	0	0	1	0	
In 6 months	3	0	1	0	0	0	4	0	
Number of Schools where stock of IFA tablets checked from register	18	23	1	0	6	8	25	31	
Percentage of students who have been administered IFA tablets/syrup during last 3 months (out of total enrolled)									
Male	58	100+	12	33	50	93	40	76	
Female	55	100+	100+	30	47	86	81	74	
Total	57	100+	22	31	49	89	42	75	

Annexure2.15: Deworming medication at school- students' survey (in %)												
Indicator	Primary				Primary with upper primary				Upper primary			
	Male		Female		Male		Female		Male		Female	
	BL	EL	BL	EL	BL	EL	BL	EL	BL	EL	BL	EL
<i>Sample students, N</i>	230	230	246	230	51	32	13	32	99	94	93	114
Received deworming tablets/syrup in school	83	86	85	86	67	81	31	94	77	91	83	94

<i>Students who received deworming tablets/syrup, n</i>	190	198	208	197	34	26	4	30	76	86	77	107
Frequency of receiving deworming tablets / syrup in school												
Yearly	26	11	24	8	71		25		33	15	31	24
Half Yearly	46	64	52	63	24	58	50	63	42	80	38	72
Quarterly	2	1	1	3				7	1			
Monthly	8	1	5	3					13		13	
Not fixed	5	8	6	11	3	35		20	3	5	5	4
Don't know	10	16	8	12	3	8	25	10	3		6	
Consume deworming tablets / syrup distributed in school	100	97	100	99	100	96	100	100	100	100	100	100
Frequency of consuming Deworming tablets / syrup in school (in %)												
Yearly	26	11	24	8	71		25		33	15	31	24
Half Yearly	46	63	52	64	24	56	50	63	42	80	38	72
Quarterly	2	1	1	3				7	1			
Monthly	8	1	5	3					13		13	
Not fixed	15	24	14	22	6	44	25	30	5	5	12	4

Annexure2.16: Deworming Medication at School-school checklist (in number)										
	Primary		Primary with Upper primary		Upper Primary		Total			
	BL	EL	BL	EL	BL	EL	BL	EL	BL	EL
N	46	46	4	4	13	13	63	63		
School administer deworming tablets/syrup to students	46	46	4	4	13	13	63	63		
Frequency of administration of deworming tablets/syrup during last year										
In 6 months	35	31	1	4	8	10	44	45		
Once in a year	5	0	0	0	2	0	7	0		
On National Deworming Day	6	15	3	0	3	3	12	18		
Students who have been administered deworming tablets/syrup (in %)										
Male	84	73	82	90	86	75	84	76		
Female	84	73	81	93	83	61	84	74		
Total	84	73	81	92	84	67	84	75		
Verification of date when last time deworming tablets/syrup was given to the children										
Verified from register	28	15	3	0	6	6	28	15		
Register not available	18	31	1	4	7	7	18	31		

Annexure2.17: Health check-ups in school- Students' survey (in %)												
Indicator	Primary				Primary with upper primary				Upper primary			
	Male		Female		Male		Female		Male		Female	
	BL	EL	BL	EL	BL	EL	BL	EL	BL	EL	BL	EL
<i>Sample students, N</i>	230	230	246	230	51	32	13	32	99	94	93	114
Receive health check-ups in school (in %)	60	82	54	83	49	28	62	63	52	90	78	87
<i>Students who received health check-ups, n</i>	138	188	132	192	25	9	8	20	51	85	73	99
Health check-ups in school is conducted by...												
Doctor/Health Officer	93	88	91	86	84	89	63	75	90	94	93	94
Nurse/ ANM	3	9	5	10	16	11	38	25	6	6	5	5
Don't know	4	3	4	3					4		1	1
Frequency of health check-ups												
Fortnightly/15-days									2			
Monthly	3	3	2	2			13		10		8	
Quarterly	4	3	2	3			13		10		5	
Half-Yearly	11	17	6	18		56			10	38	5	34
Yearly	36	43	32	44	60	33	13	75	49	39	49	45
More than a year	1	10	6	5					4	9	5	5
Not fixed	22	18	26	18	28	11	50	20	2	13	10	13

Don't know	24	7	26	10	12		13	5	14	1	16	2
Students reported health check-ups being conducted in last 15 days (prior to survey) in %												
Number of times												
0	93	91	92	94	84	100	100	85	94	96	84	97
1	7	9	8	6	8			15	6	4	16	3
2	1				8							

Indicator	Primary School		Primary with Upper primary		Upper Primary		Total	
	BL	EL	BL	EL	BL	EL	BL	EL
N	46	46	4	4	13	13	63	63
Health check-ups for students conducted in school	44	46	4	4	11	13	59	63
Frequency of health check-ups								
Every month	2	0	2	0	0	0	4	0
In 3 months	3	5	0	0	1	3	4	8
In 6 months	14	18	0	0	6	4	20	22
Once in a year	25	23	2	4	4	6	31	33
Number of times school conducted health check-ups in the last one year								
1 Time	29	30	3	4	6	12	38	46
2 Time	13	16	0	0	4	1	17	17
3 Time	2	0	0	0	1	0	3	0
Teacher could not recall	-		1		-			
Health check-ups in school conducted by...								
Doctor	44	27	4	1	11	9	59	37
Both(Doctor & ASHA)	0	19	0	3	0	4	0	26

