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Targeting Errors and Leakage in a Large-Scale In-Kind Transfer Program
The Food Friendly Program in Bangladesh as an Example

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Abstract

We evaluated a large transfer program in Bangladesh, named the Food Friendly Program (FFP, *Khaddo Bandhob Karmasuchi*), based on observational data. The program aims to provide nutritional support to poor rural households during preharvest seasons by offering rice at a subsidized price. It is a targeted program where the selection of the beneficiaries takes place through local governments and community consultations. We examined both inclusion and exclusion errors and measured the magnitude of corruption in the program. We found that for every taka spent by the government under the FFP, about 0.88 taka, on an average, reaches the eligible beneficiaries. In addition, we also looked at the regional variations in poverty and redistribution. The program seems to be achieving a high level of targeting efficiency, though spatial heterogeneity remains an important drawback. Our evaluation offers some important policy lessons discussed in detail in the report.

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Acronyms

BBS	Bangladesh Bureau of Statistics
BIHS	Bangladesh Integrated Household Survey
BNP	Bangladesh Nationalist Party
CBN	Cost of Basic Needs
DG Food	Directorate General of Food
FFP	Food Friendly Program
GDP	Gross Domestic Product
GR	Gratuitous Relief
HCR	Head Count Ratio
HIES	Household Income and Expenditure Survey
HQ	Headquarters
IFPRI	International Food Policy Research Institute
LGED	Local Government and Engineering Department
LPL	Lower Poverty Line
ME	Margin of Error
MoF	Ministry of Food
MP	Member of Parliament
OLS	Ordinary Least Squares
PMT	Proxy Means Testing
PSU	Primary Sample Units
SDG	Sustainable Development Goals
TCF	Thana/Upazila Food Controller
UNO	Upazila Nirbahi (executive) Officer
UP	Union Parishad
UPL	Upper Poverty Line
UPZ	Upazila
USAID	US Agency for International Development
VGD	Vulnerable Group Development
VGF	Vulnerable Group Feeding

1. Introduction

Bangladesh hosts an array of social safety net programs that aims, among other objectives, to enhance the food security of its food-insecure citizens. In recent years (2018-19), the combined spending on social safety net programs reached approximately 14% (Tk. 64,177 crore) of the country's budget, and about 2.5% of its GDP. Due to a relatively low-income level and a high incidence of food poverty, the country understandably puts sizable prominence on the food security within its overall social safety-net program portfolio, with about 16% (Tk.10,457 crore)¹ of the total expenditure on social safety net programs allocated to food security. The program that we evaluate here, *Khaddo Bandhob Program*, also known as *Food Friendly Program* (FFP), is a newly devised component of the food security program that has emerged as one of the top programs within the food security sub-portfolio. One of the distinct features of this program is that it specifically targets income and consumption seasonality observed in rural areas during the pre-harvest seasons.²

As aforementioned, the FFP is a relatively new transfer program of the Govt. of Bangladesh under which the Ministry of Food (MoFood) has been delivering rice to a large number of rural households at a highly subsidized rate, with eligible households able to purchase rice at 20% to 30% of the prevailing market price. Started in 2016, the FFP is aimed to replace other similar transfer programs currently run by various government entities such as the Vulnerable Group Development (VGD) program, Vulnerable Group Feeding (VGF), Gratuitous Relief (Food) in the near future. The stated objective of FFP is to achieve 'no poverty' and 'zero hunger' - part of the UN Sustainable Development Goals (SDGs)- through food assistance and nutritional support to the rural poor. At present, the program provides 30 kg of subsidized rice per month to *eligible* (discussed later) households during the program months. The FFP runs twice a year during the *Boro* pre-harvest season (*Mar.-April*) and *Aman* pre-harvest season (*Sept.-Nov.*). These are the two lean seasons in rural Bangladesh when rice prices increase, and job opportunities and agricultural wages in rural areas decrease, putting poor rural households, especially agricultural labour households, at risk of seasonal hunger and occasional famine.

According to the figures collected from the Directorate General of Food (DG Food), under the program the MoFood has distributed 684,752 metric tons of rice to 4,565,013 households in 2016-17, 298,492 metric tons of rice to 4,974,867 households in 2017-18, and 743,838 metric tons of rice to 4,958,920 households in 2018-19 (till April 2019). The rice delivered under this program is heavily subsidized at the tune of around 80% (78%, 80%, and 80% in 2016-17, 17-18, and 18-19, respectively), which amounted to a subsidy of \$254 million US dollars in 2016-17, \$121 million US dollars in 2017-18, and \$306 million US dollars in 2018-19 (till April 2019).

Based on the latest household income and expenditure survey (HIES) conducted by the Bangladesh Bureau of Statistics (BBS) in 2016, about 15% of rural households (13% nationally) live

¹ US\$1.25 billion; exchange rate 1 USD =83 Taka.

² Figures are taken from the Ministry of Finance Website: Budget 2017-18, 2017-18 (revised), and Budget 2018-19. Accessed April 24, 2019.

below the extreme poverty line. The corresponding figures for the upper poverty line are 26% rurally and 24% nationally.³ This implies that the total number of households in rural areas that live below the extreme poverty line and upper poverty line (in 2016) is approximately 4.2 million and 7.4 million, respectively.⁴ Hence, if targeted properly, the FFP can reduce seasonal hunger and poverty for all the rural households in Bangladesh that live below the lower poverty line, which also corresponds to a coverage of 70% of all rural households that live below the upper line. However, this requires meeting the following necessary conditions:

- a. That the targeting error (both inclusion and exclusion errors) is low – the included beneficiaries truly live below the poverty line.
- b. That the program is free of leakage – the difference between the amount of rice allocated in the program and the amount received by the targeted households is very low, if not zero.
- c. That the regional variations in income and consumption seasonalities are considered in the subsidy allocation decision.

One of the key features of the FFP is that it is targeted, implying that only households with well-defined observable characteristics are eligible to be part of the program and receive subsidized rice. In practice, beneficiaries are selected by local government representatives (usually UP members), often in consultations with government and local civil society representatives (primary school teachers, family planning officers, Imams, freedom fighters, ruling party leaders, etc.). These representatives utilize their local knowledge and local information rather than conducting any surveys to verify the characteristics of households or conducting any sort of means testing.

The FFP guidelines published in 2017 include both inclusion and exclusion criteria to help select eligible households. To be considered as a beneficiary, households must have a head who is a permanent resident of the *union parishads* (UP) and also possesses a national ID card. In addition, in order to be eligible for the program, a household must be poor, functionally landless, and the household head works as a day laborer. Households headed by widowed/ separated /divorced/ deserted/ elderly/ disabled females and households with children and disabled individuals get priority. These criteria are verifiable, and unsurprising, very similar to the VGD program - the longest serving transfer program in the country. Lastly, more than one member from the same household cannot be included in the FFP, and current VGD beneficiaries are ineligible as well. In our empirical evaluation, we will use these inclusion and exclusion criteria to see if the listed beneficiaries are eligible for the FFP.

Given that it is an in-kind transfer program, the subsidized good (rice) passes through several stages before it reaches the intended beneficiaries. The subsidized rice is delivered through dealers

³ The extreme poor households are those households whose total expenditures are equal to the food poverty line. The moderate poor households are those households whose food expenditure is at the level of food poverty line. This method of defining the poverty line is based on Cost of Basic Needs (CBN). Using this method, BBS estimates the minimum level of household income that can purchase a food basket of 11 selected food items to satisfy the basic needs of the household members (2122 k.cal per person per day)(Bangladesh Bureau of Statistics (BBS) 2019).

