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**Impact of Caregiver Incentives on Child Health:  
Evidence from an Experiment with  
Anganwadi Workers in India**

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## **ABSTRACT**

### **Impact of Caregiver Incentives on Child Health: Evidence from an Experiment with Anganwadi Workers in India**

This paper provides evidence of effectiveness for performance pay among government caregivers to improve child health in India. In a controlled study of 160 daycare centers serving over 4,000 children, we randomly assign individual workers to receive either fixed bonuses or incentive payments based on the weight-for-age nutritional status of children in their care, and also collect data from a control group receiving only their standard salary. Mothers of children in all three study arms receive nutrition information. We find that performance pay reduces the prevalence of underweight by about 5 percentage points over 3 months, and height improves by about one centimeter. Impacts are sustained in the medium term when incentives are renewed but fade when they are discontinued. Fixed bonuses lead to smaller effects. Both treatments appear to improve worker effort and communication with mothers, who in turn feed a more calorific diet to their children at home.

JEL Classification: O1, I1, M5

Keywords: performance pay, incentives, malnutrition, undernutrition, underweight, child development, child health, Anganwadis, ICDS, nutrition

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**Impact of caregiver incentives on child health:  
Evidence from an experiment with Anganwadi workers in India**

Performance pay and financial incentives for health improvements are controversial. Well-targeted incentives may improve efficiency, but payments can also distract people and diminish intrinsic motivation leading to worse results over time. Previous studies on incentives to improve health in developing countries have focused primarily on payments to individuals for their own health as in Powell-Jackson et al. (2015) or to caregivers to provide specific services as in de Walque et al. (2015). Here we provide incentives to health workers based on client outcomes, targeting weight-for-age malnutrition among children attending urban day care centers in Chandigarh, India. The trial builds on Singh (2015, 2016), in collaboration with local health authorities to improve services in an urban area where about 40% of children are clinically underweight.

The economic value of preventing child malnutrition is the subject of a long literature in economics, from Strauss (1986) to Scholte, Van Den Berg and Lindeboom (2015) and many others. Following Behrman and Deolalikar (1987), improvements over time have been found to be driven primarily by technological and institutional changes that shift food demand and care practices. In India, one factor influencing child nutrition is performance of preschool daycare centers funded through the government's Integrated Child Development Services (ICDS) program. This is the world's largest child development system, launched in 1975 to help prevent malnutrition, which ICDS managers typically measure in terms of low weight for age. There are now over one million ICDS centers across the country, each serving about 60 children from 6 months to 6 years of age through an Anganwadi worker who is paid a fixed salary of approximately Rs. 4000 or US\$67 per month. The older children above 3 years of age are expected to attend the center from 9:00 am to noon, and to

receive a mid-day meal provided by the caregiver. Other services provided include supplementary take-home rations, immunization, health checkups and nutrition advice.

The quality of services actually delivered at ICDS centers is highly contentious. Program gaps exist in almost all areas of ICDS delivery, and even basic amenities are often lacking (Chudasama et al. 2015; Gupta et al 2013). Workers have limited education, training, job security and infrastructure (Ramachandran et al., 2010; Sharma et al., 2014), and they report significant stress and dissatisfaction (Mohanani et al., 2012). If motivated to do so, caregivers can influence the prevalence of child underweight through two main channels: first through the direct provision of food and other services to the child at the center, and secondly through effective communication with mothers either when they drop off or pick up their child from the center or by making home visits. A World Bank report by Gragnolati et al. (2005) found both to be limited, with many missing meals and almost no effective communication between workers and mothers. A more recent household survey in 100 Indian districts indicates that although 96 percent of locations were served by a functioning ICDS center, only 50 percent of them actually provided food on the day of survey and just 19 percent of the mothers reported that the workers provides nutrition counselling (Hungama Report, 2011).

Previous studies of ICDS program impacts have used cross-sectional observations and found mixed results: Deolalikar (2005) found evidence of lower underweight prevalence among boys in locations with ICDS centers in the early 1990s, but Lokshin et al. (2005) find strong selection effects with ICDS centers more likely to be located in places that also benefit from other advantages. Focusing within Chandigarh, Thakur et al. (2011) found that program enrollment was not associated with lower prevalence of underweight children, but using national data and matching methods to address geographic and household-specific selection effects Kandpal (2011) and Jain (2015) found significant gains in child height, and Mittal and Meenakshi (2015) found reductions in the prevalence

of underweight. Randomized trials at ICDS centers have focused on introducing additional services, such as increasing take-home rations (Avula et al. 2011).

