In the form of bread? A randomized comparison of cash and food transfers in Yemen

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Abstract: Debate over the implementation of food assistance programs and the role of in-kind food aid has intensified in recent years. Within that context, we study a randomized control trial of 136 rural communities in Yemen. Poor households in half of the communities received assistance in the form of in-kind food (wheat flour and oil), and households in the other half received an equal valued cash transfer. On average, households that received cash exhibited greater dietary diversity, with differences driven largely by increases in consumption of protein-rich foods like meat and fish. However, food households consumed, on average, approximately 100 more calories per person per day than cash recipients, due largely to higher wheat flour and oil consumption. Modality type did not significantly affect non-food consumption, including usage of qat, a mild narcotic leaf consumed widely in Yemen. Cash cost nearly a third less to transfer then food.

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1. Introduction

Developing country governments and donors are increasingly interested in moving away from commodity-based assistance, such as food aid, and replacing it with alternative transfer modalities such as cash and vouchers. In theory, cash is preferable to in-kind transfers on the basis on welfare grounds: cash provides recipients with the freedom of choice to make optimal expenditure decisions. It does not distort individual consumption or production choices at the margin, and providing cash generally has lower administrative costs. Nevertheless, in-kind assistance programs have traditionally been the preferred delivery of economic assistance to the poor, particularly in developing countries.

Despite substantial research into the impact of food assistance (e.g., Barrett and Maxwell 2005) and the impact of conditional cash transfers (CCTs) in many contexts (see Fiszbein et al. 2009 for review), there is almost no evidence from a rigorous evaluation directly comparing the impact and cost-effectiveness of cash transfers and food transfers in the same setting (Ahmed et al. 2009; Gentilini 2007; Webb and Kumar 1995). Indeed, the effectiveness of in kind transfers relative to cash is likely to depend on several factors: whether the in-kind transfer is infra or extramarginal (i.e. less/more than what the household would have consumed in the transfer's absence; whether the in-kind good is normal or inferior; the pervasiveness of liquidity constraints; and the intrahousehold bargaining dynamics associated with the receipt of either modality.

In order to provide rigorous evidence on the relative impact and cost effectiveness of cash and food transfers, we analyze the results of a cluster-randomized control trial of a seasonal safety net program implemented by the World Food Program in rural Yemen.[1] In the intervention under study, 136 village clusters (known as Food Distribution Points) were randomly assigned to receive either food or cash assistance. Over the course of seven months, households in food FDPs received 3 food transfers, each consisting of 50 kg of wheat and 5 liters of oil. Over the same time period, households in cash FDPs received 3 cash transfers of an amount equivalent to the local value of the food basket (~$50). In both treatment arms, only need-eligible households, as determined by a proxy means test, received benefits. Baseline and endline surveys of both beneficiaries and those with proxy mean scores just above the qualifying threshold were conducted in all clusters.

[1] The study in Yemen was part of a four country study conducted by IFPRI in cooperation with the WFP. Other country sites were Ecuador, Uganda and Niger.

Cash beneficiaries experienced significantly greater dietary diversity, as measured by three basic indicators: Household Dietary Diversity Score (HDDS), Dietary Diversity Index (DDI), and Food Consumption Score (FCS). Amongst the three, the cash advantage was largest for FCS, where the impact of cash transfers was 9 percent higher than on food transfers. Children in cash beneficiary households also consumed a wider variety of foods and were 16 percent more likely to obtain a minimally diverse diet.

Food beneficiaries consumed approximately 100 more calories per person per day than food beneficiaries, though the total value of the consumed food was similar across both groups. The higher caloric consumption for food households stemmed entirely from the consumption of food basket items: wheat and oil. Cash households, however, consumed significantly higher caloric levels of animal products (27 percent) and pulses and tubers (40 percent). Expenditure patterns matched these consumption differences, as cash households not only spent significantly larger sums on food basket items, but also on non-basket items such as rice (42 percent) and meat (73 percent). However, households receiving both cash and food report similar rates of both difficulty meeting food needs, and reduction in meal frequency or volume.

No significant differences in patterns of non-food consumption or expenditure emerge by modality. In particular, the preferred estimates did not detect higher qat expenditure or usage among cash households.

Cash benefits proved nearly five times less expensive to deliver than food baskets. Exclusive of the transfer value and beneficiary verification, each cash transfer cost WFP $4.09 and each food transfer $10.37. Including the additional transportation costs incurred by cash beneficiaries, who were required to travel significantly farther than food recipients, raises the per transfer cost of cash to $7.24. The total cost to WFP, including the value of the transfers, to raise FCS by 15 percent using cash amount amounted to $374.77.

Overall, cash transfers raised dietary diversity and quality more highly than food, and were cheaper to deliver and administer. Food beneficiaries, however, consumed more calories overall. Consequently, food transfers appeared to be extra-marginal in terms of dietary composition, but infra-marginal in terms of overall food consumption. That is, under the alternative of an equal-valued budget increase, food beneficiaries consume more oil and wheat than they would optimally, and would spend the excess money on higher quality food items (like meat and pulses) instead of non-food items (like qat)

2. The Intervention (Cash and Food Transfers)

Yemen consistently ranks near the bottom across a range of development indicators, including those linked to nutrition, food security, gender, and human development. More recently, the emerging conflict and civil unrest has thought to exacerbate the so called triple "F" (food, fuel, and financial) crisis, further impoverishing the Yemeni population (Breisinger et al. 2010).

In response, WFP proposed a seasonal ESN consisting of bi-monthly cash and food transfers to assist 1.8 million "severely-food-insecure" persons across 14 governorates[2] in the six-month lean season from May to October. The ESN is one component of a comprehensive two-year Protracted Relief and Recovery Operation (PRRO).[3] Household-level transfers are distributed in coordination with local partners: the Yemen Post and Postal Savings Corporation (PPSC) in the case of cash transfers and the Ministry of Education (MoE) in the case of food transfers. Transfers are given out at district branches of the PPSC in each governorate (see Annex 1, PPSC branches in Hajjah and Ibb).

The food transfers are stored in warehouses outside of Sana'a and distributed through local government-run primary schools with the assistance of a food distribution committee (FDC) (see Annex 2, FDPs in Hajjah and Ibb). The FDC is comprised of approximately three individuals per FDP including a school teacher from each primary school, a local council administrator, and a guard. Each individual beneficiary holds a WFP ration card containing a unique ID number, photograph, and other identifying information, and presents the card at the time of transfer pickup. Because beneficiaries may not always be able to travel due to physical disability or other reasons, other family members can collect transfers on behalf of the beneficiary if they have the ration card, national ID of the beneficiary, and self-identification. Initial meetings with beneficiaries were held in June 2011 before the first transfer of the 2011 cycle was distributed to sensitize beneficiaries to the program objectives and

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[2] The targeted governorates are Al-Baidha, Al-Dhalee, Al-Hudaida, Al-Mahwait, Amran, Dhamar, Hajja, Ibb, Lahj, Mareb, Raymah, Sana'a (rural), Shabwa, and Taiz.

[3] In addition, the new PRRO's nutrition component aims to prevent and address acute malnutrition through (1) blanket supplementary feeding for children 6 to 23 months; (2) targeted supplementary feeding for children 6 to 59 months; and (3) Targeted supplementary feeding for pregnant and lactating women.

logistics.[4] A follow-up meeting for cash beneficiaries was held in November 2011 during the first disbursement of cash transfers.

The value of the bi-monthly transfer is standardized across treatment arms. The food ration is equivalent to the estimated median residual caloric gap between the recommended individual caloric intake and the typical intake of food-insecure households (initially calculated at approximately 25 percent of the required calorific needs, or 500 kcal per person per day). The bi-monthly food ration to cover this gap for an average household size of seven persons is 50 kg of wheat flour and 5.0 liters of vegetable oil. The total value of the cash transfer is approximately $49 (10,500 Yemeni riyals [YER]) per transfer per household, a figure based on the average equivalent price of the food ration on local markets. Cash transfer households can collect cash at any time up to 25 days after disbursement.

[4] In the case of cash transfer FDPs, a second resensitization campaign was held between November 22 and 25 after funds were transferred to PPSC to reinforce messages from the first campaign.

3. Experimental Design and Estimation Strategy

3.1 Experimental Design to Study the Impact of Transfers

The strategy for estimating the impacts of the cash and food assistance is built into the design of the study. We use an experimental design to randomly assign each of the 136 FDPs or "clusters" to one of two treatment arms: the cash transfer group and the food assistance group. Because the total number of clusters is relatively large, random assignment of clusters assures that, on average, households should have similar baseline characteristics across treatment arms.

The gold standard for randomized control trials (RCTs) is to have a third arm of randomization that includes a pure control group that receives no transfers. Upon discussions with the WFP Yemen country office, however, it became apparent that a pure control group was not feasible in the context of the ESN due to ethical and security concerns. As a result, the analysis focuses on the relative effectiveness of food and cash transfers.[5]

Changes in timing of the transfers complicate our ability to directly compare the impacts of food and cash. Most notably, changes in timing of the survey and distribution schedule resulted in the loss of a pure pre-intervention survey, as the baseline survey occurred after the first food transfer (but before the first cash transfer). Ideally, the disbursement schedules should be identical so that differences in impact can be attributed to difference between the modalities rather than differences in seasonal or other environmental factors influencing budgeting and resource flows within the household, or discrepancies in the period between transfer receipt and survey measurement.

The first distribution cycle for cash began on November 22 (duration of 25 days), while the second started on January 5, and the third began on February 22, all with identical duration periods (WFP-CO 2012). In contrast, the first food disbursement began August 3, prior to the baseline survey, and the second transfer began in late October. The final food transfer, however, did not occur until April. Differential timing of modality receipt represents a significant challenge in comparability.