⁴ Poverty figures are from HIES 2016 Preliminary Report. Population figures are from the Bangladesh Bureau of Statistics' Population Project of Bangladesh: Dynamics and Trends.

appointed by the UPZ committee. The UPZ committee appoints one dealer in each UP for every 500 beneficiaries. Dealers appointed by the UPZ committee collect rice from the respective Upazila Food Controller (henceforth, TCF). Dealers deliver rice to eligible beneficiaries twice or thrice a week in a dealer's shop. Rice delivery days, amount and price are posted in front of each dealer's shop. In terms of information availability, each beneficiary receives a beneficiary card, and a complete beneficiary list is posted in the UP digital center. We estimate the leakage that may happen between the TCF and dealers, and dealers and beneficiaries. While leakages upstream are not unlikely, the physical rice is stored and delivered from government-owned storages often located in upazilas and controlled by TCFs. More importantly, the DG Food has confirmed that the rice delivered by DC Food and that received by the TCFs is identical.

In Bangladesh, there are inter-regional variations in the severity of seasonality and poverty among different rural regions. It is therefore important to understand the allocation of subsidies across regions within the country. According to the FFP guidelines updated in 2017, the Government decides the number of beneficiary households that will receive subsidized rice in each upazila (UPZ). A UPZ committee (which consists of an MP, UPZ Chairman, UNO, six civil servants, and one citizen journalist) divides the number of beneficiaries among UPs based on poverty incidence and level of destitution. A UP committee (which consists of a UP chairman, members, a secretary, and two civil society representatives nominated by the chairman) prepares a list of eligible households for each UP based on poverty and destitution levels. Given that the disaggregated poverty data is available up to the district level, the evaluation of the appropriateness of the FFP's beneficiary allocation will be limited to the district level.

The rest of the report is organized as follows: the evaluation design is discussed in Section 2; the main outcomes are summarized in Section 3; the main determinants of the three aspects of the program that we evaluate are explored in Section 4; and the main conclusions and policy lessons from our evaluation are presented in Section 5. The sample design, data collection and other related information are provided in Appendix 1.

2. The Evaluation Design

The current evaluation of the FFP based on observational data has been drawn from three sources:

- a. A new survey – Food Friendly Program Survey (FFPS) – that we conducted in 2018 after the FFP was implemented in March-April 2018;
- b. Revisiting a subsample of households originally surveyed in IFPRI's Bangladesh Integrated Household Survey (BIHS),
 - We surveyed the BIHS households in the sub-districts that were selected in (a);
- c. Using the Bangladesh Bureau of Statistics (BBS)'s Household Income and Expenditure Survey (HIES) data conducted in 2016.

For the new survey, FFPS, we drew our samples based on some important characteristics that may influence transfer: remoteness, poverty rate, population, political affiliation of elected candidates and past FFP allocations. Our aim was to draw a representative sample of beneficiaries, dealers, UP's chairmen, and upazila chairmen. In order to do so, we used: a) district poverty rate as a proxy for the UP poverty rate from the HIES2016 report; b) population of the Union Parishads from the 2011 Population Census conducted by the BBS; c) political affiliation of elected parliament members in 2008 election from the Election Commission; d) distance of UPs from UPZ headquarters and Dhaka as a proxy for remoteness drawn from the Local Government and Engineering Department (LGED)'s GIS data; and e) number of beneficiaries/amount of rice allocated to each UPZ in the last program cycle drawn from the MoFood's district record.

Table 1: Balance check for the FFP Survey Sample

	(1) Not- included Mean/SE	(2) Included in FFPS Mean/SE	t-test (1)-(2) Difference
% Head Count Ratio (Upper Poverty Line) for the union's district	32.398 [0.200]	32.887 [0.871]	-0.489
% Head Count Ratio (Lower Poverty Line) for the union's district	18.677 [0.151]	19.001 [0.671]	-0.324
Beneficiary Dataset: Number of Dealer's in the given Upazila	23.886 [0.198]	24.300 [0.860]	-0.414
Voter Dataset: average proportion of Awami League voters across constituencies by District	0.576 [0.003]	0.583 [0.014]	-0.007
Voter Dataset: average proportion of BNP voters across constituencies by District	0.369 [0.002]	0.363 [0.007]	0.007
Distance Dataset: distance from union HQ to nearest upazila HQ	7.274 [0.069]	7.436 [0.301]	-0.163
Distance Dataset: Distance from Union HQ to Dhaka HQ	147.014 [1.200]	153.800 [5.232]	-6.786
Population dataset: population in the union	25391.663 [196.196]	26726.026 [1126.830]	-1334.363
Observations	3885	227	
F-test of joint significance (F-stat)	0.827		
F-test, number of observations	4112		
The value displayed for t-tests are the differences in the means across the groups. The value displayed for F-tests are the F-statistics. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level.			

Based on the above characteristics, we drew a sample of 227 *Union Parishads* distributed across 175 upazilas in 61 districts out of a total of 64 districts in the country. The sample size determination, including the sample design, has been discussed in Appendix 1 in detail. The geographic distribution

of upazilas is shown in Figure A1 in Appendix 1. Table 1 shows the representativeness of the FFPS unions. It compares the averages of 227 unions drawn in the sample with the averages of the rest of rural unions (3885) not drawn in the sample along several important dimensions: incidence of poverty, number of dealers that distribute rice, political affiliation of voters, population size, and remoteness. The selected unions are similar to the non-selected unions in all dimensions. In addition, the overall difference (F-test) between the two groups is also statistically insignificant.

For the beneficiary selection, 25 beneficiaries from each UP were randomly selected from the list of beneficiaries found in the Directorate General of Food (DG Food) website (<http://www.dgfood.gov.bd>), and the first 20 of them were interviewed. When any of those 20 beneficiaries could not be found in the described location, s/he was replaced by the name of the beneficiary starting from the 21st sample. In a few cases, we ran out of samples as the listed beneficiaries could not be traced. In the case of the union of Shubhadya in Keraniganj Upazila (Dhaka District), no randomly selected beneficiaries could be traced because of the frequent migratory tendency of the inhabitants of the area. Therefore, 4528 beneficiaries in only 226 unions were interviewed successfully. There are several unions for which the list had not been updated on the website. In these cases, our data collectors collected the updated list from the TCF office, and the sample was re-generated randomly. In addition, all chairmen and dealers in the selected UPs, and all the TCFs of the respective upazilas were also interviewed.

Revisiting part of the BIHS sample

According to Ahmed et al. (2013), BIHS is a nationally representative survey of rural households in Bangladesh (both nationally and divisionally). It is a product of the International Food Policy Research Institute (IFPRI) and US Agency for International Development (USAID). The BIHS data includes detailed information on assets, food and non-food expenditures, among others. For detailed information on this survey and data collection, see Ahmed et al. 2013. We re-surveyed all the BIHS households located in 175 upazilas selected in the FFPS. Our aim in re-visiting these households was to see both inclusion and exclusion of beneficiaries based on their pre-program socio-economic status. Data collection was limited to their program status (i.e. if they were part of the FFP list), amount of rice received, and price paid, and other indicators. Figure A2 in Appendix 1 shows how the two survey samples (FFPS and BIHS) are drawn and how they linked to each other.

Using HIES 2016 data

HIES 2016 is representative of each of Bangladesh's 64 districts, and it allows us to calculate the district-specific head count ratio based on the upper poverty line, and lower poverty line. In addition, it also allows us to calculate seasonal incidence of poverty for each of the districts. This is feasible due to the fact that household interviews in every district were conducted around the year, enabling the average food and non-food expenditure for a particular season for a given district to be calculated.

However, it should be noted that the calculation of seasonal poverty rates can be subject to bias if intra-district variation in consumption varies from season to season.