In this study we evaluate the effectiveness of targeting workers' efforts using existing resources, through a small performance bonus paid on top of the worker's regular salary. Our bonus is based on the principal nutritional objective of ICDS services which is to reduce the fraction of children who are classified as underweight. Other data we collect allow us to look beyond average treatment effects on underweight status, examining the degree to which caregivers target efforts at children near classification thresholds and also capturing impacts on linear growth through changes in height. We consider the timing of change including whether weight gains persist after performance pay is discontinued, and we address the mechanisms by which changes are achieved, using unannounced visits to each center to observe workers' level of effort plus detailed household and caregiver surveys at regular intervals to study behavioral responses.

A growing literature finds that small changes in compensation schemes and recognition for specific achievements can generate substantial improvements in performance, at a fraction of the cost of funding additional services or a "business as usual" budget increases (Ratto and Burgess 2003, Glewwe and Muralidharan, 2015). A central challenge in these schemes is to align workers' incentives with policymakers' objectives. In our setting, each Anganwadi worker is individually responsible for services at her center, thereby avoiding the problems associated with free-ridership in groups identified by Burgess, Tominey and Propper (2016). We take advantage of this structure to make payments based on overall outcomes among all the children at each center, incentivizing each worker to allocate efforts among tasks in somewhat the same way as payments to teachers for education outcomes based on improved test scores (Muralidharan and Sundararaman 2011, Ree et al. 2015, Hasnain et al. 2014). In contrast to these outcome-based payments, performance pay in the

health sector mainly targets the provision of intermediate inputs such as clinic visits or other specific services (Banerjee et al. 2010, Basinga et al. 2011, Miller et al. 2012, Miller and Barbiaz 2014).

Health outcomes like child underweight depend on the caregiver's actions only indirectly, through interactions between their services and the child's diet at home as well as their sanitation and disease environment (Hammer and Spears 2016). Like Gertler and Vermeersch (2012), our study aims to test performance incentives for a given level of resources available to caregivers and households. The only input we provide other than the incentive itself is a simple and inexpensive recipe book with nutrition information, which caregivers and mothers could use to improve care if they choose to do so. Singh (2015) found that this very low-cost information treatment complements caregiver efforts, by facilitating communication about how to prepare safe, nutrient-dense meals. To provide this common background information we distribute the books to all mothers of children in the trial. ICDS workers can refer to the book and discuss specific recipes based on the caregiver's localized knowledge of the family's circumstances, and also discuss how disease and sanitation interact with diet to influence child health.

Designing incentives for health workers to use existing resources most effectively has long been and remains challenging across a wide range of settings (Hillman et al., 1998; Burgess and Metcalfe, 1999; Mannion and Davies, 2008). Explicit incentives can crowd out other motivations (Lazear 2000; Benabou and Tirole 2003, 2016; Ashraf et al., 2012), and after the scheme is discontinued performance may be worse than before it was introduced (Camerer, 2010; Lester et al., 2010). Our test is designed to address these concerns, allowing comparison over time between performance payments and a fixed bonus treatment that is calibrated to have about the same expected value, to control for any income or substitution effects of additional pay. This isolates the impact of making payments conditional on measured outcomes, as opposed to simply setting targets (Bhushan et al., 2007). We also compare both payment arms to a pure status-quo block in which

Anganwadi workers receive only their base salary, to test the effects of any kind of payment and targeting relative to city-wide trends, seasonality and price shocks.

## **Treatments**

The performance pay treatment we offer reflects the stated objective of the ICDS program, which is to reduce the number of children classified as severely or moderately malnourished in terms of weight for age. In the incentive treatment, workers were offered a bonus of Rs. 200 (about US\$3) for each child whose classification improved, net of any children whose classification worsened, over each three-month round of the trial. The alternative fixed bonus was set at Rs. 200 over three months, reflecting the expected performance of one net improvement observed in the earlier Chandigarh and Kolkata performance pay schemes in Singh (2015) and Singh and Mitra (2015). Payoffs in the performance-pay treatment are truncated at zero, as no money would ever be taken from workers should the children in their center experience more declines than advances over the three-month period.

To ensure clarity regarding program objectives, each ICDS worker in the trial was provided a goal card with lists of her enrolled children, their present health indicators and target weights after three months. Each target was calculated on the basis of the World Health Organization (WHO) reference levels of weight for severely, moderately and not malnourished children of each age (in months) and sex. Target weights were the WHO thresholds for improvement (or worsening) from one category to the next.