Background Characteristics	N		HHs reporting child fallen sick in the last 15 days		Avg. days child was absent from school due to sickness in the last 15 days	
	BL	EL	BL	EL	BL	EL
Religion						
Hinduism	644	661	42.9	31.2**	0.70	0.53
Islam	88	71	40.9	31.0	0.44	0.27
Social group						
General	42	66	50.0	34.8	0.74	0.53
Scheduled Castes	272	223	43.4	30.9**	0.71	0.53
Other Backward Classes	418	443	41.4	30.7**	0.63	0.48
Mother Education						
Illiterate	368	326	41.6	31.9**	0.68	0.52
Primary	123	122	48.0	24.6**	0.72	0.32
Upper primary	112	123	42.9	35.0	0.57	0.53
High school	39	68	41.0	27.9	0.49	0.43
Intermediate	31	42	48.4	35.7	1.10	1.00
Diploma /Degree & above	10	16	20.0	37.5	0.00	0.56
Not Completed Primary	40	30	40.0	30.0	0.68	0.40
Mother not alive	9	5	33.3	40.0	0.22	0.40
Standard of living Index						
Poor	552	466	44.0	31.8**	0.70	0.52
Moderate	180	260	38.3	29.6	0.54	0.44

High	0	6	-	50.0	-	1.83
Land holding size (in Ha.)						
< 0.25 ha	239	231	43.1	27.3**	0.64	0.44
Between 0.26-0.5 ha	46	54	30.4	42.6	0.30	0.63
Between 0.6-1 ha	13	14	15.4	42.9	0.00	0.71
> 1 ha	3	9	33.3	11.1	0.67	0.11
No land	431	424	44.5	31.8**	0.74	0.52
Note: * significant at <0.05; ** significant at <0.01						

Annexure 3 : Chapter3 -Operational Feasibility of Fortification of Rice, Awareness Activities and Scaling up

Annexure 3.1 Storage facility for FRK and fortified rice-Observation based	
Specifications	Compliance status
Bags of FCI Rice in intact condition (<i>without any wear and tear</i>)	Yes
Condition of walls and ceilings surrounding food grains	Maintained, well-lit and dry
Stacking of cartons and bags	In order
Material labelled by putting separate boards	Yes
Display of Stack cards	Not seen
Location of Pesticide, cleaning chemicals or other harmful substances	No chemical or pesticide found near storage.
Location of empty HDPE/jute bags	In a separate room
Storage place for FRK bags in safe, hygienic, cool and dry place	Yes
Number of cartons of FRK in intact condition	All
Number of cartons FRK with wear and tear	0
Handling of FRK wearing hand gloves and mask	Could not observe (<i>mill was not operational on the day of visit</i>)
Separate storage facility for rice and fortified rice	Yes
Fortified rice stored under lock and key	Yes
Condition of walls and ceilings surrounding storage space of fortified rice	Well maintained
Vertical stacking of fortified rice bags	Yes
Display of Stack cards	No
Process followed for clearance of inventory: <i>First in -First Out (FIFO) and First Expiry- First Out principle</i>	Yes
Labelling of bags and display of boards	Yes

Annexure 3.2 -Miller cost - Rice fortification costs in Pilot district- Varanasi (on actual basis)				
Budget Heads	Unit	Unit cost	No. of units	Total cost
A. Cost of Transportation	mt	500	4104	20,52,000
Transport & handling cost of rice from FCI godown to wheat flour mill				
B. Storage & Insurance Cost				16,58,014
1.Storage of FCI Rice	mt	180	4104	7,38,720
2.Storage of fortified rice kernels (FRK)	mt	180	41.04	7,387
3. Storage of processed fortified rice	mt	180	4145.04	7,46,107
4.Insurance of the entire stock	mt	40	4145	1,65,800
C. Packing & Marking cost (1-2)				14,65,928
1. Packing materials (25kg HDPE bags with polyethylene inner) including marking cost	bags	13	165800	21,55,400
2. Cost of FCI Rice Gunny Bags (4104 MT rice in 50 kg gunny bags)	bags	8.4	82080	6,89,472
D. Direct Processing Cost				10,42,502
1. Cost of Labor(1 Supervisor)	Month	15000	18	2,70,000
2. Cost of Labor (2 Operators)	Month	10000	36	3,60,000

3. Energy & other utilities (Power supply for 10 HP)	Month	2275	12	2,32,502
4. Equipment Maintenance cost	Month	10000	18	1,80,000
E. Indirect Processing Cost				2,99,610
1. Management/Administrative Cost	Month	15000	18	2,70,000
2. Interest on Performance Bank Guarantee, @5%	Month	1645	18	29,610
Total: A+B+C+D+E				65,18,054

Annexure 3.3: Cost components for Quality Control (cost/district)						
S. No	Heads	Parameters	Unit cost	No. of samples / visit	Samples/yr	Cost in Rs
A	Fortified rice (stored)	Iron	450	1	12	5400
B	Fortified rice (under production)	Iron	450	1	12	5400
C	Grand total					10800