Appendix Table A2 compares the FFPS, BIHS and HIES households.

3. Outcomes

We start with the average outcomes categorized into three groups – a) beneficiary selection including the targeting errors; b) leakage in the program; and c) regional variations in poverty and allocation of beneficiary numbers into different regions.

3.1 Beneficiary selection

We start with examining how the actual FFP beneficiaries look like in reality by matching the observed characteristics of the FFP beneficiaries found in the survey to the FFP selection criteria (Table 2). In more than 97% of the cases, beneficiaries do meet one of the main inclusion criteria – the household head is a woman, who is either a widow, or divorced, or deserted by her husband, or under severe financial stress, or an elderly female. However, we also found that in about 3% cases, at least one of the household members is also a VGD recipient, which is an exclusion criterion for the FFP. This implies that about 3% of beneficiary households are double-dipping into similar kinds of social transfer programs. In terms of the beneficiary inclusion process, beneficiaries did not pay any bribes to be listed in the FFP in more than 99% cases. However, in the less than 1% cases where they paid bribes to be included in the list, the average amount paid was 235 Tk, which is equivalent to almost one-month's worth of benefits.

We also estimated the inclusion and exclusion errors. As described in Section 2, the inclusion error calculated at the beneficiary level is based on the PMT scores whereas the exclusion error is calculated at the district level.

Table 2 – Average Outcomes of FFP

	N	Mean/SE
Beneficiary selection¹		
HH is eligible (widowed/ divorced/deserted/financially distressed / old female)	4528	0.974 [0.002]
Household has a VGD recipient	4505	0.028 [0.002]
Inclusion error based on PMT scores	4371	0.146 [0.005]
Exclusion error using the upper poverty line ²	60	0.224 [0.020]
Exclusion error using the lower poverty line ²	60	0.108 [0.014]
Amount of 'bribe' (in Tk.) paid to be included in the FFP-list	4528	1.765 [0.672]
Leakage¹		
Listed beneficiary exists (1) or not (0)	4528	0.997 [0.001]
Listed beneficiary possesses card (1) or not (0)	4528	0.934 [0.004]
The listed beneficiary received rice in March-April 2018	4505	0.970 [0.003]
Amount of rice (in KG) the household received in March - April 2018	4528	56.847 [0.176]
Price (in Tk) per kg of rice paid by the beneficiary	4371	10.082 [0.006]
Average price per KG in Tk. paid by dealers to TCF	4389	8.478 [0.002]
The difference between amount of rice received by beneficiary and reported by dealer	4449	3.028 [0.077]
Missing rice bet TCF and dealer per beneficiary (in KG)	4469	1.432 [0.116]
Regional variations in beneficiary allocation²		
Average distance of beneficiaries to sub-district HQ in KM	60	7.726 [0.274]
Average distance of beneficiaries from Dhaka in KM	60	152.891 [9.911]
% of poor - upper poverty line	60	0.262 [0.021]
% of poor - lower poverty line	60	0.144 [0.015]
FFP ben minus total poor (UPL) divided by total population	60	-21.084 [1.779]
FFP ben minus total poor (LPL) divided by total population	60	-9.676 [1.316]

¹Outcomes are calculated based on data collected in the FFP survey. ²Outcomes are calculated based on HIES data, and FFP survey data aggregated at district.

3.2 Leakage (corruption)

The first question we were interested in answering was if a beneficiary listed in the government database truly existed. In 99.7% of cases the beneficiary listed in the government data base actually existed in reality. This is in fact a noteworthy achievement in such a large and newly devised transfer program. We could not identify the beneficiary in only in a small fraction of cases (0.3%). However, it should be noted that errors such as misspellings of names or insufficient search efforts on the part of the surveyors (among others) could have led to not finding the beneficiaries. Secondly, we asked the identified beneficiaries if they possessed the official FFP card or not. 7% of beneficiaries interviewed did not possess any FFP card. This is an important consideration as recipients not having an official beneficiary card can potentially lead to a leakage of benefits. The third question we asked was if the listed beneficiaries received rice under the FFP program during March-April 2018. 97% of the listed beneficiaries reported receiving rice in March-April 2018. Conversely, about 3% of the identified beneficiaries had not received the rice allocated to them.

Figure 1: Distribution of rice received by beneficiaries from dealers

We now turn to the total rice missing between the dealers and beneficiaries, and its distribution. The average amount of rice received per beneficiary is about 57kg, which is about 5.3% less than the total amount of rice allocated for transfer (Table 2). We also looked at the amount of rice received by dealers from TCFs, which is about 58.5kg per beneficiary. This implies the missing rice between

dealers and TCFs is about 2.4% of total transfer, making the rice missing between dealers and beneficiaries net of TCF 2.9% of total rice.

We also look at the distribution of missing rice. In about 86% of cases, beneficiaries received the full amount of rice from dealers. However, in about 7% of cases, they received about 4kg less from the dealers; in 2.5% of cases they received 30kg or less; and in about 3.5% cases, beneficiaries did not receive any rice at all (Figure 1).

Figure 2: Distribution of rice missing between TCFs and dealers

In contrast, in about 90% of cases, dealers received the full amount of rice from TCFs. However, in about 5% of cases, they received about 3kg less from the TCF; in 2% of cases they received between 3 to 30kg less from the TCFs; and in about 2% cases they received less than half of the rice from the TCFs (Figure 2).

3.3 Regional variations in the distribution of beneficiaries

Seasonal variation in poverty is highly pronounced in some parts of the country. Based on the HIES data, the head count ratio (HCR) based on the upper poverty line in March-April 2016 in

different districts varied from no poverty to 66%, while the mean was 26%⁵. The remoteness of beneficiary households, measured as distance from the upazila HQ and Dhaka, varied from about one km to 12km, and from 25km to more than 300km, respectively. Given these, we looked at the extent of under-provision /over-provision of FFP beneficiaries, defined as the total number of FFP beneficiaries in a district minus the total number of poor households (seasonally adjusted), divided by the total district population. Again, we see high variation in both over-provision and under-provision, implying that in some districts the total number of FFP beneficiaries exceeds the total number of poor, and vice versa.

In Figure 3, we put the seasonally adjusted HCR based on the Upper Poverty Line (UPL), and over(under) provision of FFP beneficiaries against distance from Dhaka as a proxy for the remoteness of a household and a community. Whereas allocation of beneficiaries is satisfactory for districts with a lower HCR, under-provision increases as the HCR increases. Coincidentally, the gap between the HCR and under-provision, while low at a shorter distance, and at a lower HCR, it increases with remoteness and with an increase in poverty rate.

Figure 3

⁵ Seasonally adjusted HCR is calculated from HIES2016 data where we used the food and non-food expenditures of rural households in each district surveyed only in March-April 2016. The expenditure amount that defines poverty lines, upper and lower, remain unchanged to HIES2016. In few districts (Chittagong, Dhaka, Gazipur, Munshiganj, Madaripur, Narshingdi, Narayanganj), we used the yearly average due to an insufficient number of observations.

4. Understanding the determinants of outcomes

4.1 Beneficiary selection (targeting errors)

We look at inclusion error and exclusion error separately. We define inclusion error to be 1 for a beneficiary household if the household's PMT⁶ score is above the threshold, or if the household's per capita consumption is above the *upper* poverty line. The data for this comes from the FFPS; given that data contains household's asset information only, the inclusion error is based on the household's PMT score, not on the actual consumption.

As the name suggests, it is basically a proxy for household socioeconomic status. In the absence of detailed information on household income and consumption, which requires a considerable amount of time and financial resources, PMT is an indirect method to predict poverty and identify the target group for social welfare programs in a cost-effective way. Although the PMT has been criticized on several grounds, it is still a widely used tool for poverty targeting.