Despite these temporal incongruities, the aggregate value of transfers preceding the endline survey remains comparable across modalities. In addition, randomization assures that mean differences in endline outcomes between cash and food beneficiaries should provide well-identified impact measures without the need to control for baseline covariates potentially affected by early food transfers.

[5] A comparison group consisting of households categorized by a proxy means test as having economic means just above the cut-off for qualification to receive ESN transfers was also identified and surveyed.

3.2 Estimation Strategy

Estimation of the relative impacts of cash and food transfers relies on the randomized assignment of FDPs to either modality. With a sufficient number of clusters, random assignment eliminates systematic differences between food and cash beneficiaries and permits unbiased causal inference based on post-intervention outcomes. By obviating the worry that households either select into or are selected into either treatment based on their characteristics, impact estimates are unlikely to be biased by innate differences between each group. Consequently, the preferred empirical specification throughout the paper relies on average differences between each treatment group in the endline survey:

$$Y_{i,c,s=\text{elg}} = \alpha + \beta^{post} F_{c,s=\text{elg}} + \delta X_{i,c,s=\text{elg}} + \varepsilon_{i,c,s=\text{elg}} \qquad (1)$$

where $Y_{i,c,s=\text{elg}}$ is the outcome of interest for treatment-eligible (status *s*= *elg*) household *i* in FDP c in the post-intervention survey, $F_{c,s=\text{elg}}$ is a dummy variable equal to 1 if the treatment eligible household is located in an FDP assigned to receive food, and $X_{i,c,s=\text{elg}}$ is a vector of control variables for treatment eligible households. The parameter β^{post} gives the change in outcome *Y* due to assignment to the food group relative to assignment to the cash group (i.e., the cash group is the omitted group). Note that the main empirical specification given by equation (1) uses only post-intervention outcomes, and is estimated solely among the sample of households eligible to receive the treatment. Ignoring the covariates for simplicity, β^{post} represents a simple difference in post treatment means:

$$\hat{\beta}^{post} = (\bar{Y}^{post}_{Food} - \bar{Y}^{post}_{Cash}). \qquad (2)$$

To illustrate, $\hat{\beta}^{post} < 0$, for cash households experienced a larger increase in outcome *Y* than $\hat{\beta}^{post} > 0$ food households. If , food households experienced a larger increase in outcome *Y* than cash households.

In all specifications, we calculate intent-to-treat (ITT) estimates. That is, we consider all treatment eligible beneficiaries as treated, without regard to reports of actual receipt of the transfer. We do so for several reasons. First, only 7 percent of potential beneficiaries report not receiving a transfer. Second, those reporting not receiving a transfer may be strategically underreporting. We find that administrative records contradict nearly half of those cash beneficiaries not reporting transfer receipt. Third, after correcting for contradictory reports, we find reports of nonreceipt to be symmetric by

modality. As a consequence, we prefer ITT estimates to dropping part of the sample.

Due to a last minute delay by WFP in their implementation of the food distribution, food beneficiaries received their final transfer much closer to the endline survey date than cash recipients. The median food and cash households obtained their transfers 15 and 49 days, respectively, prior to the survey. This nearly month long gap complicates the impact estimates presented here.

The potential distortionary impact of the difference in transfer timing depends on the outcome under consideration and the extent to which households are able to smooth consumption. For example, assuming no credit and storage constraints, the timing of transfer receipt should have no or very little impact on comparative outcomes related to consumption and expenditure.[6] However, if, for instance, food depreciates at a higher rate than cash due to spoilage,[7] the timing discrepancy will be evident in a higher marginal propensity to consume from the basket among food households. Without solid evidence on the empirical validity of these various assumptions, it is difficult to model and predict the size and direction of bias introduced by timing differences.

The analysis presented in this report takes a minimalist approach with respect to adjusting for differences in timing of transfer receipt. Due to the quite limited degree of overlap between the empirical distributions of survey-transfer duration by modality, controlling for the time gap explicitly introduces multicollinearity problems that complicate the identification of treatment effects. However, for outcomes that rely on a recall period including the week before the survey (e.g., days in the last 7 the household consumed meat), the analysis excludes those households that received their transfer in the eight day period before the survey.[8] As these excluded households are exclusively food recipients, analysis is conducted to demonstrate that the selected sample is still "balanced" with respect to the cash comparison group (i.e., that the minority of households who received the transfer close to their survey date are not observably different than the rest of the food beneficiary sample). Throughout the analysis, the implications of the transfer timing differences on the interpretation of the results are discussed when relevant.

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[6] Note that if households smooth consumption by selling assets, measures of wealth may still be affected.

[7] It is not obvious, *a priori*, that the 'burn rate' of food must be higher than cash. For example, the monitoring cost of cash in an intrahousehold bargaining process may differ from food, thus introducing a timing imperative in the spending of cash.

[8] The choice of a period of eight, and not seven, days was given due to time lags from transportation and ingredient preparation.

4. Sample Design and Data

4.1 Site Selection and Sampling

Overall, 14 governorates were chosen to implement the ESN based on the classifications of at least 10 percent of the population as severely food-insecure, with the end objective of reaching at least 75 percent of this population at the governorate level (WFP-CO Yemen 2011a). The governorates of Hajjah and Ibb were chosen to be the sites of the cash and voucher pilot based on several criteria. These governorates are second- and third-ranked among the 14 governorates implementing the ESN in terms of absolute numbers of food-insecure persons. In addition, Hajjah and Ibb have high percentages of the food-insecure (46.3 percent and 44.0 percent, respectively, according to the 2009 CFSS), as well as relative stability and implementation feasibility (WFP-CO Yemen 2011a).

The 136 FDPs within the sample area were randomized into equal numbers of cash or food transfers. Taking into consideration the context of the project area, we stratified the randomization of clusters at the governorate-level due to the distinct socioeconomic and geographic characteristics of Hajjah and Ibb

4.2 Sample Size

Based on the distribution of clusters in the treatment arms and the required sample sizes, 15 treatment households and 11 non-beneficiary households were randomly selected to be interviewed in each FDP. In total, 3,536 households were included in the baseline sample. Approximate sample size calculations were conducted across countries at the inception of the study and are found in Ahmed et al. (2010).

This analysis conducted throughout this report is restricted to 3,353 treatment and comparison households for whom consistent data from both the baseline and endline surveys exists. Of the 183 households in the original sampling frame not included in this analysis, only 26 are omitted due to pure attrition. These 26 households had moved away from their location during the baseline survey, and were unable to be interviewed for the endline survey. The majority of these households originally resided in the Al-Wahdah FDP in Hajjah, and were forced to move due to ongoing tribal violence. Another 54 households were not included because multiple beneficiaries lived in the same household. The remaining households not considered here had extensive incomplete, missing or unreliable data for key sections.

4.3 Household Characteristics

In this section, we provide analysis on household characteristics at the time of the baseline survey for the 1,983 households in the baseline sample that received transfers (see Table 1). While the original sampling frame evenly divided observations between Hajjah and Ibb, the sample used for analysis is slightly weighted in favor of Ibb. The discrepancy stems primarily from the high level of attrition in one cash-assigned FDP, Al-Wahdah, which was affected by armed conflict (see above).

Table 2 reports summary statistics of several key demographic and socioeconomic indicators across treatment arms. Comparing the food and cash treatment arms, the randomization appeared to function reasonably well. In terms of household demographics, food households appear relatively more likely to be headed by a females and singles, although the education levels of the household head do not significantly differ. In terms of assets, cash households do appear to be slightly more likely to have more phones and own their plot of land, and they have a wealth index level .09 standard deviations higher than food households.[9] These differences are relatively small in magnitude, but significant at the 10 percent level, implying that controlling for baseline socioeconomic status in the main analysis will improve the accuracy of estimated treatment effects.

Much of the analysis here makes use of a subset of the sample analyzed in Tables 1 and 2. The subset consists of households who received their transfer more than 8 days prior to the endline survey. As nearly all cash households received their transfer prior to the eight day cut-off, the subset is primarily a subsample of the surveyed food beneficiaries. The survey-transfer timing was driven largely by coincidental logistical concerns of both the World Food Program food transfer team, and the YPC survey fieldwork, and there is little a priori reason that the food beneficiary subsample is 'selected for' in a statistically meaningful sense. Nevertheless, there is no guarantee that this is a random subsample of the randomly selected food beneficiaries, and consequently Table 3 illustrates the socioeconomic characteristics of the subsample in relation to both the cash and "unselected" food sample.

[9] The standardized wealth index is constructed using principal components analysis of 11 asset ownership indicators and 4 household structure characteristics. The methodology used to construct the index is similar to that used to construct wealth indices in the Demographic and Health Survey (DHS). The constructed index is then normalized across the baseline sample.

Comparing those included and those excluded within the food treatment group (Table 3), it becomes clear that while the excluded group is slightly more likely to come from Hajjah, differences in other indicators are generally not significant economically and statistically. The lone exception is that the excluded group has higher motor vehicle ownership rates (5% versus 1%), and slightly higher wealth index levels (not statistically significant). As a whole, the summary statistics do not suggest that selecting the subsample of food households who received the transfers more than 8 days from survey time introduces discernible bias into the analysis.

4.4 Food Consumption Data and Descriptive Statistics

The following analysis relies on the construction of several different food consumption aggregates. These aggregates are primarily based on detailed questions concerning the food purchased and consumed by the household over the previous seven days.