Annexure 3.4: Cost components for FRK in Pilot district- Varanasi				
S.No	Cost categories	Cost in Rs/MT	Calculation	Cost in Rs
	Rice to be fortified in MT			4104
A	Fortified kernels require in MT			41.04
B	Manufacturing Cost			
B1	Raw Materials	36669	36669X41.04	1504896
B2	Conversion / Processing	7368	7368X41.04	302383
B3	Packaging	1050	1050X41.04	43092
B4	Analytical Tests	500	500X41.04	20520
B5	Miscellaneous	4918	4918X41.04	201835
C	Total of B	50505		2072725
D	Transportation	5000		205200
E	Total (C+D)	55505	C+D	2277925
F	Grand total	55505	E+F	2277925

Annexure 3.5: Cost components for equipments for pilot project	
Equipment	Cost (in Rs)
Vibratory feeder (manufacturer-M/s Kunstwerk)with vibratory feeder for FCI rice	1,00,000
Blending equipment (manufacturer– M/s Orion fabricators)	890000
Total estimated cost of equipment for fortification of rice	990000

Annexure 3.5 A: Cost components for equipments for scaling up			
	No. of units	Unit cost	Total price
Vibratory feeder	2	50000	100000
Conveyor belt, screw	1	200000	200000
Total			300000

Annexure 3.6: MDM Kitchen, water and cleaning facilities in schools-Observation (in number)									
	Primary (n=46)		Primary with Upper primary (n=4)		Upper Primary (n=13)		Total (N=63)		
	BL	EL	BL	EL	BL	EL	BL	EL	
Water Facility within kitchen									
Tap	5	15	3	0	3	4	11	19	
Storage/Container	20	19	0	4	6	6	26	29	
No facility within kitchen	21	12	1	0	4	3	26	15	
Designated place for washing utensils/plates									
Yes, within kitchen	1	0	1	1	0	0	2	1	

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Outside kitchen	27	31	0	0	6	12	33	43
In open ground	18	15	3	3	7	1	28	19

Annexure 3.7: Awareness and Perception about fortified MDM and its benefits- Students						
Indicator	Primary		Primary with upper primary		Upper primary	
	Male	Female	Male	Female	Male	Female
<i>Sample students, N</i>	230	230	32	32	94	114
Aware about rice served during MDM is fortified with nutritive items	62	56	16	25	82	76
<i>Students aware about fortified MDM, n</i>	143	128	5	8	77	87
Benefits of eating fortified rice						
Prevents anaemia	59	59	80	38	77	63
Protects from nutritional deficiencies	35	30	60	25	43	36
Better physical and mental growth	37	39	40	38	43	47
Improves immune system	17	8	20	13	29	26
Don't Know	14	15	20	25	1	1
Taste-wise difference between MDM before pre-fortification and now (post-fortification)						
Fortified MDM tastes better than non-fortified MDM	67	60	53	53	73	72
Fortified MDM tastes similar to non-fortified MDM	9	8	19	13	13	11
Fortified MDM tastes worse than non-fortified MDM	0	1	6			1
No feedback from child	23	31	22	34	14	16
Students' perception about consumption pattern of fortified MDM vis-à-vis non-fortified MDM among students						
Consumption of fortified MDM has increased	68	66	53	56	71	69
Consumption of fortified MDM is similar	25	27	34	28	24	25
Consumption of fortified MDM has decreased	-	1	-	9	3	2
No feedback from child	6	6	13	6	1	4
Complaint against fortified MDM	2.6	1.3	-	-	2.1	1.8

Annexure 3.8: Opinion about all meals including MDM- students survey (in %)												
Indicator	Primary				Primary with upper primary				Upper primary			
	Male		Female		Male		Female		Male		Female	
	BL	EL	BL	EL	BL	EL	BL	EL	BL	EL	BL	EL
<i>Sample students, N</i>	230	230	246	230	51	32	13	32	99	94	93	114
Meals usually taken at home (in %)												
Breakfast	100	98	100	98	100	100	100	100	100	91	100	95
Lunch	6	8	6	5	20	25	0	16	8	11	4	7
Evening snacks	65	91	58	90	57	94	62	97	55	87	63	88
Dinner	100	100	100	100	100	100	100	100	100	100	100	100
Meals taken at home is sufficient in quantity (in %)												
Yes	100	100	100	100	100	100	100	100	100	100	100	100
Regularity of intake of MDM in school in a week (in number)												
Average Days	6	6	5	6	6	6	6	6	6	6	6	6
Number of times finish the whole MDM daily that is given in school (in %)												
Yes, most of the time	81	93	81	91	61	75	100	81	76	90	84	94
No, sometimes not	10	3	8	5	18	9	0	6	19	5	11	4
Don't finish most of the time	6	3	10	3	16	6	0	6	4	3	4	1
Don't eat MDM	3	1	1	1	6	9	0	6	1	1	1	2
Get a second helping of MDM (in %)												
Yes	70	82	65	81	73	81	100	84	79	76	91	83
Don't eat MDM	3	1	1	1	6	9	0	6	1	1	1	2
Don't Know	0	4	0	0	10	0	0	0	0	3	0	1
Overall like MDM given in school (in %)												
Yes	87	90	89	83	63	69	100	69	74	82	88	85
Don't Know	0	1	1	1	0	9	0	9	0	2	0	2