In this study, the PMT score estimation is based on Sharif (2012); we identified the key covariates required for poverty targeting and included those while developing our FFPS survey instrument. The recommended variables can be grouped under four broad headings: (a) Socio-demographics and household head characteristics; (b) ownership of assets which are easily verifiable; (c) housing and sanitation quality and access to remittance; (d) geo-location variables. We have utilized a modified specification of Shariff (2012) and used the latest round of Household Income and Expenditure Survey (HIES 2016) to estimate the PMT score. Note that the spatial and geographic variation among the households in Shariff (2012) is captured by dummies at the division level. However, the number of divisions in Bangladesh has considerably changed between 2005 and 2016, and we have addressed this change in our specification.

In the first stage, the PMT weights are derived using household level information from the HIES (2016). The weights are basically the coefficients obtained from a simple Ordinary Least Square (OLS) regression of per capita consumption expenditure on a host of covariates that fall under the broad headings mentioned above.⁷ The weights obtained from HIES (2016) are reported in Table A3 in the appendix and corresponding weights obtained by Sharif (2012) is presented as well for the ease of interpretation. Note that there appears to be significant difference in the derived weights from two different samples.

Once the PMT weights are calculated for each of the household, the next step is to determine a threshold score based on which one can predict welfare level of the household. This threshold score is critical because households whose PMT score would fall below this cutoff level would be considered as poor and vice versa. We thus map this calculated PMT score for each of the households included

⁶ PMT (Proxy Means Testing) method uses observable and verifiable characteristic of the households from survey data to predict household welfare.

⁷ For each of the expositions, the weights are rounded to the nearest integer following Sharif (2012)

in HIES (2016) with the poverty line income. The PMT score of households that belongs to the upper poverty line income in the distribution of annual household income is being considered as the threshold score.⁸

Since we have information related to each of the covariates for each of the households in the FFPS sample, the weights obtained from HIES (2016) are utilized to calculate the PMT score for each of the households included in the FFP sample⁹. Once the PMT weights are calculated for each of the FFP recipient households, the cutoff score is finally employed among the FFPS recipient to predict household level of welfare i.e. which of the FFP beneficiaries are poor. In other words, all FFP beneficiaries whose PMT score are above this threshold are non-poor in terms of predicted welfare and thus ineligible to be included in such a social welfare program. The non-poor who are receiving the FFP benefits are part of the targeting error.

Exclusion error: We define exclusion error to be 1 for a non-beneficiary household if either the household's PMT score is below the threshold, or if the household's per capita consumption is below the *lower* poverty line. However, calculating the exclusion error requires us to collect a representative sample of the rural population. We attempted to do so by resurveying a randomly selected sub-sample of the BIHS households. For reasons not yet understood, however, this part of the data could not be used.

Given that the data that was collected by visiting the subset of BIHS households was not useful in calculating the exclusion error, we opted for an alternative approach that relies on the assumption that poverty within a district is equally distributed.¹⁰ Note that the HIES2016 survey is representative at the district level, and it calculates poverty rate for each district; as a result, any further disaggregation is not attainable with the existing sets of data.

- From the census data, we take the total population of district k as n_k
- From the HIES2016, we find out the head count poverty rate of each district; and we calculate the total number of poor living in each district (p_k)
- From the FFP survey, we calculate the average inclusion error for each district (e_k).
- From the official FFP beneficiary list, we find out the number of beneficiaries in each district (b_k).
- The exclusion error is then can be expressed as:

⁸ Since multiple households correspond to the upper poverty line income, we have picked the median PMT score.

⁹ For each household the PMT score is constructed by adding the constant with each of the covariate times the associated weight. In other words, $PMT_i = 856 + \sum_{j=1}^k w_{jk} X_{ijk}$, where "i" denotes household and "k" denotes covariate included in the regression.

¹⁰ The key assumption here that the intra-district variation in poverty-rate is less than the inter-district variations is common in the poverty literature. This is one of the main justifications of calculating poverty rate at the district level, and allocating fund accordingly.

$$Error_k = \{p_k - b_k * (1 - e_k)\}/n_k$$

Empirically, we explain error (exclusion error and inclusion error) of household i living in the local government area j as a function of local government's characteristics (political affiliation of the elected leaders, voting patterns), geographical remoteness of the household i (distances from the upazila HQ and Dhaka), and eligibility indicators (VGD member, widow etc). γ is the district fixed effects (we allocated samples based on district poverty rates calculated from HIES 2016). The estimation equation is given below:

$$ERROR_{ijk} = \alpha + \beta_j X_{ijk} + \gamma_k + \varepsilon_{ijk}$$

We start with the factors that determine inclusion error (Table 3). Recall that the inclusion error in the FFP sample is about 15% implying that 15% of the households included as beneficiaries should not have been included because, according to the PMT scores, they are not poor. Factors that lead to their inclusion included the household head being widowed, divorced, or deserted, which are important inclusion criteria. Given that selection of beneficiaries for the FFP is done by the local government officials, this set of criteria can lead to inclusion, and perhaps justifiably so. Surprisingly, however, household's land ownership increases the inclusion error. In fact, about 3% of the FFP beneficiaries own more than one-acre land, and about 8% of the beneficiaries owned more than 0.5 acre of land – the cut-off (often used) for being defined as poor. Paying a bribe to be an FFP recipient was found to have had no effect on the inclusion error.

Remoteness and whether the household head worked primarily as a day laborer were both factors that reduced the inclusion error. These two factors indicate that the current system may be regressive as it works against the day laborer and households living in remote communities.

Next, we turn to the exclusion error. Keeping it low is perhaps more important from a re-distributional purpose as well as to achieve the core objective of the FFP. As seen above, remoteness reduces inclusion error, which again, is regressive from the re-distributional perspective. We start with looking at the association between remoteness – the average distance of households from Dhaka - and exclusion error (Figure 4). We also include the district poverty rate (based on the upper poverty line), which co-moves with the exclusion error by construction.¹¹ The positive association between remoteness and exclusion error, and remoteness and a higher incidence of poverty is obvious.

¹¹ Note that due to this high association between the upper poverty line (UPL) and exclusion errors, we do not use the UPL as an explanatory variable in our regression that follows.

Table 3: Determinants of inclusion error (based on PMT scores) - OLS regressions

VARIABLES	(1) Inclusion error based on PMT scores	(2) Inclusion error based on PMT scores	(3) Inclusion error based on PMT scores
Household head is a widow, or divorced, or deserted	0.064*** (0.017)	0.051*** (0.017)	0.052*** (0.017)
Household has a disable member	-0.048 (0.033)	-0.035 (0.032)	-0.036 (0.032)
Household has a VGD recipient	-0.043 (0.029)	-0.051* (0.027)	-0.054** (0.027)
Primary occupation of the household head is day laborer	-0.112*** (0.011)	-0.097*** (0.012)	-0.097*** (0.012)
Total land owned by the household (in decims)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)
Amount of 'bribe' (in Tk.) paid to be included in the FFP-list	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)
UP chairman is affiliated with the current government party	0.017 (0.017)	-0.004 (0.014)	-0.002 (0.013)
Poverty head count ratio at district based on the upper poverty line	-0.005*** (0.000)	0.011*** (0.001)	-0.006 (0.009)
Distance of the household from Upazila center			-0.002* (0.001)
Distance of the household from Dhaka			-0.001* (0.000)
Observations	4,354	4,354	4,354
Adjusted R-square	0.093	0.156	0.157
District Fixed Effects are included?	No	Yes	Yes

Standard errors in parentheses are clustered at Union Parishad level. *** p<0.01; ** p<0.05; * p<0.1.