None of the children in these ICDS centers was at risk of becoming overweight in terms of weight-for-age, but some were short enough that weight increases to achieve a normal weight-for-age could make them overweight by the WHO's criterion of more than one standard deviation above

normal weight-for-height at that age and sex. To avoid incentivizing excess weight gain in these cases, target weights were reduced to that threshold for those who were either moderately malnourished (17 children) or severely malnourished (7 children), so that achieving the target would not make the child overweight for their height.

Caregivers in the treatment arms with the fixed bonus of Rs. 200 were also provided with goal cards noting target weights for all children, and mothers in all treatment arms were provided recipe books to help them respond to ICDS caregivers' efforts following Singh (2016). The weight and height measurements of children were conducted at each site independently of ICDS management, by a team of hired enumerators. For a random sample of children, weights were also cross-checked by hired supervisors. This arrangement ensures that the impact of treatments we provide would be adequately measured and feasible for the ICDS to scale up or test elsewhere, as the goal cards for each caregiver, recipe books for each mother, and incentive payments of Rs. 200 over three months are relatively low cost compared to workers' monthly salary of approximately Rs. 4000. The low magnitude of incentives and independent measurement on varied occasions also help to reduce the chance of workers "gaming" the system.

### **Experimental design and data collection**

Our project was carried out in close collaboration with the Social Welfare Department of Chandigarh, a Union Territory in northern India. As shown in Figure 1, we draw ICDS centers from geographically separate parts of the city administered by different block officers, to preclude spillovers between the treatment arms and the control group. Table 1 shows the timeline of the experiment, involving a sequence of month-long surveys to measure all children in each center at intervals of three months, in July and October 2014, and then in January, April and July 2015. In addition, there were unannounced supervisory visits to the centers between rounds to measure

attendance of workers and monitor effort. During the first three month period between two baseline surveys no treatments were provided, so as to test for pre-treatment differences in time trends among the sites. We also continued two rounds of observation after the treatment, to test for persistence of impacts and any possible negative consequences of withdrawing incentives.

The 84 centers in Block 1 served as a case-control group, to capture trends associated with seasonality or other shocks to child weights in Chandigarh as a whole. Incentive treatments were implemented in the 76 centers of Block 2, starting after the second baseline survey. Block 2 was chosen for the incentive treatments with an eye to external validity, because it had a lower average prevalence of malnutrition and hence a smaller fraction of the population susceptible to improvement. Previous studies suggested that lower prevalence would make it the more difficult of the two blocks in which to detect a statistically significant improvement (Singh 2015; Singh and Mitra 2015). Any significance of performance pay relative to the control group would therefore be more likely to hold elsewhere, improving the relevance of our study to other populations.

The 76 centers in Block 2 were randomly assigned to one of two incentive treatments, through a lottery conducted in the workers' presence. Half of the workers drew the performance pay treatment, and half drew the fixed bonus. The performance pay treatment payments were made first in February 2015 and then in May 2015. It is important to note here that an additional set of ICDS centers, shown in Figure 1 as Block 3, was also part of this trial. They served as control sites for the first three rounds, after which they received tournament-type incentives in which caregivers compete against each other. Results for those treatments are reported in a separate paper. This paper focuses on the contrast between performance pay on a piece-rate basis and fixed bonuses of similar expected value as provided in Block 2.

Each administrative block is managed by a single officer and a set of field supervisors. Every supervisor is responsible for about 20 centers, each of which is staffed with one Anganwadi worker

to serve about 30 preschool children. Monthly meetings of each block's workers and supervisors are held with the block officer; this contributes to the homogeneity of information and conditions of service within each block, and required that our design provide treatments of similar value to workers within each block.