MDM beneficiaries	Primary (n=46)		Primary with Upper primary (n=4)		Upper Primary (n=13)		Total (N=63)	
	BL	EL	BL	EL	BL	EL	BL	EL
Male students	51	70	29	56	41	80	41	69
Female Students	50	77	66	77	53	80	51	78
Total	51	74	32	67	47	80	45	74

Indicator	Primary				Primary with upper primary				Upper primary			
	Male		Female		Male		Female		Male		Female	
	BL	EL	BL	EL	BL	EL	BL	EL	BL	EL	BL	EL
<i>Sample students, N</i>	230	230	246	230	51	32	13	32	99	94	93	114
Heard about anaemia	12	41	15	35	4	16	31	16	32	66	46	69
<i>Students heard about anaemia, n</i>	28	95	37	81	2	5	4	5	32	62	43	79
Source of Information about anaemia (in %)												
Teacher	79	75	78	77	50	40	75	60	81	84	81	86
Parents	14	11	16	11		40	25	-	16	6	16	6
During school health/ education sessions	4	15	3	14	50	20	-	40	-	11	2	9
Causes of anaemia (in %)												
Lack of iron in the diet/ eat too little, not much	89	87	81	85	50	100	25	80	75	90	63	96
Sickness/infection (malaria, hookworm infection, other infec	43	29	16	32	50	20		20	19	40	33	35
Heavy bleeding during menstruation	-	1	-	2	-	-	-	-	-	-	5	8
Don't know	-	-	11	-	-	-	75	-	16	-	19	-
Symptoms of anaemia (in %)												
Less energy/weakness	86	93	86	91	100	100	25	100	72	92	84	91
Paleness/pallor	21	57	22	54	50	80	25	20	34	60	37	58
Spoon nails/bent nails	-	16	3	21	-	20	-	-	13	35	2	33
More likely to become sick (less immunity to infections)	32	41	24	48	-	40	-	-	22	34	14	32
Don't know	7	-	8	-	-	-	75	-	13	-	14	3
Methods for preventing anaemia (in %)												
Eat/feed iron-rich foods/ having a diet rich in iron	75	91	81	80	-	60	25	60	69	90	63	89
Eat/give vitamin-C-rich foods during or right after meals	25	38	19	42	-	60	-		16	40	30	38
Take/give iron supplements if prescribed	36	19	16	31	100	40	25	60	19	24	21	39
By eating fruits/ beetroot juice	18	2	16		-	-	-	-	13	-	7	3
Don't know	7	1	5	1	-	-	75	-	13	-	14	1

Annexure 3.11: Knowledge about Undernutrition-students' survey (in %)												
Indicator	Primary				Primary with upper primary				Upper primary			
	Male		Female		Male		Female		Male		Female	
	BL	EL	BL	EL	BL	EL	BL	EL	BL	EL	BL	EL
<i>Sample students, N</i>	230	230	246	230	51	32	13	32	99	94	93	114
Heard about undernutrition	6	20	7	16	6	13	8	19	26	56	32	55
<i>Students heard about undernutrition, n</i>	14	45	16	37	3	4	1	6	26	53	30	63
Source of Information about undernutrition												
Teacher	71	64	94	78	67	50	100	33	81	85	90	92
Parents	7	18	6	16	-	50	-	17	19	8	17	5
Through school health/ education sessions	36	16	6	19	33	25	-	50	-	15	3	6
Causes of undernutrition												
Not getting enough food	71	78	19	68	67	75	100	33	54	74	46	68
Food does not contain enough nutrients	14	58	56	54	33	100	-	67	46	57	40	41
Disease/ ill and not eating food	43	20	6	30	33	-	-	17	8	25	23	38
Don't know	14	2	25	3	33	-	-	-	15	-	20	-
Symptoms of undernutrition												
Lack of energy/ weakness	57	71	56	57	67	75	-	83	62	74	37	63
Cannot work, study or play as normal (disability)	7	24	25	22	33	75	-	-	27	21	7	41
Weakness of the immune system (becomes ill easily or becomes)	14	27	13	38	-	50	-	-	8	40	20	25
Loss of weight/ thinness	64	60	44	65	67	75	100	67	54	62	33	68
Children do not grow as they should (growth faltering)	7	11	13	16	-	-	-	-	4	17	-	21
Don't know	14	2	19	3	-	-	-	-	12	-	30	-
Ways to prevent undernutrition												
Give more food	64	60	56	46	100	25	-	50	42	60	27	59
Feed frequently	14	42	25	51	33	100	-	50	54	30	33	43
Give attention during meals	29	47	31	62	67	75	-	17	42	70	23	56
Go to health centre/ hospital and check child's growth	36	22	6	32	-	-	100	33	8	34	17	44
Don't know	14	2	13	-	-	-	-	-	19	-	33	-