Three separate indices of household food consumption aggregate data on household food frequency: the Dietary Diversity Index, Household Dietary Diversity Score (HDDS), and the Food Consumption Score (FCS). The most straightforward of these measures, the Dietary Diversity Index (DDI), sums the number of distinct food categories consumed by the household in the previous seven days. The household questionnaire covers 39 such food categories (see Annex 3 for a list), and thus the DDI in this survey can feasibly range from 0 (no consumption at all) to 39. Hoddinott and Yohannes (2002) show that the DDI correlates well with both household dietary quantity and quality, and thus provides a useful summary point of comparison within the measured sample. The HDDS captures a similar element of food access, although it differs from DDI in that frequency is measured across standardized food groups, instead of individual food items. The score is calculated by summing the number of food groups consumed in the previous seven days from the following 12 groups assembled by the Food and Agriculture Organization (Kennedy, Ballard, and Dop 2011): cereals, roots/tubers, vegetables, fruits, meat/poultry/offal, eggs, fish/seafood, pulses/legumes/nuts, milk/milk products, oils/fats, sugar/honey, miscellaneous.

The FCS also aggregates seven-day consumption across standardized food categories. However, the FCS weights food group consumption by both days of intake and a predetermined set of weights designed to reflect the heterogeneous dietary quality of each food group (Weismann et al. 2008). The FCS is calculated by summing the number of days eight different food groups (staples/pulses, vegetables, fruit, meat/fish, milk/dairies, sugar/honey, oils/fats) were consumed by a household during the seven days before the survey,

multiplying those frequencies by the appropriate weights, and summing across categories to obtain a single proxy indicator. While Weismann et al. (2008) do not find justification for the truncation to eight categories and weighting scheme of the FCS, the score remains in use by the WFP in its food security assessments of Yemen, and is thus reproduced here for comparability. Following the WFP (2008), we use the food groups and weights listed in Table 4 to calculate the FCS.

In addition to measures of dietary diversity, the analysis considers three basic measures of per capita food intake in the household: calories of food consumed, value of food consumed, and value of food available.

Caloric intake is constructed from the amount of food consumed by households (from purchases, own stock, or in kind gifts/payments). In order to convert quantities of various food items into kilocalories, the food amounts are multiplied by their per unit energy values. Several challenges complicate this process. No complete food composition tables exist in Yemen, so we have no standardized source for determining Yemen-specific energy conversion units. Instead, this analysis relies on energy values stemming primarily from the Food Composition Table for Egypt in the World Food Dietary Assessment System of the Food and Agricultural Organization (FAO) (WFOOD 1996), and secondarily from the USDA Nutrient Database (USDA 2010). The strategy here mirrors that in Ecker et al. (2010).

Several caveats apply to the caloric data presented here. The primary purpose of constructing the caloric indicators is within sample consistency, so that the analysis of the effect of transfers on caloric consumption can be accurately assessed for both treatment groups. Therefore, in order to avoid introducing modality specify bias into the construction of the aggregates, refuse factors and aggressive imputation of missing or outlier values were not integrated. While the estimates of caloric consumption differentials by treatment groups are highly reliable, the overall mean caloric consumption figures may be slightly overstated.

Value of food consumed and available is likewise determined from seven day recall of food quantities purchased, consumed, and received. While consumption statistics refer only to food that household members reporting actually consuming, any food stocks purchased or received by the household in the previous seven days but not consumed factor into the available food category.[10] Consumption and availability of food quantities are converted into values using the imputed unit prices for each food derived from the food expenditure module.

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[10] Note that stored food received or bought more than seven days prior to the survey will not be counted.

In the transfer effects analysis, all the consumption data are converted into logarithmic form due to right skewing of the data. Further, the top and bottom 2 percent of the distribution of each aggregate are trimmed in order to diminish the influence of outliers.

Finally, several measures of self-reported household food insecurity are reported. These include months in the previous six that households had difficulty satisfying their food needs, and days in the past week that households were required to reduce the amount of food consumed at or frequency of meals consumed. These indicators are reported as a subjective supplement to objective measures of food insecurity.

Tables 5 and 6 present several dietary diversity, food consumption, and food insecurity aggregates from the baseline and follow-up surveys, respectively. At baseline, households eligible for treatment consumed approximately 7 out of 12 basic food groups (HDDS), 2,562 kilocalories per person per day,[11] 2,215 of which were derived from consumption of cereals 92 from animal products, ate meat less than one day per week, chewed qat nearly 3 days per week, and considered themselves food-insecure for less than three of the previous six months. Note that at baseline, the comparison group had higher objective measures of food security (FCS, caloric consumption) and dietary quality, but very similar measures of self-reported food insecurity (Table 5). At the endline, however, treatment eligible households narrowed the gap or overtook comparison households in mean levels of dietary diversity and caloric consumption (Table 6).

5. Experience with Transfers

Beneficiaries were also asked to break down into categories how their transfers were used. While section 6 offers more detailed analysis of the impact of transfers on consumption and expenditure, Table 4 displays the self-reported breakdown of transfer expenditure for each type. Note that food households rarely report selling the transfer. On average, less than one percent of the transfer is sold. The vast majority of the food transfer (69%) is reported to be consumed immediately, with another 28 percent saved for consumption beyond two weeks.

Cash households report spending 88 percent of their 10,500 YER transfer on staple foods. Unlike food households, cash households report spending a nontrivial portion of their transfers towards repaying debts (5 percent) and transportation (2 percent), but almost nothing on qat (14 YER).

[11] As noted above, the caloric consumption figures are likely an overestimate.

Beneficiaries were also asked the proportion of cash and food that they would prefer to comprise their transfer. Figures 1a, 1b, and 1c graph the responses according to survey round and modality assignment.[12] In the first survey round, over half of food beneficiaries preferred receiving a transfer of all food, and less than 25 percent wanted a transfer composed entirely of cash (Figure 1a).

The results from the endline survey reveal much stronger preferences for cash (Figures 1b and 1c). Half of food beneficiaries in the last survey round now preferred to have an all cash transfer, while only a third preferred an exclusive food transfer. Among the cash group over three quarters expressed a preference for an all cash transfer, and only 10 percent preferred food only.

6. Impact of Transfers on Dietary Diversity, Food Consumption and Food Security

6.1 Relative Impacts of Treatment on Dietary Diversity, by Transfer Modality

Analysis of the relative of effects of food and cash transfers begins with dietary diversity outcomes. Equation (1), the main specification relying on only the difference in endline survey outcomes between the treatment groups, is estimated with and without covariates (Table 7). The first row estimate represents the difference in outcomes between the food and cash groups (i.e., equation [2]). Note that all the estimated coefficients are less than zero, which indicates that the impact of the cash treatment is larger than that of food for each outcome. In addition, for each outcome, the magnitude of the difference is larger and more precisely estimated when controlling for covariates.

For the household dietary diversity score (HDDS), the single difference estimate with covariates implies that households in the food group consumed .41 less food groups out of a possible 12. Relative to the baseline mean, that represents a 5.7 percent larger effect for cash, significant at the 1 percent level.

The results for the dietary diversity index (DDI) estimations are similar to HDDS, although slightly less precisely estimated. Cash households consumed .63 more food items out of a possible 39, which represents a 5.8 percent advantage over food households. That estimate is significant at the 5 percent level.

The largest difference between the cash and food treatments arises for the food consumption score (FCS) outcome, which weights dietary diversity by food quality. For the FCS, the impact of cash transfers is 4.52 units, or 9.2

[12] Only beneficiaries who actually received a transfer were asked this question. As a result, no data exits for cash beneficiaries during the first found.

percent higher than food transfers. The estimated difference is significant at the 1 percent level.

The World Food Program considers a Food Consumption Score below 28.5 as poor to borderline food consumption. As implied from the estimates on FCS in table 7, households receiving food transfers were more likely to be considered as having poor food consumption than those receiving cash transfers (Table 8). The magnitude of the effect depends on the specification. The linear probability (OLS) estimate from column suggests that food households have a 6 percentage point higher probability of having a poor FCS score. The probit estimates indicate that, for the average household, food households had a 9 percent higher likelihood of an FCS score below 28.5.

Taken together the estimates imply a robust advantage for cash transfers over food transfers in the effect on dietary diversity, as suggested by theory. The larger effect for the FCS outcomes suggests that the disparity in diversity is driven at least in part by more frequent consumption of higher quality food groups.

6.2 Relative Impacts of Treatment on Consumption, by Transfer Modality

Dietary diversity comprises one aspect of food security, but the quantity and value of food consumed also plays a key role. In this section, the relative effect of the transfers is calculated for three different consumption aggregates (Table 9): the value of food consumed by the household, the value of food available to the household, and the calories consumed by the household. All three indicators have been calculated on a per-capita basis, and log transformed.[13]

The value of household consumption appears slightly higher in the cash group, but the difference is statistically insignificant. The value of food available, however, is estimated to be 12 percent higher among the cash group, with a p-value less than .01.[14] Conversely, food households appear to be consuming four percent more calories per capita than those in the cash group.

[13] See section 4.4 for a more detailed explanation of the construction of these consumption aggregates.

[14] The wide disparity may result primarily from food beneficiaries storing food transfers, which were not counted in this analysis.

In concert with the dietary diversity analysis, the results from analyzing consumption aggregates paint a more complete picture of household food security. Households receiving transfers in-kind appear to be consuming more food on a caloric basis, but the excess calories are more likely to be "cheap." That is, the higher caloric intake of food households likely stems from the inexpensive (on a per-calorie basis) staples in the food basket. That story is consistent with the large discrepancy between the two transfer groups in FCS, which more heavily weights non-staple foods.

6.3 Relative Impacts of Treatment on Food Types, by Transfer Modality

To better determine how each transfer type influences dietary composition, caloric consumption is disaggregated by food group. The relative effect of the transfers is estimated on the frequency of consumption of food groups, as well.