Table 2.1 shows summary statistics from the first baseline survey across our two treatment groups and the control block. Column 4 compares the performance pay arm in Block 2 to the pure control centers in Block 1, showing the intended differences with a lower prevalence of malnutrition (and hence a smaller population susceptible to improvement) in Block 2 as opposed to Block 1. Given these differences, we stagger in controls for observable characteristics that may differentiate Block 2 from Block 1, and focus on the differences between the randomly assigned treatments within Block 2. Column 5 provides a balance test between those two arms, showing that the only significant difference between them is in Panel C, as more workers are from scheduled castes or tribes in the performance pay treatment as opposed to the fixed-bonus arm. From panel A, we see that children in all centers have an average age of about 4.3 years and have roughly equal numbers of boys and girls, and that mothers are somewhat more likely than the workers to be from a scheduled caste or tribe. Mothers are much younger than the workers, and they have an average of two children in the home. Beyond these balance tests, our design includes two rounds of baseline surveys to test for any differences in pre-trends in outcomes and covariates that could threaten the assumption of common trends during the trial period. An appendix provides details on these checks, starting with Table A1 that gives us baseline correlations between health and individual covariates. This reveals that older kids are taller and more likely to be underweight for their age and height. Malnutrition is also more widespread among children whose mothers are younger, illiterate and have lower income and assets, belonging to a scheduled caste, without a grandmother at home, and with more siblings at home. There is no significant effect of father's literacy in this context, and having a toilet without a flush is

correlated only with child height. Workers' characteristics are generally not correlated with child health.

Table 2.2 illustrates compliance and attrition rates across the three groups and five rounds. The total number of children weighed generally rises from round to round, from 4294 in the first baseline to 4550 in the last endline, reflecting the city's overall population growth or an increase in attendance at the centers. There is a high degree of turnover at each center, with 20 percent or more of the children in each arm not being reweighed at the end of each three-month period. Attrition rates are lower during the periods of incentive treatments, indicating that caregivers are not selectively rejecting children whose weights have worsened, and that families may even be sending more children to the centers in response to improved services there. It is also notable that close to 90% of all mothers are surveyed in each round, which is helpful for identifying families' responses to the caregivers' actions. It is still possible that attrition is systematically different in the treatment and control groups. In particular, we would be concerned if those with higher weight for age z-scores were less likely to get weighed at midline and endline in the performance pay treatment group (for example, see Jacob (2005)). This could signal a change in the composition of the groups because of the treatment and we would need to correct for non-random attrition. Table 2.3, columns (1) to (4), provide evidence that between rounds 2 and 3 (Baseline-II and Endline-I), there are no significant differential attrition rates and the attrition itself is not correlated with higher z-scores in the treatment groups. In the medium term, there is lower attrition in the performance pay group suggesting that the children are less likely to drop out or be absent from day care centers on the day of the survey. However, there is no pattern suggesting non-random attrition across groups based on health.

Of late, bound estimators have been proposed to counter non-random attrition and these require relatively few assumptions. These estimators determine an interval for the true treatment

effect based on extreme assumptions about the impact of selection on estimated effect that are consistent with the data. We carry out estimation of Lee (2009) bounds on our treatment effects to understand the range of estimates in the short-term and medium-term with assumptions about non-random attrition in one direction or another. This corresponds to two extreme assumptions about missing information that are consistent with the observed data and a one-sided selection mechanism (Tauchmann, 2013). In the group that suffers less from attrition either the largest or the smallest values of the outcome are excluded from analysis. Table A4 gives us performance pay treatment effect bounds of between 0.057 and 0.388 for the short term and between 0.050 and 0.275 for the medium term. In both cases, the upper bound is significant at the 1% significance level. The upper bounds for the fixed bonus treatment are lower than the performance pay treatment in both the short and medium-term. Even though the bounds themselves are less precisely estimated for the fixed bonus treatment in the medium term, the lower and upper bound are close to one another suggesting that there was a medium term gain in the fixed bonus treatment that cannot be explained away by attrition.

Table 2.4 provides the unconditional means for each weight indicator across rounds and treatments. In particular, from the second baseline (round 2) to the first and second endlines (rounds 3 and 4) we find a striking improvement in both treatment arms of children’s average weight, weight-for-age z score and prevalence of weight-for-age malnutrition. Hypothesis tests to identify the significance and magnitude of these changes are detailed below.

### **Empirical Specification and Main results**

The empirical specification for our main results is a standard difference-in-differences equation:

$$z_{ijt} - z_{ijt-1} = \alpha + \beta(\text{performance})_j + \gamma(\text{fixed})_j + \mu_{ijt-1} + \theta_{jt-1} + \varepsilon_{ijt}$$

$$t \in \begin{cases} \{2\} \textit{pre - trends} \\ \{3\} \textit{short - term} \\ \{4\} \textit{medium - term} \\ \{5\} \textit{long - term} \end{cases}$$

In the above equation the subscript,  $t$  represents the survey round,  $i$  is the individual (child), and  $j$  is the center or worker. The main independent variables, *performance* and *fixed* take the value 1 if the child is in that treatment group and 0 otherwise.  $\beta$  and  $\gamma$  are our main coefficients of interest and they represent the impact of the two treatments.  $\mu_{ijt}$  is a term for the matrix of mother and child level control variables.  $\theta_{jt}$  is center-level control variables. Heteroscedasticity-consistent errors,  $\varepsilon_{ijt}$ , are clustered at the center level. Performance Pay was promised to workers in November 2014 based on individual weight-for-age targets and was paid out in February 2015. Another round of promises was made in February 2015 and payments were made in May 2015. Fixed bonus was an ex-ante incentive of Rs. 200 in November 2014.