Figure 4

Unlike the inclusion error, for which our unit of analysis was households, we analyze the exclusion error at the district level due to the data limitations mentioned earlier. Program size and remoteness are factors that increase exclusion error (Table 4). Quantitatively, the exclusion error increases by about 8 persons for every 100 additional FFP beneficiaries. This shows the trade-off between program size and targeting quality: as the program size increases, the chances of excluding the eligible households also increase.

Table 4. Determinants of exclusion errors – OLS regression

	(1) Exclusion Error (using Upper Poverty Line)
Average distance of beneficiaries to sub-district HQ in KM	-0.012 (0.009)
Average distance of households from Dhaka in KM x 1000	0.541* (0.299)
The total rural population in the district (in 000) x 1000	-0.028** (0.013)
The total number of FFP beneficiary in the district (in 000) x 1000	0.763* (0.306)
Observations	61
R-squared	0.189

Standard errors in parentheses are clustered at Districts. *** p<0.01; ** p<0.05; * p<0.1.

The exclusion error increases with remoteness as well as with the larger programs (when the total number of beneficiaries is higher). This implies that remote and poorer districts suffer most from the exclusion error (Figure 5). In regions less than 100km from Dhaka, the exclusion error is about 16%. It increases to 22% when the beneficiaries are living between 100 and (less than) 200km from Dhaka, and it reaches 38% when beneficiaries live 200km and further from Dhaka (Figure 5).

Figure 5

4.2 Leakage (corruption)

We examine the determinants of missing rice between beneficiaries and dealers and between the dealers and TCFs. While one would expect a positive association between the two, the correlation between them is close to zero, implying that leakage between dealers and TCFs is not the sole reason that beneficiaries get less rice

In Table 5 we report the OLS regression results where we first regress the amount of rice missing between beneficiary and dealer for each FFP beneficiary surveyed in the FFPS. We first start with the beneficiary characteristics, local government characteristics and poverty rates. We then include dealers' characteristics, including if they are politically affiliated with the current political party, remoteness, and district fixed effects. As obvious, most of the variations is coming from district heterogeneity

rather than from beneficiary or dealers' characteristics. Given these results, one cannot find any systematic pattern of factors that explain the missing rice between the FFP beneficiaries and the dealers.

Table 5 – Determinants of Leakage

VARIABLES	(1) Amount of rice missing at beneficiary	(2) Amount of rice missing at beneficiary	(3) Amount of rice missing at beneficiary	(4) Amount of rice missing at beneficiary	(5) Amount of rice missing at beneficiary	(6) Missing rice bet TCF and dealer per beneficiary (in KG)	(7) Missing rice bet TCF and dealer per beneficiary (in KG)
Household head is a widow, or divorced, or deserted	0.254 (0.308)	0.317 (0.307)	-0.112 (0.208)	-0.100 (0.202)	-0.100 (0.202)		
Household has a disable member	-0.643 (0.495)	-0.624 (0.505)	-0.102 (0.413)	-0.114 (0.406)	-0.097 (0.405)		
Household has a VGD recipient	0.954* (0.488)	0.915* (0.497)	0.266 (0.382)	0.241 (0.388)	0.280 (0.388)		
Primary occupation of the household head is day laborer	-0.280 (0.198)	-0.215 (0.192)	0.021 (0.135)	0.016 (0.133)	-0.006 (0.133)		
Total land owned by the household (in decms)	-0.003 (0.003)	-0.002 (0.003)	0.004** (0.002)	0.004** (0.002)	0.005*** (0.002)		
Amount of 'bribe' (in Tk.) paid to be included in the FFP-list	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)		
UP chairman is affiliated with the current government party	-0.501 (1.003)	-0.519 (1.022)	-0.098 (0.933)	-0.103 (0.959)	-0.093 (0.959)	0.107 (0.377)	0.150 (0.382)
Poverty head count ratio at district based on the upper poverty line	-0.012 (0.021)	-0.007 (0.021)	-0.094 (0.186)	-0.359 (0.447)	-0.294 (0.448)	0.726** (0.321)	0.740** (0.363)
Dealers' average years of schooling		0.075 (0.100)					-0.026 (0.141)
Dealer is politically affiliated to the current govt.		1.076 (1.048)					-0.148 (1.786)
Dealers' average distance from the TCF office		-0.054 (0.038)					-0.016 (0.052)
Distance of the household from Upazila center				-0.011 (0.053)	-0.008 (0.053)	0.031 (0.044)	0.037 (0.054)
Distance of the household from Dhaka				-0.012 (0.018)	-0.009 (0.018)	0.032** (0.013)	0.034** (0.015)
Missing rice bet TCF and dealer per beneficiary (in KG)					-0.089** (0.038)		
Observations	4,409	4,329	4,409	4,409	4,409	4,450	4,368
R-squared	0.006	0.017	0.324	0.325	0.332	0.610	0.610
District Fixed Effects are included?	No	No	Yes	Yes	Yes	Yes	Yes

Standard errors in parentheses are clustered at *union parishads*. *** p<0.01; ** p<0.05; * p<0.1.

We then examine the factors that account for the missing rice between dealers and TCFs (columns 6-7 in Table 5). Here, we find that factors that are strongly associated with missing rice are high poverty rate and remoteness; the poverty rate being the most prominent factor. Quantitatively, for a 1% increase in the HCR (based on the upper poverty line), the dealer receives about 1kg (1.06kg) rice less per beneficiary from TCFs¹². Similarly, for a one kilometre increase in the distance from Dhaka, the dealers receive 0.05kg less rice per beneficiary from the TCFs.

4.3 Beneficiary allocation to regions

¹² It is derived from the average rice missing between dealers and TCFs (1.432kg in Table 2) multiplied by the coefficient of the poverty head count ratio (0.74 in Table 5).

We finally examine if the regional variation in income and consumption seasonality are considered in the subsidy allocation mechanism. We do so by looking at if the FFP beneficiary as a proportion of rural population is linked to the HCR and remoteness (columns 1-2 in Table 6). In addition, we look at if there is a link between under-provision and remoteness (columns 3-4 in Table 6).

Table 6: Regional differences in poverty incidences and beneficiary number

VARIABLES	(1) FFP beneficiary as a % of total population	(2) FFP beneficiary as a % of total population	(3) FFP ben minus total poor (UPL) divided by total population	(4) FFP ben minus total poor (LPL) divided by total population
Poverty head count rate - UPL	4.345** (1.760)			
Poverty head count rate - LPL		5.670** (2.776)		
Remoteness: Bet 100KM to <200 KM	0.816 (0.576)	0.931 (0.576)	-9.890** (3.940)	-5.518** (2.570)
Remoteness: 200 KM and above	-0.261 (0.766)	-0.213 (0.837)	-20.256*** (6.580)	-15.569*** (5.202)
Observations	57	57	57	57
R-squared	0.186	0.168	0.217	0.227

Standard errors in parentheses are clustered at Districts. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

The regression results based on district level data show that the beneficiary allocation is very responsive to the poverty head count rate, and more so to the lower poverty line. This is in fact encouraging. However, the allocation is non-linearly associated with remoteness; it first increases with remoteness and then decreases after 200km.

Figure 6

In areas less than 100km away, the number of beneficiaries as a proportion of district population increases by 3.8% from the mean of 2.6%. It increases to 4.6% when the beneficiaries are living between 100 and 200km away, and it reduces to 3.5% when beneficiaries live 200km or further away (Figure 6).

Under provision/over-provision

In areas less than 100km away, the under provision is around 13%. It reaches to 22% when the beneficiaries are living between 100 to (less than) 200km away, and it reaches to about 33% when beneficiaries live 200km and further away (Figure 7).