Caloric consumption analysis by food groups reveals that food transfer recipients consume significantly more calories from their food basket items than cash recipients, but cash recipients consume more from a wider variety and higher value group of foods (Table 10). Using the single difference specification, food recipients consume 12 and 31 percent more calories from wheat and oils than cash recipients. While food recipients consume 8 percent more cereals overall than cash beneficiaries, the latter consume over 50 percent, or nearly 430 more kcals from non-wheat cereals than the food group. Cash recipients also enjoy 27 percent more calories from animal products (i.e., meat, fish, dairy, eggs), the equivalent of approximately one extra egg or 100 grams of lamb every five days. The caloric intake of non-cereal starches like tubers, pulses and legumes, is 40 percent, or approximately 20 kcals, higher among the cash group. While cash beneficiaries receive slightly more calories from fruit and vegetables, the difference is not significant.

Food frequency estimates also suggest a far more diverse diet for cash recipients. Table 11 displays incident rate ratios (IRRs) derived from negative binomial regression coefficient estimates of the relative impact of the transfers on the number of days per week that a food group was consumed by the household. Food frequency is a count variable, which can take positive integer values between 0 and 7. The negative binomial regression model is a generalized version of the poisson model that permits the variance to be greater than the mean, and more appropriate to food frequency data due to the large number of zeros.[15] The IRRs in Table 11 are interpreted as follows: numbers above 1 represent higher rates of feeding frequency among the food

[15] In addition, goodness of fit tests strongly reject a poison process with no overdispersion.

beneficiaries (relative to the cash group), numbers lower than 1 represent lower rates of feeding frequency among food beneficiaries (relative to the cash group), and an IRR of 1 represents perfect equality of feeding frequency rates between the two groups.

Unsurprisingly, the estimates detect no difference between the food and cash groups in the rate of the consumption frequency of cereals (column 1). The equality stems from the fact that 99 percent of all households consume cereals every day. However, food beneficiaries do consume oil, a food basket item, at 1.04 times the rate of the cash group. Conversely, food beneficiaries consume fish, meat (including poultry) and eggs at much less frequent rates than cash beneficiaries (approximately 68, 38, and 40 percent less, respectively). Based on baseline levels of food frequency, the estimates translate into the difference between eating meat, for example, every nine days instead of every 12 days. Food beneficiaries also consume nuts and pulses, and roots and tubers significantly less frequently, as well.

6.4 Relative Impacts of Treatment on Feeding of Young Children

Feeding practices greatly affect the health and nutritional status of young children (WHO 2008). The previous results demonstrate that transfer type clearly influences the amount, variety, and frequency of consuming different food groups. Consequently, using data from the child feeding survey module, we examine the extent to which very young children experience these differences in Table 12. As per standard practice, infant and young child feeding variables are disaggregated by age, and food frequency is aggregated into seven food groups (WHO 2008).[16]

The first indicator, known as minimum dietary diversity, measures whether the child has consumed four or more food groups. Children between 6 and 23 months living in food beneficiary households are 16 percent less likely to obtain a minimally diverse diet (column 1). Differences by modality for older children are not significant (column 2). Children in both age groups from food beneficiary households consumed less food groups overall relative to their cash peers (columns 3 and 4).

Mimicking the methodology used to construct the overall household dietary diversity indicators, we also construct child specific measures of HDDS and FCS (columns 5 through 8). The relative gap for both age groups and indicators is negative, underscoring the fact that the relatively higher dietary

[16] The seven food groups are (1) grains, roots and tubers; (2) legumes and nuts; (3) dairy products; (4) Flesh foods; (5) Eggs; (6) Vitamin A-rich fruits and vegetables (i.e., orange foods); and (7) other fruits and vegetables.

diversity benefit derived from cash transfers is experienced by young children as well. Indeed, in comparison to the household FCS estimates, the gap is even larger for children.

6.5 Relative Impacts of Treatment on Self-Reported Measures of Food Insecurity

The evidence thus far suggests that cash beneficiaries consumed a wider and more valuable array of food items at more frequent rates than food beneficiaries. Food beneficiaries, however, consumed slightly more total calories, nearly all derived from their food baskets of wheat and oil. Consequently, the relative impact of subjective assessments of household food insecurity may depend on the manner in which households consider food quality versus quantity when determining the criteria for a period of "difficulty meeting food needs".

Once again, we use negative binomial regressions in Table 13 to report IRR estimates of the relative impact of transfers on several count data outcomes: the number of days in the previous seven that households cut back on the number of meals consumed; the number of days in the previous seven that adults in the household ate less food than desired; the number of days in the previous seven that children in the household ate less food than desired; and the number of months in the last six that households reported problems satisfying their food needs.

The indicators dealing with self-reported food insecurity coping strategies (columns 1 through 3) all suggest that cash beneficiaries reported higher rates of cutting back on food consumption in the previous week. However, none of the effects are significant at conventional levels. Similarly, no significant difference between the transfers is found in self-reported difficulty satisfying food needs. As a result, despite the strong differences by transfer modality in food consumption patterns, self-reports of food insecurity do not appear dependent on transfer type.

6.6 Relative Impacts of Treatment on Food Expenditure

In-kind transfers clearly obviate some of the need to purchase foods. However, the extent to which these transfers impact expenditure patterns in Yemen for items both excluded and included in the food basket is unknown.

Examining patterns of weekly food expenditure reveals that cash beneficiaries spend more on nearly every food group than food beneficiaries (Table 14). Overall, cash beneficiaries spend 47 percent more per week (approximately 570 YER, or $2.88) on all food items. Unsurprisingly, the

largest expenditures differences by transfer modality involve food groups that include items in the food basket. Cash beneficiaries spend 160 percent more money on wheat, and 130 percent more on fats (i.e., oils). Echoing results from the food frequency and caloric consumption estimates, the largest nonfood basket discrepancy in expenditure is for "flesh foods" (i.e., meat, chicken and fish), where cash households spend 73 percent more than food beneficiaries. Expenditure differences for fruits and vegetables are not significant. These results may understate the expenditure differences between the treatment groups if cash beneficiaries spend a large share of the transfers within the first week.[17]

6.7 Relative Impacts of Treatment on Nonfood Expenditure

One motivation for distributing in-kind transfers, as opposed to cash, is to ensure that that the transfer is used as intended by the donor. This "paternalistic" justification for in-kind donor preferences may be especially pertinent in contexts where intrahousehold bargaining power is unevenly distributed, and the propensity to indulge vices is high. Both circumstances could potentially be applied to rural Yemen, where female autonomy is low, and consumption of a mild narcotic leaf, qat, is high. Therefore, we examine the patterns of nonfood expenditure by modality, in order to determine if the different transfer vehicle led to changes in nonfood related spending.

In Table 15, we display coefficients from single difference regressions of several nonfood expenditure items on modality type. In terms of total nonfood expenditure, we cannot detect any differences between the cash and food groups. In fact, the point estimate on total nonfood expenditure exclusive of qat and sheesha is zero. Examining qat expenditure only, the point estimate suggests that food beneficiaries spend slightly more on qat, although the coefficient is imprecisely estimated and not significant.[18] Indeed, no significant differences emerge by modality for any of the nonfood expenditure spending categories. Consequently, transfer type did not appear to influence patterns of expenditure for items other than food.

6.8 Relative Impacts of Treatment on Self-Reported Measures on Usage of Qat

Due to its widespread use and identification with Yemeni social behavior, we investigate qat's consumption and use in more detail. Examining

[17] Conversely, the consumption and dietary diversity may overstate the differences by transfer group if food households consume a disproportionate share of food basket items within the first week.

[18] We examine qat in more detail in the following section.

those eligible to receive transfers at baseline, 52 percent of households reported consuming any qat in the past week, and 30 percent reported chewing every day. Those numbers are below the 70 percent estimate of any qat consumption obtained by a nationally representative survey in Milanovic (2007). The smaller estimates are likely due to the different sample composition in the survey; respondents here are poorer, more likely to live in female-headed households, and not representative geographically. Underreporting of qat consumption due to reluctance to discuss the issue may also play a role.[19]

Indeed, the overall averages for qat consumption disguise large differences by region and gender of the headship. In Ibb, 57 percent of households have consumed qat, versus only 46 percent in Hajjah. More strikingly, male-headed households consume much more frequently than female-headed households. In the former, qat is chewed at least once a day by 60 percent of the treatment eligible sample at baseline, while 35 percent consume the leaf daily. For female-headed households in the same sample, any consumption is only 16 percent and daily consumption just under 12 percent.

The analysis in Table 15 showed no difference in qat expenditure based on treatment status, but in this section we focus on consumption. Narrowing the focus on consumption permits us to examine how transfer type may affect not only expenditure, but also acquisition of qat stemming from formal or informal trading or sharing. As with expenditure, the preferred single difference estimate shows no effect of modality due to frequency of use (Table 16). The estimated incident rate ratios of days in the past seven in which qat was consumed are nearly equal by modality.

Table 17 presents another set of qat consumption indicators. In the first column, we examine whether transfer type impacted the probability of consuming any amount of qat. Single difference estimate suggest that no difference by modality exists.

The last two columns of Table 17 analyze the (log) value of weekly household qat consumption among the entire sample and among chewers, respectively. Once again, the preferred estimates do not indicate a significant difference by transfer type. Among those who report any consumption, similarly no differences by modality are apparent.

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[19] Reluctance to reveal qat usage will bias estimates only if underreporting is asymmetric by modality. That asymmetry might arise in the case of highly heteroskedastic measurement error. If, for example, cash beneficiaries do spend larger sums on qat, but those who spend high sums also underreport more severely, than the expenditure and consumption estimates will underestimate the modality difference. Frequency of use, estimated in Table 8.14, is less likely to be subject to such error.