All dependent variables are changes in a child's health status between two consecutive rounds. Weight is measured in kilograms. The z scores are calculated based on the WHO's distribution of healthy weights in a well-nourished population at each age and sex, and malnutrition status is an indicator variable equal to one if the child's weight is more than two standard deviations below the mean of the WHO's healthy population at each age and sex. Given widespread stunting, in the appendix we also report detailed data on changes in child height. Mother and child-level controls include age and sex of child, a dummy variables for if mother identifies herself as scheduled caste, if mother identifies herself as Hindu, if there is a grandmother at home, if mother cannot read and write, if husband cannot read and write, if mother is a homemaker, if toilet is communal, if toilet has no flush, mother's age, total children in household, household income and an index of 13 fixed assets in the household. Worker-level controls are dummy variables for if worker identifies herself as scheduled caste, if worker identifies herself as Hindu, if worker is college-educated, worker's age and dummy variables

for the availability of the following resources at the center: electricity, fan, helper, chart, blackboard, drinking water and toilet.

Table 3.1 shows the immediate short-term effect of the two treatments on each health outcome, reflecting change from the second baseline in October 2014 to the first endline in January 2015. Columns (1) – (3) show unconditional changes in each of the main health indicators namely weight, weight-for-age z score (Wfa z), and weight-for-age malnutrition (Wfa mal) in the two treatment groups, relative to the control group without any additional control variables. Columns (4)-(6) add mother and child controls, and (7)-(9) add worker-level controls. With or without these controls, we find strongly significant effects of performance pay. In that arm the average child gains about 200 g over three months relative to control, which is an increase of about 0.1 standard deviations in the distribution of healthy children’s weight-for-age, and a decline of between 4.0 and 5.6 percentage points in the prevalence of weight-for-age malnutrition. The comparable coefficients on the fixed bonus treatment are about half as large and not statistically significant, with wide standard errors so we cannot reject them being different from the effect of the performance pay treatment.

Table 3.2 measures the subsequent medium-term impact of each treatment on our health outcomes, reflecting change from the first endline in January 2015 to the second endline in April 2015. We find that the short-term effects are sustained and significant, with performance pay again about the same magnitude of gains as in the previous three-month period. Controlling for observables results in somewhat larger coefficients, which again indicate gains of about 200 g over three months, an increase of about 0.1 standard deviation in the weight-for-age z score, and a decline of about 5 percent in the prevalence of weight-for-age malnutrition. It is notable that workers who received the fixed bonus, which was paid out in February 2015, also achieved significant increases in

child weights during this period, which again are not significantly different from the performance pay coefficients.

Table 3.3 tests for fading out or reversal of improvements in weight after discontinuation of treatments. Data refer to changes from the second endline in April 2015 to the third endline in July 2015, after the last payments were made in February (for the fixed bonus group) or May (for the performance-pay group). What we find is no further significant improvements but also no evidence of reversals to earlier malnutrition rates. Children in centers where caregivers had earlier received performance pay treatments experienced modest weight gains, improvements in z scores and reductions in malnutrition prevalence but these changes are not significantly different from changes in the control blocks, and coefficient estimates for children in centers which had the fixed bonus treatment are even closer to zero. This lack of persistence or reversion suggests that performance pay works primarily as a direct incentive in this context, generating a one-time improvement without either entrenching or eroding the social norms and intrinsic motivations of the ICDS caregivers and the children's own families.