Figure 7

4. Conclusions and policy implications

In this paper, we evaluated one of the largest transfer programs in Bangladesh, the Food Friendly Program, which offers subsidized rice to poor households living in rural areas during the pre-harvest seasons. In our evaluation of the program, we focused on three aspects of the FFP: first, if the included beneficiaries meet the eligibility criteria set in the program design (i.e. whether the included beneficiaries truly live below the poverty line) and more importantly, if households eligible to receive the transfer (those experiencing seasonal hunger) are not excluded from the program. The second aspect we focused on was if the amount intended to transfer to the beneficiaries was actually transferred in full. In other words, we were studying whether the overall corruption in the transfer process is at a minimum. The third aspect studied is if the regional variations in income and consumption seasonality are considered when allocating beneficiaries across districts.

One of the main challenges we faced in evaluating FFP is the absence of any baseline-survey on beneficiaries or dealers. The problem is compounded by the fact that the program was being simultaneously implemented in all rural areas across the country and there was no element of randomization. As a result, we relied on information collected in a new nationally representative survey on the existing beneficiaries, dealers, and other actors in the supply of the FFP. However, one of the crucial assumptions that we had to make in the survey is that the main observable characteristics, e.g., eligibility criteria that we have relied on in our evaluation have not changed due to the FFP. For example, a female beneficiary, who is currently divorced and hence eligible, did not get divorced in order to be included in the FFP. In addition, our attempts to complement the new survey data with

the pre-existing data from BIHS faced some snags that requires further investigation. This, however, goes beyond the scope of the current evaluation.

Our main findings can be categorized by the three aspects of the program that we focused on. First, in terms of beneficiary selection, we found that the overwhelming majority of the included beneficiaries meet the eligibility criteria set in the FFP guidelines. However, there are few cases of double-dipping where the beneficiary households receive transfers under the FFP as well as under a similar program (VGD). Importantly, in most cases (99%), beneficiaries did not need to pay for inclusion in the FFP, and in most cases they received the transfer without paying any bribe or not at a price higher than the one specified in the program. Note that the inclusion error based on the PMT remains about 15%, and similarly, the exclusion error based on district level data remains at about 22%.

We found that while the allocation of beneficiaries in the FFP in different regions is responsive to the regional variation in poverty rate (based on the HCR), it fell well short of achieving a regional equity in redistribution. Our findings show that districts that have a low incidence of poverty gets almost the right number of beneficiaries allocated to them. However, though districts that have a higher incidence of poverty receive a higher number of beneficiaries, the number remains much lower than the allocation required to cover all the poor households.

Turning to the corruption present in the transfer of rice, we found that the incidences of ghost beneficiaries are almost non-existent (0.3% only), and in the overwhelming number of cases (97%), the listed beneficiaries received some amount of rice. However, listed beneficiaries received the full transfer of rice in only about 86% of cases. The transferred rice is being lost between TCFs and dealers, and between dealers and beneficiaries.

How much of a taxpayer's taka spent on redistribution towards poorer households to support their seasonal consumption actually reaches the intended beneficiaries? Based on our findings, a back-of-the-envelope calculation suggests that for every taka sent by the Bangladesh government under the FFP, about 0.88 taka, on an average, reaches the eligible beneficiaries.¹³ The 0.12 Taka that does not reach the beneficiaries goes missing between beneficiaries and dealers, between dealers and TCFs or is transferred to ineligible beneficiaries. However, these averages perhaps disguise the heterogeneity especially in terms of beneficiary locations and regional incidence of poverty, not explored in depth in the current analysis.

We have also explored the determinants of the three aspects of FFP that we have examined here. Two factors that turn out to be significant in most cases are remoteness of beneficiaries and poverty rate – both of them are highly correlated with worse outcome in all aspects.

¹³ Net benefit received by a beneficiary is calculated by multiplying a) percent eligible beneficiary found in FFPS, b) percent received benefits, and c) the average amount of rice received in March-April 2018. The figure is then adjusted for extra price paid and bribe given to become FFP member (Table 2). Other administrative costs associated with transfers such as administrative costs, commissions to dealers are not included in the calculation.

What policy lessons can be learned from FFP? First, the local government led community-based targeting is unquestionably one of the most cost-efficient methods of targeting eligible households. Surprisingly, the method is well-suited to identify the eligible households with reasonable inclusion errors. However, the exclusion error, which remains high (especially in rural areas) requires immediate attention.

Leakage and corruption, though low, can and should be reduced. One relatively easy area to focus on is the loss in rice in the transfer between TCFs and dealers. Again, there is a spatial pattern to it. Instead of studying the entire country, it would be more effective to look at the remote districts and sub-districts, where leakage is much more prevalent.

Lastly, allocation of FFP beneficiaries could be done better by focusing more on the incidence of seasonal poverty, which is overwhelmingly concentrated in remote regions and districts. These areas are identifiable from the existing data (e.g., HIES 2016), and any future allocation should take this into account. However, additional allocation in poor remote areas should be accompanied with greater oversight as it was found that leakage tends to be higher in those areas as well.

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Appendix 1

Food Friendly Program Survey

Sample design

FFP Survey (FFPS): The reference population for the primary survey is all households in rural Bangladesh that live under the upper poverty line. In addition, all dealers and TCFs (Upazila Food Controllers) involved in the delivery of the FFP are also part of the population. Our primary sampling units (PSUs) are all the Union Parishads (UPs) in the rural area of Bangladesh where the FFP program is being delivered by the dealers to the beneficiary households. The population under poverty is defined in accordance with the BBS's HIES 2016 Preliminary Report, and the definition of a household is similar to that used by BBS in its HIES 2016 (and that used by IFPRI in its BIHS).

Sample size determination:

The administrative structure of Bangladesh consists of divisions, districts, upazilas, and union parishads (UP), in decreasing order of size. There are 7 divisions, 64 districts, 484 upazilas, and 4,498 unions (all rural).

We use the following formula and parameter values to determine the sample size, where the Margin of Errors (ME) that we have allowed is 5% or less.

$$ME = z \frac{\sqrt{p(1-p)}}{\sqrt{n}}$$

Where $Z=1.96$ for a 95% CI, p is the value of our outcome. In a similar program implemented in Indonesia, Olken (2006) finds that 18% of the program's rice went missing. Hence, we use the same value, 18% as a likely outcome in FFP. If we accept 5% margin of errors, our desired sample size – the number of UPs that we should survey - should be 227. Given that the focus of the transfer program is food insecurity due to seasonal poverty, the 227 PSUs were allocated to seven divisions with probability proportional to the size of the rural population under poverty (HCR, under the upper poverty line) measured using HIES 2016 (Table A1). The selected 227 UPs come from 175 upazilas distributed across 61 districts.

Table A1. Distribution of Food Friendly Program Survey (FFPS) Samples

Division	HCR 2016	Total rural population	Number of people in poverty	Proportion of total poverty affected population	# of Union Parishads (UP)	Rounded number of UPs
Barisal	38.248	6,640,000	2,539,667	0.0750	17.01	17
Chittagong	26.775	19,700,000	5,274,675	0.1557	35.34	35
Dhaka	35.372	29,500,000	10,434,740	0.3080	69.90	70
Khulna	32.941	12,600,000	4,150,566	0.1225	27.81	28
Rajshahi	26.543	14,900,000	3,954,907	0.1167	26.49	27
Rangpur	41.274	13,400,000	5,530,716	0.1632	37.05	37
Sylhet	25.211	7,930,000	1,999,232	0.0590	13.39	13
Total	32.425	105,000,000	33,884,504	1	227.00	227

Table A2 shows the representativeness of the FFPS unions. It compares the averages of 227 unions drawn in the sample with the averages of the rest of rural unions (3885) not drawn in the sample along several important dimensions: incidence of poverty, number of dealers that distribute rice, political affiliation of voters, population size, and remoteness. The selected unions are similar to the non-selected unions in all dimensions. In addition, the overall difference (F-test) between the two groups is statistically insignificant as well.