Annexure 3.11.1: Heard of anaemia and undernutrition by background characteristics (in %)						
	N		Heard about anaemia		Heard about undernutrition	
	BL	EL	BL	EL	BL	EL
Religion						
Hinduism	644	661	20.5	45.8**	12.0	28**
Islam	88	71	15.9	33.8**	14.8	32.4**
Social group						
General	42	66	21.4	45.5*	21.4	30.3
Scheduled Castes	272	223	17.3	45.3**	10.7	30.9**
Other Backward Classes	418	443	21.5	44.2**	12.4	26.9**
Mother Education						
Illiterate	368	326	20.7	41.4**	12.8	28.2**
Primary	123	122	16.3	43.4**	7.3	23.8**
Upper primary	112	123	21.4	50.4**	16.1	31.7**
High school	39	68	25.6	45.6*	12.8	27.9
Intermediate	31	42	16.1	54.8**	12.9	45.2*
Diploma /Degree & above	10	16	30.0	43.8	20.0	0
Not Completed Primary	40	30	15.0	40*	10.0	23.3
Mother not alive	9	5	22.2	80**	11.1	60.0
Standard of living Index						
Poor	552	466	19.2	42.1**	11.1	28.3**
Moderate	180	260	22.2	48.1**	16.1	27.3**
High	0	6		100.0		83.3
Per capita monthly income (in INR)						
Above average income	395	324	20.0	43.5**	11.1	26.2**
Below average income	337	408	19.9	45.6**	13.6	30.1**
Land holding size (in Ha.)						
< 0.25 ha	239	231	22.2	48.9**	11.3	26**
Between 0.26-0.5 ha	46	54	19.6	53.7**	15.2	22.2
Between 0.6-1 ha	13	14	38.5	50.0	15.4	42.9
> 1 ha	3	9	66.7	77.8	66.7	33.3
No land	431	424	17.9	40.3**	12.1	30**
Type of ration card						
AAV	135	76	16.3	43.4**	7.4	31.6**
Priority HH	474	558	19.8	45.9**	14.1	28.7**
No ration card	123	98	24.4	38.8*	10.6	24.5**

Note: * significant at <0.05; ** significant at <0.01

Annexure 3.12: Teachers' Awareness on Anaemia and Undernutrition (in number)				
Indicators	BL	EL		
		Total	Male	Female
Surveyed teachers, N	63	63	43	20
Heard about anaemia	61	63	43	20
Symptoms of anaemia				
Fatigue	27	57	40	17
Weakness	50	54	35	19
Paleness/yellow skin/white tongue and pale eyes/Palpitation	34	39	28	11
Lack of concentration	10	35	25	10
	16	32	24	8
Cause of anaemia				
Iron deficiency	48	60	41	19
Poor nutrition, Worm Infestation/ Illness such as TB, malaria etc.	45	70	48	22
Blood Loss	28	33	22	11
Lack of breakfast	10	20	16	4
Preventive behaviours for anaemia				
Eating iron rich vegetables	43	61	41	20
Eating iron rich fruits	40	52	35	17
Eating meat/fish/eggs	30	47	33	14
Cooking in iron vessels	23	34	22	12
Consuming Deworming Tablets	18	21	14	7
Taking Iron fortified food	9	36	28	8
Consuming IFA supplements	13	36	26	10
Intake of proper breakfast	5	25	18	7
Tiranga bhojan	0	19	17	2
Heard about undernutrition	63	63	43	20
Symptoms of undernutrition				
Lack of energy/ weakness	36	56	38	18
Cannot work, study or play as normal (disability)	35	31	22	9
Weakness of the immune system (becomes ill easily or becomes seriously ill)	44	30	21	9
Loss of weight/ thinness	24	44	31	13
Children do not grow as they should (growth faltering)	10	33	22	11
Causes of undernutrition				
Not getting enough food	41	50	36	14
Food is watery, does not contain enough nutrients	49	44	28	16
Consequences of undernutrition				
Delay in physical growth	50	62	43	19
Delay in mental growth	46	59	40	19
Preventive behaviors for undernutrition				
Give more food	52	37	24	13
Feed frequently	44	39	25	14
Give attention during meals	31	46	35	11
Go to health centre/ hospital and check that the child growing	13	39	28	11

Type of IEC activity/material	Message/Topic content	HHs in %
Wall poster	<i>n</i>	79
	Use fortified rice and atta	39
	Use Iodised salt for cooking food	46
	Dietary diversity in the meal	32
	Take IFA tablets distributed in school	33
	Wash hand with soap before intake of food	48
	Wash hand with soap after use of toilet	47
Nutrition kiosk van	<i>n</i>	17
	Benefits of fortification of rice	8 nos.
	About anaemia (symptoms, prevention)	8 nos.
	Benefits of Vitamins, IFA etc.	7 nos.
Focus group discussion	<i>n</i>	84
	Dietary diversity in meals	58
	Benefits of fortification of rice	39
	About anaemia (symptoms, prevention)	37
	Benefits of Vitamins, IFA etc.	69