For a visual representation of the unconditional results depicted in our tables, Figure 2 shows the average weight-for-age Z-scores over the five consecutive rounds between July 2014 and July 2015 for the two treatment and control groups. The improvement from round 1 to 2 is a pre-trend that is shared by the control and fixed-bonus groups (here denoted "cash"), with a smaller improvement in the performance-pay group (denoted "absolute"); all groups continue from round 2 to 3, with a sharper increase in the performance-pay group to a higher level that persists in rounds 4 and 5, as the control group declines even faster than either treatment group. The factors involved in these common trends of initial improvement and then worsening in weight-for-age across all of our ICDS centers may involve fluctuations in real income and purchasing power, in addition to annual fluctuations in diet and disease associated with temperature and rainfall. Chandigarh is located in

the far north of India, so temperatures and rainfall both declined sharply over the first two quarterly periods to their annual lows around January, and then rose again over the next two quarters to their annual peak temperatures in May-July and peak rainfall in June-September.

Our trial is designed around the specific focus of ICDS management and Indian policymakers on children's malnutrition status, as measured by the prevalence of underweight. Nutritionists are also interested in stunting and attained height. Appendix Table A2 tests for effects of the incentive treatments on children's heights, in centimeters, between each successive survey round. This reveals a statistically significant increase of about one centimeter between R2 and R3, with no persistence or reversion in subsequent periods. This suggests that children's linear growth was promoted by caregivers' efforts in response to incentives at that time. The effects are robust to all controls, and are more significant and slightly larger for the performance-pay treatment than the fixed-bonus treatment, although again the difference between them is not significant.

### **Robustness checks**

A first threat to our identification strategy is that the two treatment arms, which have a lower initial prevalence of malnutrition in the first baseline survey, also have faster trend improvements over time. To test for this we repeated the baseline survey. Results are reported in Table 4, showing no pre-trend differences in the performance pay arm relative to the control group; in the fixed bonus arm, weight for age z scores improve slightly faster with significance only at the 10% level, but that effect is eliminated by controlling for observable differences as we do in the main regressions. From this we conclude that pre-trend differences cannot have contributed to the significant effect we found for performance pay.

The main effect we find is the immediate impact of performance pay over the three month period from October 2014 to January 2015. Table 5.1 tests for heterogeneity of this effect, splitting the sample by gender (columns (1) and (2)), age (columns (3)-(5)), literacy of parents (column (6)-(9)), total children in household (columns (10) and (11)), and fixed assets owned by household (columns (12) and (13)). We find that the performance pay treatment has a similar effect size across all these subgroups; the effect remains statistically significant in all except the small sub-sample of children whose fathers are illiterate. The smaller and more fragile effect of the fixed bonus treatment is significant only among boys and younger children, in columns (1) and (3).

The second important effect we find is medium-term persistence of performance pay when continued from January to April 2015. Table 5.2 shows that the magnitude and significance of this effect is generally robust across sub-samples, although there is somewhat more variation than in the short-term effects of performance pay shown in Table 5.1. Effects of the fixed bonus treatment are less consistent, with significance only in some subsamples but not others.

An important test for the incentive effect of performance pay is to test for threshold effects. Payments are based on the number of children in each malnutrition category, which provides a greater incentive per unit of weight gain in children who are closer to the threshold and more likely to move up to the next category. Focusing efforts on children near the threshold is not necessarily desirable, since it may lead to others being neglected (as in Neal and Schanzenbach, 2010), but it provides a clear test of whether workers responded to the performance-pay incentive. We define “Near” the threshold as a child being closer to their target weight than the median child in that category. We classify children into the following categories by their weight-for-age: moderately malnourished, severely malnourished and Normal. In Table 5.3, column (1), we find that the weight-for-age z-scores increase more for moderately malnourished children who are near the threshold compared to far from threshold in the performance pay treatment. In the fixed bonus treatment,

there does not appear to be a large discrepancy between those near and far from threshold. We do not find differential threshold effects for severely malnourished children (perhaps due to power issues because of low sample size) but we do find that workers in the performance pay and fixed bonus treatments also help the normal weight children, leading to fewer declines to moderate malnutrition from the normal category in the two treatments. Table A5 lists the increases and declines in the short and medium-term across the treatment and control arms. In line with our intuition we find that performance pay treatment acts both on reducing malnutrition as well as on not allowing worsening of normal weight children. The table also shows that 20 percent of the children are in a state of flux between rounds and the weights are not as persistent as expected even in the control group. For example, moving from winters (January, 2015) to summer (April, 2015), appears to worsen 13% of the normal weight children in the control group. This points to seasonality in weights, and lower vulnerability during the summer for those affected by the performance pay and fixed bonus treatments. Future work in determining the magnitude of weight-for-age malnutrition in a region should consider the impact of the season and countervailing factors during seasonality. For instance, in Figures A1 and A2, we note that among the various correlates of weight-for-age malnutrition, sanitation practices appear to be more strongly negatively correlated during onset of summer. Not having a flush toilet is correlated with lower weight-for-age in April 2015 but not in January 2015.