Table A2- A comparison among FFPS sample, BIHS and HIES households

Variable	N	(1) FFPS Sample Mean/SE	N	(2) BIHS Beneficiary Mean/SE	N	(3) HIES 2016 Sample Mean/SE	N	(4) Total Mean/SE	t-test Difference (1)-(2)	t-test Difference (1)-(3)	t-test Difference (2)-(3)
Household is a permanent resident or not	4528	0.994 [0.001]	405	1.000 [0.000]	7922	1.000 [0.000]	12855	0.998 [0.000]	-0.006	N/A	N/A
HH is functionally landless or not	4528	0.918 [0.004]	397	0.592 [0.025]	7918	0.813 [0.004]	12843	0.843 [0.003]	0.326***	0.105***	-0.221***
HH head is a day laborer	4505	0.467 [0.007]	404	0.228 [0.021]	7914	0.556 [0.006]	12823	0.515 [0.004]	0.239***	-0.090***	-0.329***
HH head is female	4528	0.121 [0.005]	404	0.158 [0.018]	7918	0.094 [0.003]	12850	0.106 [0.003]	-0.037**	0.027***	0.065***
HH head is widow or divorced or deserted	4505	0.180 [0.006]	405	0.183 [0.019]	7918	0.068 [0.003]	12828	0.111 [0.003]	-0.003	0.112***	0.115***
HH head is elderly	4528	0.095 [0.004]	404	0.109 [0.016]	7918	0.095 [0.003]	12850	0.095 [0.003]	-0.014	-0.000	0.014
Household has a disable member	4505	0.036 [0.003]	405	0.040 [0.010]	7918	0.202 [0.005]	12828	0.139 [0.003]	-0.004	-0.166***	-0.163***
vgd_recipient	4505	0.028 [0.002]	405	0.047 [0.011]	7918	0.012 [0.001]	12828	0.019 [0.001]	-0.019**	0.016***	0.035***
hh_size	4505	4.423 [0.025]	404	4.913 [0.084]	7918	4.513 [0.017]	12827	4.494 [0.014]	-0.490***	-0.089***	0.401***
hh_yrs_schooling	4505	8.087 [0.054]	404	7.671 [0.180]	7918	7.277 [0.042]	12827	7.574 [0.033]	0.416**	0.810***	0.394**
hh_head_occu	4505	1.848 [0.018]	404	2.168 [0.061]	7914	1.444 [0.006]	12823	1.609 [0.008]	-0.320***	0.405***	0.725***
hh_head_pr_occu	4528	0.601 [0.007]	405	0.474 [0.025]	7914	0.556 [0.006]	12847	0.569 [0.004]	0.127***	0.044***	-0.082***
dist_upazila	4528	7.640 [0.070]	405	8.651 [0.217]	6075	4.419 [0.112]	11008	5.899 [0.070]	-1.011***	3.221***	4.232***
dist_dhaka	4528	153.314 [1.129]	405	153.635 [3.522]	6758	178.207 [0.892]	11691	167.714 [0.696]	-0.320	-24.893***	-24.572***
population	4509	25742.489 [158.957]	394	25277.530 [421.450]	7918	26444.051 [123.612]	12821	26161.472 [95.552]	464.958	-701.563***	-1166.521**
hcrupl	4509	29.106 [0.258]	394	27.468 [0.763]	7918	38.480 [0.181]	12821	34.845 [0.151]	1.638*	-9.374***	-11.012***
F-test of joint significance (F-stat)									37.066***	416.082***	750.270***
F-test, number of observations									4872	10555	6455
The value displayed for t-tests are the differences in the means across the groups.											
The value displayed for F-tests are the F-statistics.											
***, **, and * indicate significance at the 1, 5, and 10 percent critical level.											

For the beneficiary selection, 25 beneficiaries from each UP were randomly selected from the list of beneficiaries found in the Directorate General of Food (DG Food) website (<http://www.dgfood.gov.bd>), and the first 20 of them were interviewed. When any of those 20 beneficiaries could not be found in the described location, s/he was replaced by the name of the beneficiary starting from the 21st sample. In few cases, we ran out of samples as the listed beneficiaries could not be traced. In the case of the union of Shubhadya in Keraniganj Upazila (Dhaka District), no randomly selected beneficiaries could be traced because of the frequent migratory tendency of the inhabitants of the area. Therefore, beneficiaries in only 226 unions were able to be successfully interviewed. There are several unions for which the list had not been updated on the website. In these cases, our data collectors collected the updated list from the upazila food controller office, and we had to re-generate the sample randomly.

In addition, all Chairman, and dealers in the selected Ups, and all TCFs of the respective Upazilas were also interviewed.

Table A3: Weights for each Covariate to Calculate Proxy Means Test Score

	PMT weight	
	Based on HIES (2016)	Sharif (2012): Based on HIES 2005
Sylhet	0	0
Dhaka	1	-10
Barisal	-12	-31
Chittagong	3	-12
Khulna	-29	-26
Rajshahi	-23	-26
Mymensingh	-13	x
Rangpur	-26	x
Household Size (2 members)	0	0
Household Size (3 members)	-12	-13
Household Size (4 members)	-18	-20
Household Size (5 members)	-24	-26
Household Size (6 members)	-29	-29
Household Size (7 members)	-32	-32
Household Size (8 members)	-31	-36
Number of Child (No child)	0	0
Number of Child (1 child)	-9	-7
Number of Child (2 child)	-16	-10
Number of Child (3 child)	-20	-11
Number of Child (4 child)	-24	-16

	PMT weight	
	Based on HIES (2016)	Sharif (2012): Based on HIES 2005
Spouse Education (5 years or Below)	0	0
Spouse Education (5 to 9 years)	4	3
Spouse Education (10 years and plus)	2	15
HH member work: agricultural laborer	-11	-9
HH member work: non-agricultural laborer	-8	-5
HH Head: No spouse; separated; widowed	-5	-18
HH head age: 40<yrs<60	3	5
HH head education: none	0	0
HH head Educ: below 5 years	-4	7
HH head Educ: 5 to 9 yrs	-3	12
HH head educ: > 10 yrs	-3	19
Own tube well	2	8
Own house	-6	4
Own fan	10	7
Own Television	16	12
Own cattle	-1	3
Own bicycle	7	3
Own land: none	0	0
Own land: 0< Acres < 1.5 acres	8	5
Own land: > 1.5 acres	20	23
No. of members per room	-6	-4
Roof: cement	0	0
Roof: Wood	-23	-36
Roof: Tin	-23	-28
Roof: Straw, Bamboo, Tile, Other	-24	-31
Wall: brick	0	0
Wall: mud	-13	-13
Wall: tin	-12	-10
Wall: straw, bamboo, other	-14	-16
No electricity	-3	-2
<i>No latrine</i>	0	0
<i>Kacha</i> temporary latrine	7	6
<i>Kacha</i> permanent latrine	15	6
Sanitary latrine	25	11
Household receives foreign remittances	16	13
Constant	856	757

Note: “X” indicates that the variable is absent in the model. The weights are obtained from a simple ordinary least squares (OLS) regression of Log (Per Capita Expenditure) on all the covariates listed in the left most column in the table. The weight for each covariate is obtained by multiplying its regression coefficient by 100 and rounded to the nearest integer.