Type of IEC activity/material	Message/Topic content	Primary		Primary with upper primary		Upper primary		Total	
		Male (N=230)	Female (N=230)	Male (N=32)	Female (N=32)	Male (N=230)	Female (N=230)	Male (N=356)	Female (N=376)
Wall poster	Use fortified rice and atta	18	14		10	21	24	37	33
	Use Iodised salt for cooking food	8	9	24		9	17	19	22
	Dietary diversity in meal	9	5	24	14	8	12	20	16
	Take IFA Tablets distributed in school	10	11	24	5	13	18	25	25
	Wash hand with soap before intake of food	29	25	38	24	24	28	58	51
	Wash hand with soap after use of toilet	26	24	38	19	18	25	50	47
Nutrition kiosk van	<i>Students aware about the activity, n</i>	6	10	0	1	8	8	14	19
	Benefits of fortification of rice	13	13		100	25	13	43	26
	About anaemia (symptoms, prevention)	13	19			38	31	57	42
	Benefits of Vitamins, IFA etc.	6	19			38	50	50	58
	Child should take MDM regularly	25	13			19	6	50	16
Snakes& Ladders game	<i>Students aware about the activity, n</i>	118	105	3	2	39	43	160	150
	Intake of fortified MDM is good for health	24	18	0	0	27	35	48	46
	Dietary diversity is important for physical and mental growth	12	10	0		15	11	24	21
	About cause, symptoms and prevention of anaemia	15	16	0		21	34	32	43
	Intake of Micronutrients (Iron, Folic Acid, Vit.) for good health	14	13	2		13	12	28	26
	Washing hands with soap prevents infection	23	24	3	20	32	32	51	54
	Washing hands with soap after defecation	33	30	3	20	28	38	63	66
	Participate in sports and games	22	20	2	40	16	20	41	42

Annexure 3.15: Coverage of NHED sessions (in %)				
Indicator	Primary (N=46)	Primary with Upper primary (N=4)*	Upper Primary (N=13)	Total (N=63)
Number school conducted NHED	21	-	4	25
Number of times/school (avg.)	3	-	2	2
% of student participated (out of total enrolled)				
Boys	68	-	56	62
Girls	69	-	50	59
*No NHED session conducted				

Annexure 3.16: Miller cost - Rice fortification costs for Model-1 districts (High and Medium Rice Productivity Districts)				
Budget Heads	Unit	Unit cost	No.of units	Total cost
Average rice demand / district in MDM in Model -2 districts (36 nos.)	MT		2261	
A.Packing & Marking cost (1+2)				7,64,309
1. Packing materials (50kg Gunny bags with polyethylene inner) including marking cost	bags	8.4	45225	3,79,893
2. Cost of FCI Rice Gunny Bags (2261 MT rice in 50 kg gunny bags)	bags	8.5	45225	3,84,416
B. Direct Processing Cost				7,72,502
1. Cost of Labor(1 Supervisor)	Month	15000	12	1,80,000
2. Cost of Labor (2 Operaters)	Month	10000	24	2,40,000
3. Energy & other utilities (Power supply for 10 HP)	Month	2275	12	2,32,502
4. Equipment Maintenance cost	Month	10000	12	1,20,000
C. Indirect Processing Cost				1,99,740
1. Management/Administrative Cost	Month	15000	12	1,80,000
2. Interest on Performance Bank Guarantee, @5%	Month	1645	12	19,740
Total: A+B+C				17,36,551

Annexure 3.17: Miller cost - Rice fortification costs for Model-2 districts (Medium-low; low and very low Rice Productivity Districts)				
Budget Heads	Unit	Unit cost	No.of units	Total cost
Average rice demand / district in MDM in Model -2 districts (39 nos.)	MT		2361	
A. Cost of Transportation	mt	500	2361	1180417
Transport & handling cost of rice from FCI godown to wheat flour mill				
B.Storage & Insurance Cost				952832
1.Storage of FCI Rice	mt	180	2361	4,24,950
2.Storage of fortified rice kernels (FRK)	mt	180	24	4,249
3. Storage of processed fortified rice	mt	180	2384	4,29,199
4.Insurace of the entire stock	mt	40	2361	94,433
C.Packing & Marking cost (1+2)				7,97,962
1. Packing materials (50kg HDPE bags with polyethylene inner) including marking cost	bags	8.4	47217	3,96,620
2. Cost of FCI Rice Gunny Bags (2361 MT rice in 50 kg gunny bags)	bags	8.5	47217	4,01,342
D. Direct Processing Cost				772502
1. Cost of Labor(1 Supervisor)	Month	15000	12	1,80,000
2. Cost of Labor (2 Operaters)	Month	10000	24	2,40,000
3. Energy & other utilities (Power supply for 10 HP)	Month	2275	12	2,32,502
4. Equipment Maintenance cost	Month	10000	12	1,20,000
E. Indirect Processing Cost				1,99,740
1. Management/Administrative Cost	Month	15000	12	1,80,000

2. Interest on Performance Bank Guarantee, @5%	Month	1645	12	19,740
Total: A+B+C+D+E				39,03,452

Annexure 3.18: Cost components for FRK in Pilot district- Varanasi and during scaling up (cost/ district)								
S.No	Cost categories	Cost in INR/MT	Pilot district -Varanasi		Model-1		Model-2	
			Calculation	Cost in Rs	Calculation	Cost in Rs	Calculation	Cost in Rs
	Rice to be fortified in MT			4104		2261		2361
A	Fortified kernels require in MT			41.04		22.6		23.6
B	Manufacturing Cost							
B1	Raw Materials	36669	36669X41.04	1504896	36669X22.6	829185	36669X23.6	865694
B2	Conversion / Processing	7368	7368X41.04	302383	7368X22.6	166610	7368X23.6	173946
B3	Packaging	1050	1050X41.04	43092	1050X22.6	23743	1050X23.6	24789
B4	Analytical Tests	500	500X41.04	20520	500X22.6	11306	500X23.6	11804
B5	Miscellaneous	4918	4918X41.04	201835	4918X22.6	111209	4918X23.6	116106
C	Total of B	50505		2072725		1142054		1192339
D	Transportation	5000		205200		113063		118042
E	Total (C+D)	55505	C+D	2277925	C+D	1255117	C+D	1310380
F	Grand total	55505	E+F	2277925	E+F	1255117	E+F	1310380