7. Costing Analysis

7.1 Methods

A comparison of the relative effectiveness of modalities should also consider the cost of implementing each each. While WFP tracks program costs via traditional accounting for its own records and for external accountability purposes, such methods do not allow for an accurate breakdown by modality. Traditional accounting costs often underestimate the true overall cost of program operations due to, among other things, the cost of staff time dedicated to each treatment type. Therefore, the Activity-based Costing – Ingredients (ABC-I) approach is used to calculate costs for the analysis. The ABC-I method is a combination of activity-based accounting methods with the "ingredients" method, which calculates program costs from inputs, input quantities, and input unit costs (Fiedler, Villalobos, and de Mattos 2008; Tan-Torres Edejer et al. 2003). As the ingredients method alone does not allocate costs according to program activities, it does not allow for comparison between modalities. However, this method, when paired with the ABC approach, matches activities with all their corresponding inputs into cost centers.

There are several assumptions inherent in this analysis which must be noted. In this case, the analysis focuses specifically on the cost to WFP and not to external institutions or to program beneficiaries. One particular issue in this case regards the comparability of transfers, in that in certain contexts food may hold more value, or the price of food may vary significantly in response to factors such as inflation. However, in order to facilitate comparison between the implementation costs between modalities, the cash value is assumed to be equivalent to the value of the food ration if procured in a local market. These measures were also solely calculated as an estimate of average cost, rather than marginal cost, in that average cost is assumed to be a constant.

7.2 Cost Description

Food incurred higher costs for distribution and those costs associated with in-country transport, as well as warehousing and other associated costs for commodity storage. Ocean freight, port operations and other external shipping expenses were excluded from this analysis. However, internal transportation and labor costs were included as to accurately reflect the cost of food distribution in country.

A primary cost driver for cash is the 3% fee of total cash transferred each cycle as incurred by the post office. The costs in relation to the post office concern staff time invested to manage beneficiary lists and to supervise the

transfer process (validation, distribution, and registration of transaction), as well as any materials cost. In contrast with other countries, training or additional investments in preparation for the cash transfer modality was not deemed necessary as the post office had prior experience processing the Social Welfare Fund transfer (SWF). However, while this particular implementing partner had previous experience with cash transfers, the cash modality as implemented by WFP required a beneficiary sensitization campaign, as it was new.

Because WFP had not conducted a cash transfer program previously, the cash modality may have incurred more administrative efforts upon start-up than would be necessary if the program infrastructure was already established. Thus, we may overstate relative cash costs due solely to differing placement of each modality on the experience curve, and unrealized economies of scale in cash distribution.[20]

Figure 2 reveals that the cash modality is less expensive per beneficiary ($162.65) than the food modality ($181.49). These costs include beneficiary verification and the cost of the transfers itself during the 3-cycle intervention period. On a per transfer basis (figure 3), excluding the cost of the transfer, the modality specific cost of cash ($4.09) is approximately half as expensive as compared to food ($10.37). Thus, in terms of the transaction costs, 2.2 cash transfers could be made for the cost of transferring one food basket.

The breakdown of the modality specific costs of one transfer (figure 3) highlights the prominent role of physical transfer costs in distributing food. Careful comparison of the costs by modality suggests that cash costs are likely to decrease with increases in scale and experience. Beneficiary sensitization, which accounted for 22 percent of cash transfer costs, is necessary only for first time cash recipients and higher program staff costs may be due in part to the small size and unfamiliarity of the cash program.

Households had to invest income in significant travel to receive the cash transfer. Incorporation of the beneficiary cost to collect transfer raises the per-transfer cost (excluding the value of the transfer) of cash to $8.22. For food transfers, addition of beneficiary costs raises the per-transfer cost (excluding the transfer value) to $11.35. Thus, including the beneficiary costs reduces the per transfer cost gap from $6.28 to $3.13.

8 Conclusions

[20] Food distribution, for example, benefits from a well-established procurement and distribution system and extensive institutional experience both in Yemen and abroad.

This paper examines the randomized distribution of cash and food transfers by the World Food Program in rural Yemen. Across two governorates, Ibb and Hajjah, 136 different sites were randomly selected to receive either three installments of approximately $49 worth of oil and wheat, or the same value in cash. The analysis focuses primarily on the differential impacts of these transfer types on food security outcomes.

Relative to the food beneficiaries, households that received cash transfers enjoyed a more diverse diet, consumed higher value foods (such as animal products), spent more money on both staple and non-staple food items, and fed infants and young children a wider variety of foods. Cash beneficiaries also consumed approximately 100 less calories per day than food recipients. Self-reported measures of food insecurity incidents and nonfood expenditures, including qat, did not differ by transfer type.

Costing analysis demonstrates that cash was delivered to beneficiaries more cheaply than food. The modality specific cost of delivering each cash transfer cost WFP $4.09 (8.3% of the transfer value), while each food transfer cost $10.37 (21.1% of the transfer value). The physical resources required to store and transport food comprised the bulk of the cost gap.

Cash transfers raised dietary diversity and quality more highly than food, and were cheaper to deliver and administer. Food beneficiaries, however, consumed more calories overall. Consequently, food transfers appeared to be extra-marginal in terms of dietary composition, but infra-marginal in terms of overall food consumption. That is, under the alternative of an equal-valued budget increase, food beneficiaries consume more oil and wheat than they would optimally, but they would spend the excess money on other food items (like meat and non-wheat cereals) instead of nonfood items (like qat).

Policy makers looking for a definitive statement on which modality is ‘better’ are likely to be disappointed in these results. Rather, they suggest that choice of modality should be linked to objectives. Food transfers were clearly more effective at increasing the quantity of transferred food consumed, though at the cost of constraining beneficiary choices and more administrative expense. Cash transfers, however, increased the variety of consumed foods, and were more strongly preferred by recipients.

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Table 1 Baseline survey sample, by governorate

Household sample	All		Ibb		Hajjah	
Treatment	1,983	40.9	998	58.2	985	60.1
Food	*1,001*	*50.5*	*494*	*49.5*	*507*	*51.5*
Cash	*982*	*49.5*	*504*	*50.5*	*478*	*48.5*
Total	**3,353**		**1,715**		**1,638**	

Table 2 Comparison of means of key variables at baseline, excluding those who receive transfers with 8 days of survey, by treatment status

	Food	Cash	Food - Cash
Hajjah	0.51	0.49	0.02
Female-headed HH	0.21	0.17	0.05**
HH head attended primary school or higher	0.27	0.25	0.02
HH head is married	0.77	0.82	-0.05**
HH head's age	47.59	47.06	0.52
Household size	8.66	8.89	-0.23
HH members age 0-5	1.20	1.23	-0.03
HH members age 6-17	3.89	4.00	-0.11
Number of phones	0.48	0.42	0.05*
Number of TVs	0.29	0.27	0.02
Number of refrigerators	0.07	0.07	0.01
Number of sewing machines	0.02	0.01	0.01
Number of bikes	0.00	0.00	-0.00
Number of motor vehicles	0.02	0.03	-0.00
Owns a plot of land	0.23	0.19	0.04*
Owns any cattle	0.06	0.05	0.01
Standardized Wealth Index	0.07	-0.02	0.09*
Observations	1,001	982	

Table 3 Comparison of means of key variables at baseline for beneficiaries receiving transfer more than 8 days before survey, by treatment status

	Food	Cash	Food - Cash
Hajjah	0.48	0.49	-0.01
Female-headed HH	0.21	0.16	0.05*
HH head attended primary school or higher	0.28	0.25	0.03
HH head is married	0.78	0.83	-0.05*
HH head's age	47.01	47.02	-0.01
Household size	8.66	8.90	-0.24
HH members age 0-5	1.22	1.24	-0.03
HH members age 6-17	3.88	4.01	-0.13
Number of phones	0.46	0.43	0.04
Number of TVs	0.30	0.27	0.03
Number of refrigerators	0.07	0.07	0.00
Number of sewing machines	0.02	0.01	0.01
Number of bikes	0.00	0.00	-0.00
Number of motor vehicles	0.01	0.03	-0.02*
Owns a plot of land	0.22	0.18	0.03
Owns any cattle	0.06	0.05	0.00
Standardized Wealth Index	0.05	-0.02	0.07
Observations	632	949	

Table 4 Aggregate food groups and weights to calculate the Food Consumption Score

Group	Food items	Food group	Weight
1	Maize, maize porridge, rice, sorghum, millet past, bread, and other cereals Cassava, potatoes and sweet potatoes, other tubers, plantains	Staples	2
2	Beans, peas, groundnuts and cashew nuts	Pulses	3
3	Vegetables, leaves	Vegetables	1
4	Fruits	Fruit	1
5	Beef, goat, poultry, pork, eggs, and fish	Meat and fish	4
6	Milk, yogurt, and other dairies	Milk	4
7	Sugar, sugar products, and honey	Sugar	0.5
8	Oils, fats, and butter	Oil	0.5

Source: WFP 2008.

Table 5 Comparison of means of key outcome variables at baseline, by treatment status

	Treatment	Comparison	Difference
Household Dietary Diversity Score (HDDS)	7.12	7.26	-0.14
Dietary Diversity Index (DDI)	10.96	10.79	0.17
Food Consumption Score (FCS)	49.12	52.98	-3.86***
Poor food consumption (FCS < 28.5)	0.20	0.13	0.07***
Daily per capita consumption (kcal)	2,562.62	2,840.79	-278.17***
Daily per capita cereal consumption (kcal)	2,216.20	2,373.98	-157.78**
Daily per capita animal product consumption (kcal)	92.23	152.07	-59.84***
Daily per capita oil consumption (kcal)	162.20	178.40	-16.20
Days consumed meat or poultry (in last 7)	0.56	0.59	-0.02
Days consumed qat (in last 7)	2.78	2.99	-0.22
Months had difficulty meeting food needs(in last 6)	2.65	3.05	-0.40***
Days household reduced meal frequency (in last 7)	0.64	0.71	-0.07
Days adults ate less food (in last 7)	0.37	0.47	-0.10
Days children ate less food (in last 7)	0.22	0.29	-0.07
Observations	1,581	1,085	2,666

Note: Excludes those who received transfer with 8 days of survey.