3. BIHS sub-sample

BIHS (2015), a nationally representative data of rural Bangladesh (both nationally and divisionally), was a product of the International Food Policy Research Institute (IFPRI) and the US Agency for International Development (USAID). For detailed information on this survey and data collection, see Ahmed et al. 2013. We used a sub-sample of the available sample of BIHS data and collected additional data on this sample as well.

For the survey conducted among the BIHS sub-sample, 134 unions were selected from Bangladesh Integrated Household Survey (BIHS) sample unions located within the same 175 upazilas. Among them, 116 unions were distinct whereas there were 18 unions that matched with the sample unions mentioned in (2). All the households of sub-sample of BIHS (2015) were interviewed.

Food Friendly Program Survey : Sample Unions

Survey Period: October-December (2018)

Figure A1. Map of Bangladesh Showing the 175 Survey Upazilas of Food Friendly Program Survey

Figure A2: Survey Design

Survey Instruments

Survey instruments that we developed for the study are:

- FFPS household questionnaire – this collects information on transfers received, beneficiary's assets, education, profession etc. (to verify eligibility)
- Household/beneficiary questionnaire specific to BIHS households – similar to (a), this also collected information on transfers received. However, no information on assets, education etc., was collected.
- Dealer, UP chairman and UPZ chairman questionnaire – this collected information on amount of rice received, amount disbursed, dealer's qualifications (to verify eligibility), and political affiliation.

Variable construction

Variable Name	Variable Source	Variable Construction
HH is eligible (widowed/ divorced/deserted/financially distressed / old female)	FFP survey data and BIHS sub-sample survey data	If the HH has widowed/ divorced/deserted/financially distressed / old female HH head, the value is 1, and 0 otherwise.
Household has a VGD recipient	FFP survey, BIHS sub-sample survey and HIES 2016 data	If the HH has VGD recipient, the value is 1, and 0 otherwise.
Inclusion error based on PMT scores	FFP survey and HIES 2016 data	Calculated inclusion error using the PMT score of each household
Exclusion error using the upper poverty line	FFP survey	Calculated exclusion error using the PMT score of households living under upper poverty line in HIES 2016 at district level
Exclusion error using the lower poverty line	FFP survey	Calculated exclusion error using the PMT score of households living under lower poverty line in HIES 2016 at district level
Primary occupation of the household head is a day laborer	FFP survey, BIHS sub-sample survey and HIES 2016 data	If primary occupation of the household head, the value is 1, and 0 otherwise.
Listed beneficiary exists (1) or not (0)	FFP survey	If the listed beneficiary can be traced, the value is 1, and 0 otherwise.
Listed beneficiary possesses card (1) or not (0)	FFP survey	If the listed beneficiary has card, the value is 1, and 0 otherwise.
The listed beneficiary received rice in March-April 2018	FFP survey	If the listed beneficiary received rice in March-April, 2018, the value is 1, and 0 otherwise.
Amount of rice (in KG) the household received in March - April 2018	FFP survey	Summation of total amount of rice received in each month of March and April, 2018 by each beneficiary
Price (in Tk) per kg of rice paid by the beneficiary	FFP survey	Summation of total amount of price paid in each month of March and April, 2018 by each beneficiary

Variable Name	Variable Source	Variable Construction
Average price per KG in Tk. paid by dealers to TCF	FFP survey	Calculated value from total amount of rice and total amount of price paid.
The difference between amount of rice received by beneficiary and dealer	FFP survey	Calculated value from total amount of rice received by dealer and beneficiary in each union.
Missing rice bet TCF and dealer per beneficiary (in KG)	FFP survey	Calculated value from total amount of rice received by dealer and TCF in each union.
Average distance of beneficiaries to sub-district HQ in KM	FFP survey	Calculated using GPS data
Average distance of beneficiaries from Dhaka in KM	FFP survey	Calculated using GPS data
% of poor - upper poverty line	HIES 2016	Directly imported data from HIES 2016
% of poor - lower poverty line	HIES 2016	Directly imported data from HIES 2016
FFP ben minus total poor (UPL) divided by total population	FFP survey and HIES 2016 data	Calculated value from the number of beneficiaries and total poor (UPL) in rural area
FFP ben minus total poor (LPL) divided by total population	FFP survey and HIES 2016 data	Calculated value from the number of beneficiaries and total poor (LPL) in rural area
Total land owned by the household (in decims)	FFP survey	Calculated the total amount of agricultural land owned, non-agricultural land owned and homestead land owned.
Amount of 'bribe' (in Tk.) paid to be included in the FFP-list	FFP survey	Directly imported value from the response to the respective question in the survey.
UP chairman is affiliated with the current government party	FFP survey	Directly imported value from the response to the respective question in the survey.
Poverty head count ratio at district based on the upper poverty line	HIES 2016	Collected from HIES 2016 preliminary report
Average distance of households from Dhaka in KM x 1000	FFP survey	Calculated using GPS data
The total rural population in the district (in 000) x 1000	2011 Census	Calculation adjusted with the growth rate for the year 2018
The total number of FFP beneficiary in the district (in 000) x 1000	DG Food Document	Directly imported value from the DG food document.
Dealers' Average Years of Schooling	FFP survey	Calculated value from the response to the respective question in the survey.
Dealer is politically affiliated with the current government	FFP survey	Directly imported value from the response to the respective question in the survey.
Dealers' average distance to TCF office	FFP survey	Calculated using GPS data

Variable Name	Variable Source	Variable Construction
Distance of the household from the upazila center	FFP survey	Calculated using GPS data
Distance of the household from Dhaka	FFP survey	Calculated using GPS data
Missing rice between TCF and & dealer per beneficiary (in KG)	FFP survey	Calculated value from the total amount of rice the TCF distributed and the dealer received
Poverty head count rate - UPL	HIES 2016 data	Directly imported from HIES 2016 data
Poverty head count rate - LPL	HIES 2016 data	Directly imported from HIES 2016 data
Remoteness: Bet 100KM to <200 KM	FFP survey	Calculated using GPS data
Remoteness: 200 KM and above	FFP survey	Calculated using GPS data
Household is a permanent resident or not	FFP survey	If household is living more than 1 year in the household, the household is a permanent resident.
HH is functionally landless or not	FFP survey and HIES 2016 data	Generated a dummy using the response to the question variable. If yes, the value is 1. If no, the value is 0. Calculated the total land of the household and checked whether the total land is less than 50 decimal.* <i>*According to the definition, the minimum amount of land required not to be a functionally landless household is 0.2ha (50 decimal approx).</i>
HH head is female	FFP survey and HIES 2016 data	Generated a dummy using the response to the respective question in the survey. If HH Head is female, the value is 1 and 0 otherwise.
HH Head is widow or deserted or divorced	FFP survey and HIES 2016 data	Generated a dummy using the response to the respective question in the survey. If HH Head is widow or deserted or divorced, the value is 1 and 0 otherwise.
HH head is elderly	FFP survey and HIES 2016 data	Generated a dummy using the response to the respective question in the survey. If HH Head is elderly, the value is 1 and 0 otherwise.
Household has a disable member	FFP survey and HIES 2016 data	Generated a dummy using the response to the respective question in the survey. If HH has a disable member, the value is 1 and 0 otherwise.
Household size	FFP survey and HIES 2016 data	Stands for the number of HH members. Directly imported values from the survey data.

Variable Name	Variable Source	Variable Construction
hh_years_schooling	FFP survey and HIES 2016 data	Highest years of schooling in the HH by any member of the HH
hh_head_occu	FFP survey and HIES 2016 data	Stands for occupation type of the of HH Head. Categorical variable.
population	2011 census	Total population of the union parishad
hcrupl	HIES 2016 preliminary report	Poverty Head Count Ratio using upper poverty line at district level.

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