Next, we check for heterogeneity in terms of malnutrition prevalence at the worker's center. If worker effort to reduce malnutrition involves high fixed costs, having more malnourished children initially would increase the worker's incentive to make that investment and get a higher total payment at endline. If the cost of effort increases linearly with the number of malnourished then there is no differential incentive, and having a larger fraction of the children be malnourished may signal epidemiological factors such as worse sanitation and more disease vectors, poorer diets at home, greater poverty, lower parental or worker knowledge, etc. which would make it harder to

achieve each unit of improvement. It is thus ambiguous if workers are able to do better in centers that are doing worse initially. We test for this using two parameters – (1) High or low number of malnourished children at baseline based on the median (which was 10) or (2) High or low proportion of children who are malnourished based on the median (0.36). In both cases, we find no significant differences between the high or low measures for the performance pay treatment for the first three months. Over the next three months (columns (5)-(8)), there appears to be a greater focus on the performance pay centers that had a higher prevalence. However, overall, we do not find strong evidence for there being any effect of baseline prevalence, at least in the short-term. In a similar vein, Figures A3 and A4 in the Appendix delve into heterogeneity of response to the performance pay treatment by quartiles of number of low weight-for-age children at baseline.

We also check if intra-center correlation among children underestimates our standard errors and overestimates the precision. As the treatment varies at the center level, there could be serial correlation in the health of children within a center that should be taken into account when estimating standard errors. One way of correcting for this issue is to follow a non-parametric approach and cluster standard errors at the center level (as we do in the earlier tables). Another recommendation is to carry out a Moulton (1986) parametric correction for the standard errors to allow for serial correlation and check for consistency of the main results. We do so in Table A6 and find that our results remain robust.

## **Mechanisms**

Table 6.1 shows a test for the mechanism of short-term effects by studying the changes in the quantity of worker-mother interaction. Quantity of interaction is measured by home visits by worker, center visits by mother, and frequency of worker talking about child in the last month and are reported by mother during her interviews in the intensive surveys. We find a large and significant

effect of both treatments on increasing the frequency of worker talking about child (column (3)). These effects are robust to inclusion of other controls. Overall it appears that instead of increasing the number of visits, the worker was simply more attentive during each visit.

Next, we test for the same mechanisms but now in the medium term in Table 6.2. Here we find a statistical and significant effect on home visits by worker in the two treatments. It is possible that after exhausting the returns from frequency of worker talking about child, the worker switches to making individual home visits in the medium term. This result could also imply that workers seek initially to advise the mother about what to do at home, and then turn to monitoring her compliance with that advice.

Table 7.1 addresses the content of communication between workers and mothers during the initial period of incentive treatments, obtained by asking each mother what the caregiver might have talked about during one or more conversations. Nutrition is a dummy variable equal to 1, if in the last month the worker spoke to the mother about her child's nutrition. Hygiene is 1 if the worker talked with the mother about maintaining the child's hygiene. Chart is a dummy equal to 1 if the worker showed the mother a growth chart. Scare takes unit value if the worker scared the mother with consequences of malnutrition. We find that in the performance pay and fixed bonus treatment groups, workers seem to focus on the nutritional information as opposed to talking about hygiene and showing charts. This effect is robust to including additional controls.

Table 7.2 concerns change in the content of communication after the incentive treatment, showing reversion in the frequency of conversations about nutrition, and even a reduction in conversations about each child's growth chart. This reversion or withdrawal of effort could help explain lack of persistence in the impacts after incentives end. There is some significant increase in conversations about hygiene, but only in the treatment arm that had received the fixed bonus.

The next two tables concern families' response to caregivers' efforts, first in the short term when incentives are introduced (Table 8.1) and then in the medium term over the next three-month period (Table 8.2). Each is based on mothers' reported dietary intake for her child at home, focusing on four foods of particular nutritional interest: milk and green vegetables for micronutrients, and traditional desserts or porridge for calories. These are dummy variables, coded 1 if the mother reports feeding these at least twice in a week on average. In Table 8.1 we find significant and large effects on milk, dessert and porridge consumption in the short term in both treatment groups. These are robust to including mother and child level controls as well as worker level controls. Green vegetable consumption is lower in both treatment groups, which could be due to substitution among these foods or in response to the foods children have eaten at the ICDS center. Over the next three-month period, as shown in Table 8.2, we find that the increase in milk and porridge intake remains robustly significant for the performance-pay group, but effects are smaller and less significant for the fixed bonus group. In the appendix table A3 we test for pre-trends in the mechanisms of quantity and quality of information and diet. We find differential time trends in only two of 22 comparisons, one of which is significant only at the 10% level, from which we conclude that the common trends assumption is likely to hold even for the mechanism checks.