Table 6 Comparison of means of key outcome variables at endline, by treatment status

	Treatment	Comparison	Difference
Household Dietary Diversity Score (HDDS)	7.29	7.12	0.17*
Dietary Diversity Index (DDI)	11.24	10.91	0.33*
Food Consumption Score (FCS)	51.34	50.10	1.24
Poor food consumption (FCS < 28.5)	0.17	0.20	-0.03*
Daily per capita consumption (kcal)	2,671.5	2,700.0	-28.5
Daily per capita cereal consumption (kcal)	2,137.2	2,153.8	-16.6
Daily per capita animal product consumption (kcal)	99.94	119.95	-20.01***
Daily per capita oil consumption (kcal)	178.56	192.10	-13.53
Days consumed meat or poultry (in last 7)	0.72	0.63	0.09
Days consumed qat (in last 7)	2.88	2.85	0.03
Months had difficulty meeting food needs (in last 6)	2.26	2.35	-0.10
Days household reduced meal frequency (in last 7)	0.14	0.18	-0.04
Days adults ate less food (in last 7)	0.15	0.19	-0.04
Days children ate less food (in last 7)	0.09	0.14	-0.04
Observations	1,581	1,085	2,666

Note: Excludes those who received transfer with 8 days of survey.

Table 7 Relative impact of food and cash transfers on dietary diversity measures with and without covariates

	HDDS		DDI		FCS	
Difference (Food-Cash)	**-0.26**	**-0.41**	**-0.46**	**-0.63**	**-2.41**	**-4.52**
	(0.16)	**(0.15)*** **	**(0.35)**	**(0.28)** **	**(1.40)***	**(1.19)*** **
Female-headed household		-0.50		-0.91		-4.12
		(0.19)***		(0.34)***		(1.87)**
HH head attended primary school or higher		0.25		0.49		1.00
		(0.12)**		(0.23)**		(1.48)
Household head is married		-0.05		-0.11		-2.66
		(0.19)		(0.35)		(1.99)
Household head's age		-0.01		0.00		0.02
		(0.00)		(0.01)		(0.05)
Household size		0.06		0.16		0.85
		(0.02)***		(0.04)***		(0.25)***
Household members age 0-5		0.01		0.08		0.03
		(0.04)		(0.07)		(0.50)
Household members age 6-17		-0.04		-0.09		-0.72
		(0.03)		(0.05)*		(0.29)**
Wealth index: 2nd quintile		0.24		0.37		3.27
		(0.15)		(0.28)		(1.50)**
Wealth index: 3rd quintile		0.42		0.87		5.18
		(0.16)**		(0.33)***		(1.65)***
Wealth index: 4th quintile		0.80		1.61		7.95
		(0.16)***		(0.30)***		(1.68)***
Wealth index: 5th quintile		1.05		2.40		10.19
		(0.19)***		(0.37)***		(1.95)***
Constant	7.39	6.82	11.42	8.53	52.31	48.88
	(0.12)***	(0.56)***	(0.23)***	(0.93)***	(0.98)***	(3.62)***
N	1,581	1,581	1,581	1,581	1,581	1,581

Notes: Standard errors in parenthesis clustered at the FDP level. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. All estimates control for district fixed effects. Excludes those who received transfers within 8 days of the survey.

Table 8 Relative impact of food and cash transfers on probability of having a low FCS score

	OLS Linear Probability	Probit Marginal Effect
Difference (Food-Cash)	0.06	0.09
	(0.03)**	(0.03)***
N	1,581	1,521
Adj R-squared	0.04	

Notes: Standard errors in parentheses clustered at the FDP level. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. All estimates control for gender, education, and age of marriage of the household head, household size, number of young children, wealth quintiles, and district fixed effects. Excludes those who received transfers within eight days of the survey.

Table 9 Relative impact of food and cash transfers on consumption

	Log value of HH consumption (per-capita)	Log value of available food in HH (per-capita)	Log HH per-capita calorie intake
Difference (Food-Cash)	**-0.04**	**-0.12**	**0.04**
	(0.04)	**(0.04)*** **	**(0.02)***

Notes: Standard errors in parentheses clustered at the FDP level. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. All estimates control for gender, education, and age of marriage of the household head, household size, number of young children, wealth quintiles, and district fixed effects. Top row estimates are from endline single difference (equation 1).

Table 10 Relative impact of food and cash transfers on calorie consumption, by food group

	Wheat	Non Wheat Cereals	Tubers, Pulses, Legumes, Nuts	Animal Products	Fruit & Vegetables	Oil	Sugar, Snacks, Other Foods
Difference (Food-Cash)	0.12	-0.52	-0.40	-0.27	-0.08	0.31	-0.05
	(0.05)**	(0.19)***	(0.16)**	(0.14)*	(0.10)	(0.09)***	(0.06)
N	1,581	1,581	1,581	1,581	1,581	1,581	1,581

Notes: Dependent variables are the log of household consumption (kcal/day/person) for each food group. Standard errors in parentheses clustered at the FDP level. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. All estimates control for gender, education, and age of marriage of the household head, household size, number of young children, wealth quintiles, and district fixed effects. Excludes those who received transfers within eight days of the survey.

Table 11 Relative impact of food and cash transfers on household food frequency

	Cereals	Roots/ Tubers	Vegetables	Fruit	Eggs	Meat & Poultry	Dairy	Fish & Seafood	Nuts & Pulses	Oils & Fats	Sugar, Sweets, Snacks & Honey
Difference (Food-Cash)	1.00	0.83	0.97	0.72	0.60	0.62	0.95	0.32	0.81	1.04	0.98
	(1.32)	(1.82)*	(1.15)	(1.59)	(1.98)**	(2.97)***	(0.74)	(3.58)***	(1.75)*	(2.05)**	(1.32)
N	1,581	1,581	1,581	1,581	1,581	1,581	1,581	1,581	1,581	1,581	1,581

Notes: Negative binomial regression. T Statistics in parentheses. Standard errors clustered at the FDP level.. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. All estimates control for gender, education, and age of marriage of the household head, household size, number of young children, wealth quintiles, and district fixed effects. Excludes those who received transfers within eight days of the survey. Dependent variables is number of days in last week that household ate food item. Coefficients are incidence-rate ratios, where 1 represents perfect equality of feeding frequency between food and cash, values below 1 represent lower feeding frequency by food treatment, and values above 1 represent higher feeding frequencies by food treatment.

Table 12 Relative impact of food and cash transfers on dietary diversity for infants and young children

	Child 6 to 23 months ate 4 or more food groups	Child 24 to 59 months ate 4 or more food groups	Total food groups consumed by child aged 6 to 23 months	Total food groups consumed by children aged 24 to 59 months	HDDS of children aged 6 to 23 months	HDDS of children aged 24 to 59 months	FCS of children aged 6 to 23 months	FCS of children aged 24 to 59 months
Difference (Food-Cash)	-0.16	-0.05	-0.42	-0.30	-0.49	-0.35	-6.48	-7.46
	(0.06)***	(0.05)	(0.21)*	(0.14)**	(0.30)	(0.16)**	(4.25)	(1.88)***
N	267	791	267	791	267	791	266	791

Notes: Standard errors in parentheses clustered at the FDP level. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. All estimates control for gender, education, and age of marriage of the household head, household size, number of young children, wealth quintiles, and district fixed effects. Coefficients in columns (1) and (2) are linear probability estimates. Excludes those who received transfers within eight days of the survey.

Table 13 Relative impact of food and cash transfers on self-reported food insecurity

	Days household reduced meal frequency (in last 7)	Days adults ate less food (in last 7)	Days children ate less food (in last 7)	Months had difficulty meeting food needs (in last 6)
Difference (Food-Cash)	0.49	0.61	0.89	1.06
	(1.46)	(1.46)	(0.24)	(0.54)
N	1,580	1,580	1,377	1,983

Notes: Negative binomial regression. T Statistics in parentheses. Standard errors clustered at the FDP level.. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. All estimates control for gender, education, and age of marriage of the household head, household size, number of young children, wealth quintiles, and district fixed effects. Excludes those who received transfers within eight days of the survey in columns 1 through 3. Coefficients are incidence-rate ratios, where 1 represents perfect equality of frequency between food and cash, values below 1 represent lower frequency in the food treatment, and values above 1 represent higher frequencies in the food treatment.

Table 14 Relative impact of food and cash transfers on weekly food expenditures

	Total food expenditure	Wheat	Sorghum	Rice	Meat (incl. fish & poultry)	Eggs	Legumes	Dairy	Fats	Vegetables	Fruit
Difference (Food-Cash)	-0.47	-1.60	-0.30	-0.42	-0.73	-0.05	-0.20	0.04	-1.30	-0.17	-0.10
	(0.10)***	(0.27)***	(0.09)***	(0.21)**	(0.25)***	(0.07)	(0.14)	(0.10)	(0.18)***	(0.18)	(0.15)
N	1,543	1,581	1,581	1,581	1,581	1,581	1,581	1,581	1,581	1,581	1,581

Notes: Dependent variable is the log of weekly food expenditure for the food group in the column heading. Standard errors in parentheses clustered at the FDP level. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. All estimates control for gender, education, and age of marriage of the household head, household size, number of young children, wealth quintiles, and district fixed effects. Excludes those who received transfers within eight days of the survey.