Annexure 4: Key Parameters of Assessment

The output tables are generated using the indicators based on the following parameters:

Socio-demographic characteristics of sample population- Social group; family size; educational status attained by parents; source of livelihood, standard of living index (SLI).

Extent of awareness of micronutrient malnutrition and anaemia- cause, symptoms, source of information.

Food consumption pattern: Food Consumption Score (FCS), based on the frequency of intake of food items at household level during last seven days, irrespective of quantity and quality, was calculated. To collect the data a detailed list of food items was included in the household survey schedule. For each food item, household level consumption was captured in terms of number of days out of last seven days (maximum seven) that particular food item was consumed. Further to estimate FCS, food items were categorized into eight food groups. The eight food groups are: Main Staples, Pulses, Vegetables, Fruit, Meat & Fish, Sugar, Oil, and Condiments. Each food group was given a weight. The scores were categorized into three groups; poor; borderline; and acceptable.

Morbidity pattern among Children-Acute and Chronic morbidity³¹ incidences for last 15 days was captured.

Reach of MDM to intended beneficiaries- Gender wise analysis of student attendance; consumption of MDM vis-à-vis enrollment was done.

Cooking practices of MDM in schools- Using school checklist and IDIs with CCHs/MDM in-charge, cooking practices were analyzed along with the food safety and hygiene norms laid down and practiced.

Supply and consumption/utilization of health services/IFA/deworming-Data on health services such as observance of NHED, supply and consumption of IFA/deworming tablets/syrups was analyzed. Effort was made to collect the data from stock and indent register of sub centres and schools to assess the supply and consumption pattern of tablets/syrups.

School Infrastructure Index was developed in terms of availability of safe drinking water, toilet, handwashing facility etc. Further analysis like student-toilet ratio, student-teacher ratio, per capita availability of drinking water etc. was carried out.

³¹ The acute morbidity includes diseases like Diarrhea, Gastroenteritis etc. while chronic diseases include Anaemia, Alzheimer, dementia, Arthritis, Asthma, Cancer, Diabetes etc

Hospital and domiciliary expenses on sample students: Average out of pocket expenses (last six months) on health was estimated based on information collected on cost of doctor consultation, medicine, pathological test, radiology test, cost of transportation, person-days loss during the treatment/ admission, food cost if bought from outside, and any other miscellaneous expense was considered. Person-days cost was calculated based on the minimum government rate.

Assess the school absenteeism rate amongst the children between 6 to 14 years: Absenteeism rate was calculated based on the information captured from the attendance register.

Awareness about programme activities: Awareness about the activities like community wall poster on fortified atta(wheat flour) mid-day meals and its benefits, Nutrition Kiosks Van (Poshan Chetna Rath), Snakes & Ladders game, NHED session, group discussions conducted during the project implementation period. The awareness among the parents and students were captured during field visit.

Project Cost: The Government of Uttar Pradesh mobilized the government staff to support implementation of the fortification pilot project, from preparation to assessment. WFP incurred the costs for preparation, fortification operations, capacity building and IEC campaigns, quality assurance during the project period. The total cost shouldered by WFP for these activities during this pilot project is estimated to be around 4, 70, 91,053 INR (included hardware and software cost).³²

Handing over: WFP will develop a hand-over strategy during the implementation phase of the project and work towards takeover of the project by the government during the six-month period of hand-over. All costs towards fortification of the mid-day meals in Varanasi will be borne by the government starting from the hand-over phase. WFP will also develop and share with GoUP a scale-up plan along with the cost for implementation of the project.

³²*Amendment to Agreement between Government of Uttar Pradesh and World Food Programme dt.9/1/2020*