Table 15 Relative impact of food and cash transfers on nonfood expenditures

	Total nonfood (including qat & tobacco)	Total nonfood (excluding qat & tobacco)	Total nonfood (excluding celebrations, qat, & tobacco)	Qat	Tobacco	Clothing	Transport	Household and kitchen supplies	Fuel and lighting	Celebration
Difference (Food-Cash)	-0.01	0.00	-0.00	0.13	0.11	0.00	-0.04	-0.01	-0.04	0.04
	(0.09)	(0.10)	(0.10)	(0.25)	(0.18)	(0.16)	(0.14)	(0.06)	(0.14)	(0.04)
N	1,581	1,581	1,581	1,581	1,581	1,581	1,581	1,581	1,581	1,581

Notes: Dependent variable is the log of weekly expenditure on the item in the column header. Standard errors in parentheses clustered at the FDP level. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. All estimates control for gender, education, and age of marriage of the household head, household size, number of young children, wealth quintiles, and district fixed effects. Excludes those who received transfers within eight days of the survey.

Table 16 Relative impact of food and cash transfers on frequency of qat use

	Days used qat (of last 7)
Difference (Food-Cash)	**0.97**
	(0.41)
N	1,581

Notes: Negative binomial regression. T Statistics in parentheses. Standard errors clustered at the FDP level. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. All estimates control for gender, education, and age of marriage of the household head, household size, number of young children, wealth quintiles, and district fixed effects. Top row estimates are from endline single difference (equation 1). Excludes those who received transfers within eight days of the survey. Coefficients are incidence-rate ratios, where 1 represents perfect equality of frequency between food and cash, values below one represent lower frequency in the food treatment, and values above one represent higher frequencies in the food treatment.

Table 17 Relative impact of food and cash transfers on qat consumption

	Consumed any qat	Value of weekly household qat consumption (per-capita)	Value of weekly household qat consumption (per capita) among chewers
Difference (Food-Cash)	**-0.00**	**-0.02**	**-0.02**
	(0.03)	**(0.13)**	**(0.07)**
N	1,581	1,581	820

Notes: Standard errors in parentheses clustered at the FDP level. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. All estimates control for gender, education, and age of marriage of the household head, household size, number of young children, wealth quintiles, and district fixed effects. Coefficients in column (1) are linear probability estimates. Top row estimates are from endline single difference (equation 1). Excludes those who received transfers within eight days of the survey.

Figure 1a Ideal transfer modality, food beneficiaries, baseline

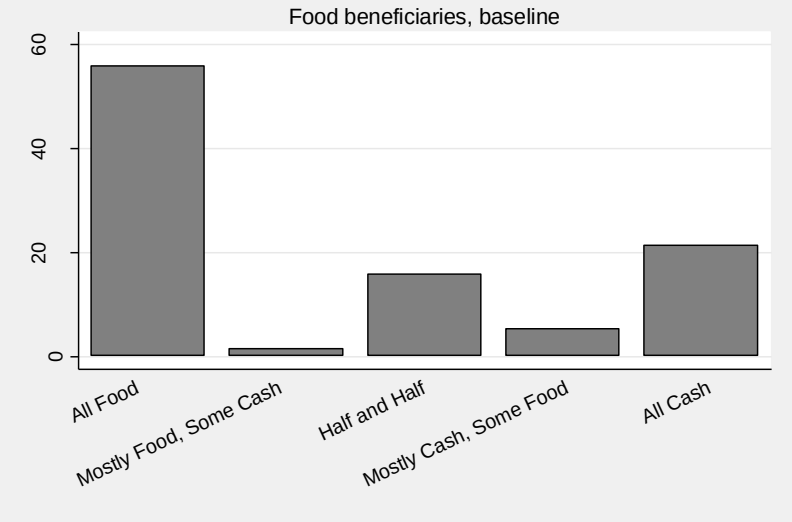


Figure 1b Ideal transfer modality, food beneficiaries, endline

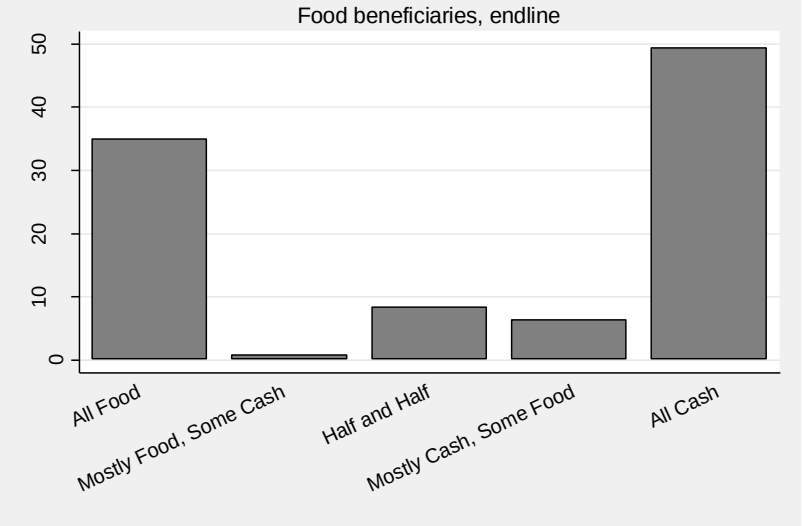


Figure 1c Ideal transfer modality, cash beneficiaries, endline

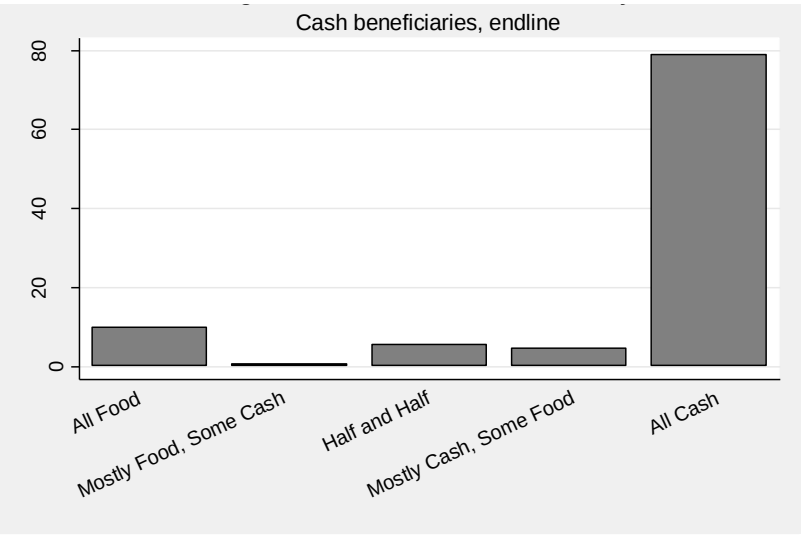

Cash beneficiaries, endline
0
20
40
60
80
All Food
Mostly Food, Some Cash
Half and Half
Mostly Cash, Some Food
All Cash

Figure 2 Total cost of three transfers per beneficiary, by modality

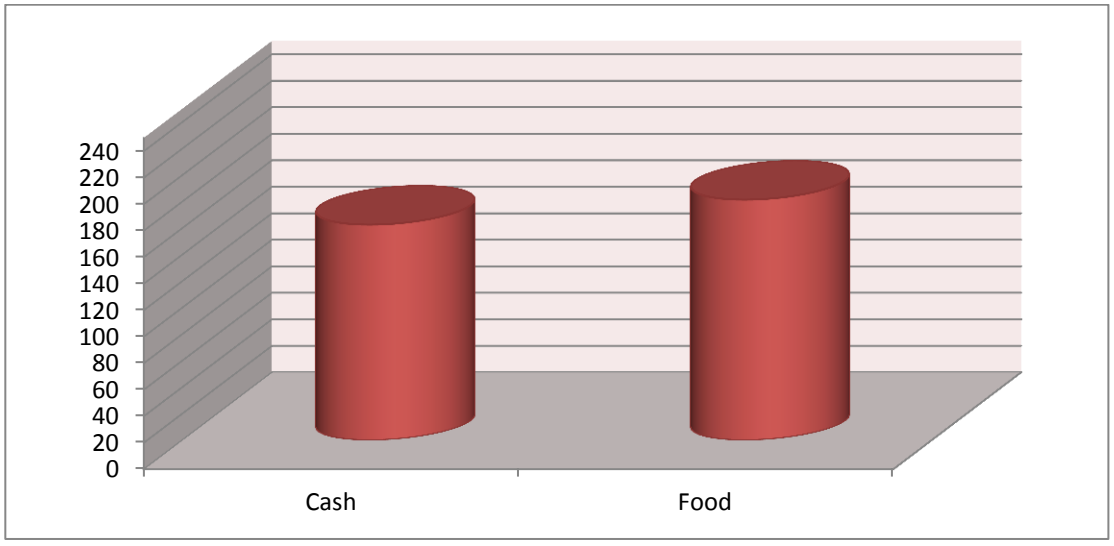
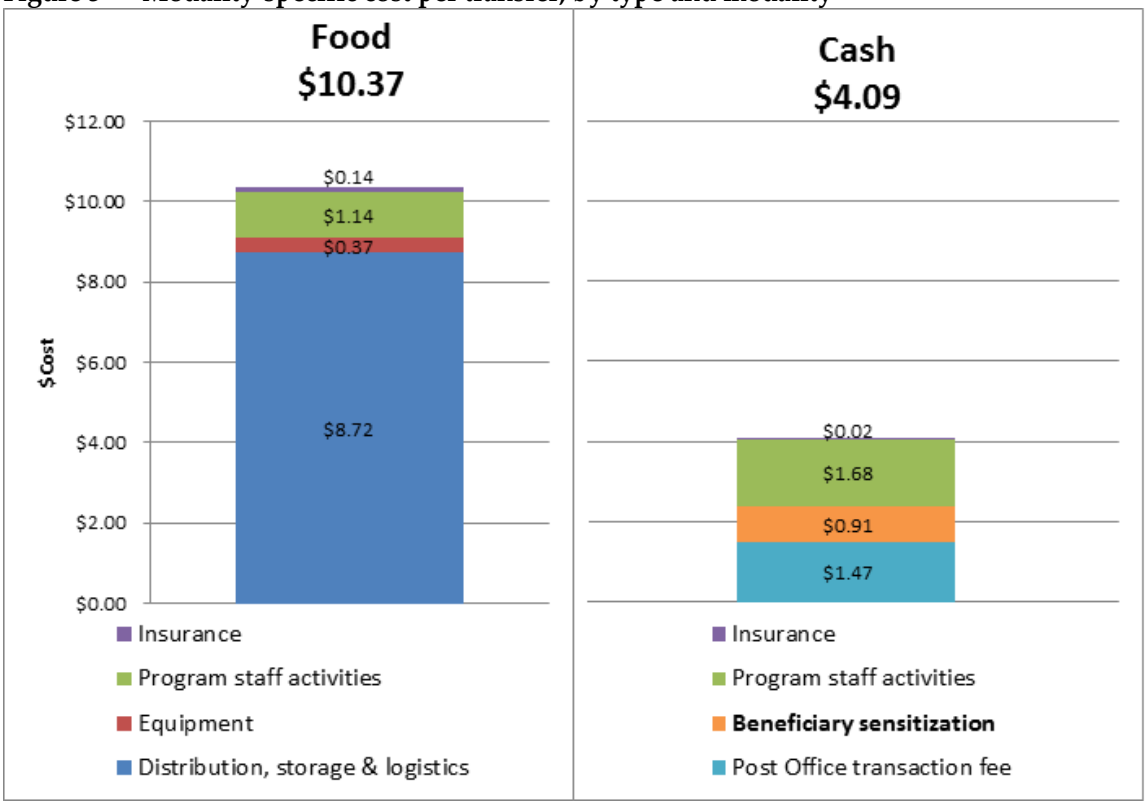
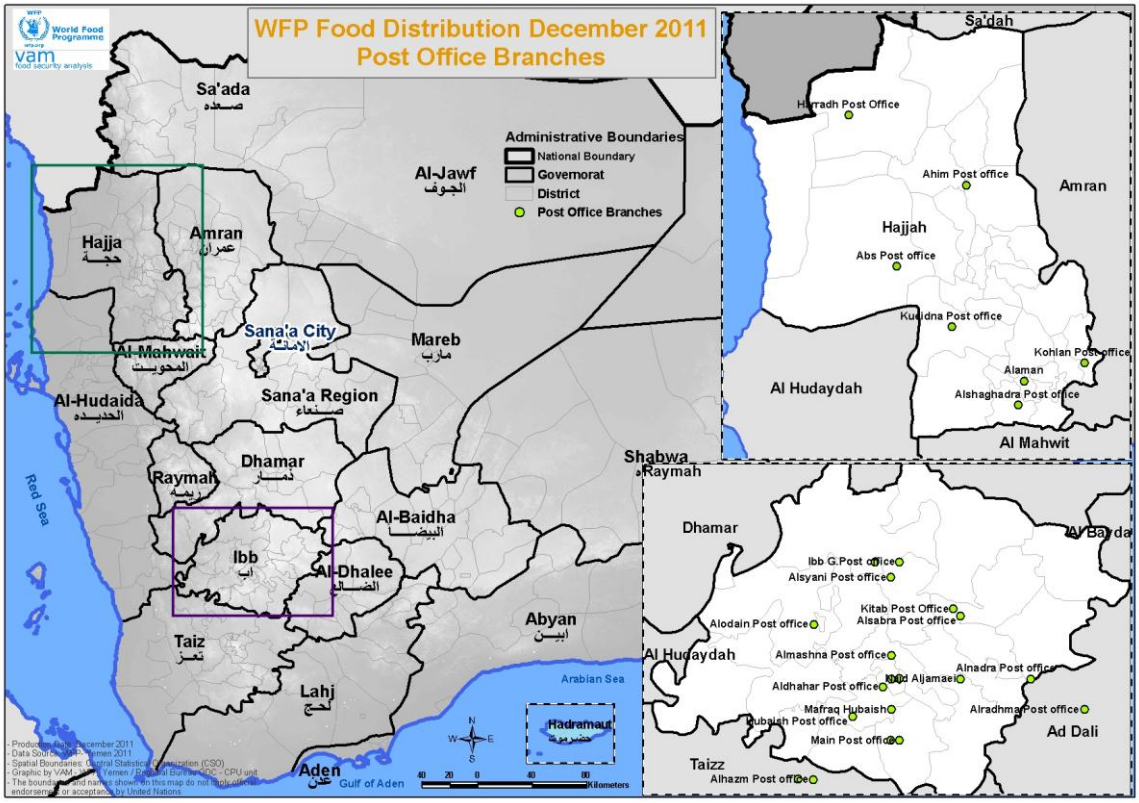


Figure 3 Modality-specific cost per transfer, by type and modality

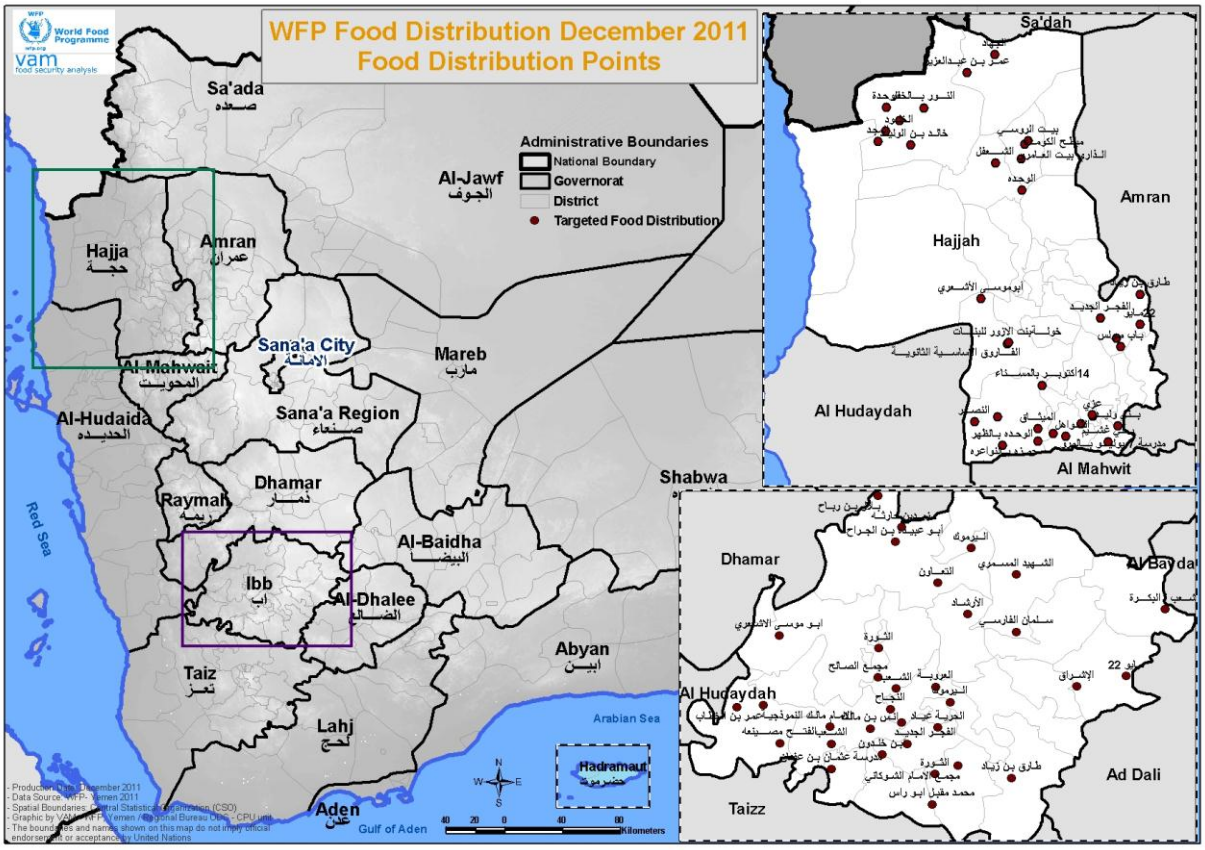


Annex 1: Map of PPSC branches in Hajjah and Ibb



Source: WFP-CO Yemen (2011b).

Annex 2: Map of food distribution points in Hajjah and Ibb



Source: WFP-CO Yemen (2011b).

Annex 3: List of 39 Foods Covered by Household Consumption Module

01	Wheat (flour, bulgur)
02	Sorghum
03	Maize
04	Millet
05	Legumes (beans, peas, lentils)
06	Barley
07	Bread/pita/kedma
08	Potato or white sweet potato
09	Rice
10	Chicken
11	Fish or other seafood
12	Meat (Lamb/goat/beef)
13	Eggs
14	Leafy greens (spinach, kale)
15	Orange-colored fruits and vegetables (orange sweet potato, oranges,
16	Bananas
17	Lemons
18	Grapes
19	Other fruits (Apple, melon, pomegranate, peaches, guava, figs,
20	Cucumber
21	Onion, garlic
22	Tomato
23	Eggplant
24	Cabbage
25	Squash/zucchini
26	Other vegetables (okra, peppers, peas, green beans)
27	Nuts
28	Vegetable oil/butter/ghee/semn
29	Dried fruits (apricots, dates, raisins)
30	Honey/sugar
31	Spices/condiments (ginger, chilies, salt etc)
32	Dairy products (buttermilk, yogurt, sour milk, cheese)
33	Aseed porridge
34	Coffee (qishr, qahwa)
35	Tea/tea leaves
36	Chips/fried snacks
37	Sweets/biscuits/etc.

38	Yemeni sweets
39	Soft drinks/juices/other sugary drinks