Annexure 5: Assessment Matrix

<p>Relevance</p>	<p>Are the activities and outputs of the project consistent with the overall goal and the attainment of its objectives?</p> <p>Are the activities and outputs of the project consistent with the objectives of the project state/country?</p>	<ul style="list-style-type: none"> Identify the socio-economic-demographic characteristics of the families of school children by gender (mother/father). What is the food consumption pattern at household level? What is MDM consumption pattern among students (girls/boys)? To assess the absenteeism rate among students To measure the extent of awareness of the causes, symptoms, and prevention from malnutrition and anaemia among school children. To examine the morbidity patterns among the target school children. 	<ul style="list-style-type: none"> Parents of school children Students Teachers School 	<ul style="list-style-type: none"> Household level survey with parents of the students In-depth Interviews(IDI) with Teachers Checklist & Observation 	<ul style="list-style-type: none"> Social analysis of primary data <p>Limited data is available at school level from other sources. However for household level indicators data sources such as Census and National Family Health Survey will be referred to for triangulation.</p> <p>Information on absenteeism will be captured from both students' survey and school records for the same reference period</p>	<ul style="list-style-type: none"> Census 2011 NFHS-4 (2015-16) <p>The reports are government owned and widely used for policy and programme level decision making</p> <p>Further validation of primary data with parents/students at the end of data collection phase may not be feasible due to time/cost implications.</p>
<p>Effectiveness</p>	<p>To what extent are the objectives of the programme likely to be achieved?</p> <p>What are the major factors likely to influence the intervention?</p>	<ul style="list-style-type: none"> To assess the cooking practices of MDM and use of double fortified salt in preparation of MDM in schools ? Extent of Satisfaction with supply of MDM food grains etc. Attendance & Absenteeism Rate To examine the infrastructure of school in terms of availability of safe drinking water, toilet, handwashing facility etc. To assess the type of health services provided in the schools To assess the capacity of miller (rice/wheat) for blending and quality assurance protocols 	<ul style="list-style-type: none"> MDM Cook School Teachers Students School 	<ul style="list-style-type: none"> IDI Household level survey Checklist & Observation 	<p>Qualitative and Quantitative data analysis</p> <p>Satisfaction with MDM will be enquired with teachers and students</p> <p>School observation and interview with cook will provide two data sources for cooking related practices and other infrastructure as well as progress reports of MDM Authority will provide data for triangulation.</p> <p>School records and students interview will provide attendance and absenteeism data</p>	<ul style="list-style-type: none"> DISE MDM Authority's Quarterly progress report <p>The reports are government owned and widely used for policy and programme level decision making as well as for audit purposes</p>

<p>Efficiency</p>	<p>How likely the intervention will be cost-efficient? Was the intervention implemented in a timely way?</p>	<ul style="list-style-type: none"> • What is the proposed budget and Utilization? • What is the current cost of transportation? • What is the handling and storage process and system, in place? • Available human resources (teachers/cooks) & other resources (cooking items) at school level • Timeline for project intervention (proposed vs. actual) 	<ul style="list-style-type: none"> • Project document • Millers • School teacher/head teacher 	<ul style="list-style-type: none"> • Literature review • IDI • Observation checklist 	<p>Primary and secondary data analysis. Face to face interviews and observation of school infrastructure will add to the information available</p>	<ul style="list-style-type: none"> • Government data on MDM supply related information for the district will be reliable for triangulation.
<p>Sustainability</p>	<p>To what extent did the intervention activities include considerations for sustainability, such as capacity building of local government institutions, communities and other partners? To what extent is it likely that the benefits of the intervention will continue after WFP's work ceases? To what extent is the willingness of the government to continue in the current location or scale up to other locations as well? What is the operational feasibility of the project intervention?</p>	<ul style="list-style-type: none"> • Perception about the fortification of midday meals and its quality assurance • Willingness of the state government to accept fortification of midday meals and its quality assurance 	<ul style="list-style-type: none"> • MDM Authority • District Primary Education Office • School Teachers • Project Authorities 	<ul style="list-style-type: none"> • IDI • Progress Reports 	<ul style="list-style-type: none"> • Primary and secondary data relate to project intervention and policy decisions taken during the project period will be analysed at the time of endline assessment. 	<ul style="list-style-type: none"> • Policy related documents available in public domain (websites) if any will be reliable and authentic.

Annexure 6: MDM beneficiaries during current academic year (2018-19)

MDM beneficiaries during current academic year: November 2019 to January 2020

		Primary		Primary with Upper primary		Upper Primary		Total	
		BL	EL	BL	EL	BL	EL	BL	EL
Boys	Total Enrollment	2,565	2,582	2,132	754	1,089	826	5,786	4,162
	Average days school open	25	19	24	23	25	19	24	20
	Total Enrollment during current year	3,15,049	2,43,606	2,53,175	85,139	1,34,310	77,941	7,02,534	4,06,686
	MDM beneficiaries during April to September 2018	1,60,960	1,70,739	73,653	47,741	55,426	62,383	2,90,039	2,80,863
	MDM beneficiaries rate in %	51%	70%	29%	56%	41%	80%	41%	69%
Girls	Total Enrollment	2,630	2,761	183	872	1,008	1,152	3,821	4,785
	Average days school open	25	19	24	23	25	19	24	20
	Total Enrollment during current year	3,23,033	2,60,494	21,731	98,463	1,24,320	1,08,702	4,69,084	4,67,659
	MDM beneficiaries during April to September 2018	1,61,334	1,99,776	14,344	76,125	65,402	86,825	2,41,080	3,62,726
	MDM beneficiaries rate in %	50%	77%	66%	77%	53%	80%	51%	78%
Total	Total Enrollment	5,195	5,343	2,315	1,626	2,097	1,978	9,607	8,947
	Average days school open	25	19	24	23	25	19	24	20
	Total Enrollment in last three month	6,38,082	5,04,100	2,74,906	1,83,603	2,58,630	1,86,642	11,71,618	8,74,345
	MDM beneficiaries during April to September 2018	3,22,294	3,70,515	87,997	1,23,866	1,20,828	1,49,208	5,31,119	6,43,589
	MDM beneficiaries rate in %	51%	74%	32%	67%	47%	80%	45%	74%