Our final mechanism check concerns absenteeism during the months between rounds of data collection. Independent supervisors were hired to make unannounced visits to the centers in August-September 2014, November-December 2014, February-March 2015 and May-June 2015, to check for presence of the worker and to weigh the food served at the center as well. Table 9 shows that the attendance of the workers went up significantly in the performance pay treatment in the month of November after the incentives were promised to them. There are also sporadic increases in attendance among workers who received the fixed bonus treatment, but the timing of these increases cannot be clearly linked to payment dates so may be due to random fluctuations in absenteeism. Overall, there is a significant increase in attendance of Anganwadi workers in the performance pay

treatment in the short-term. We also show the increases graphically in the three groups in Appendix Figures A5, A6 and A7. However, we do not find any evidence to suggest that the weight of the total food being served increased in the performance pay or fixed bonus arm.

## **Conclusion**

This paper describes a randomized controlled trial of financial incentives for improved service delivery among 160 government workers in ICDS centers caring for over 4000 children in Chandigarh, India. In this trial, workers in centers selected for treatment randomly drew either a one-time fixed bonus of Rs. 200, or a performance-pay incentive of Rs. 200 per child at their center whose classification improved from severe to moderate or moderate to no malnutrition, net of any children whose classification worsened, over two successive three-month periods. This criterion for performance pay directly reflected the government's goal to reduce prevalence of underweight in ICDS centers, as measured by each child's weight relative to a healthy population at each age and sex. Workers on performance pay contracts had high expectations from themselves. In Figure A8, we show that more than 50% of the workers expected to receive the maximum incentive possible. Their expectations were highly optimistic. Overall, the average payouts in the performance pay treatments were close to Rs. 800, half that of their mean expectation (as shown in Figure A9).

Our trial compared outcomes in the two treatment arms with each other, and with children at case-control centers in another part of Chandigarh. All children attending every center in the trial were measured on five successive occasions, through two baseline surveys to detect any trend differences prior to the trial, and then three endline surveys to detect short- and medium-term responses to treatment followed by persistence or reversal after incentives are removed. Surveys also included interviews with mothers about their interactions with the ICDS caregiver, and about

what their child ate at home. Unannounced visits to each center in between the surveys were used to monitor caregiver effort.

Our principal finding is that workers receiving performance pay achieved significant improvements in children's weights, averaging an increase of about 200 g per child relative to control, weight-for-age z score improvement of 0.1 standard deviations, and reduction in the prevalence of malnutrition by 5 percentage points over the first three months of performance pay. In the short-term, the number of malnourished children in a center declined by an average of 2 in the performance pay group and by 1 in the fixed bonus group relative to the control group change (of improving 2 children). Similar improvements were achieved in the performance pay group over the second three months of performance pay. Some improvement was also observed among children in centers where workers received the fixed bonus, but the gains from performance pay were larger and more consistent among subsamples of the population. In a similar vein, Ree et al. (2015) finds that doubling of pay significantly improved teacher satisfaction with their income but it led to no improvements in measures of teacher effort or student learning outcomes. Performance incentives for Rwandan health care workers have been shown to lead to a 20% increase in productivity, and significant improvements in child health (Gertler and Vermeesch, 2012).

Our robustness checks find no differences in pre-treatment time trends between arms of the trial, and mechanism tests reveal significant increases in the frequency with which caregivers receiving performance pay actually discussed nutrition with mothers, and significant increases in the frequency with which those mothers reported feeding milk, porridge and desserts to their child.

The trial reported in this study builds on Singh (2015), continuing a series of trials designed to inform performance pay in the ICDS system in India. Related research concerns the use of tournament-type contests among Anganwadi workers in ICDS centers, the specific kinds of effort that workers use to achieve children's weight gain, and complementarity or substitution between what

they provide and children's diets or care practices at home. Replication of this trial will be needed to confirm its validity, but results to date provide grounds for optimism that low-cost incentives can help public service providers significantly improve child health outcomes.

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## FIGURES

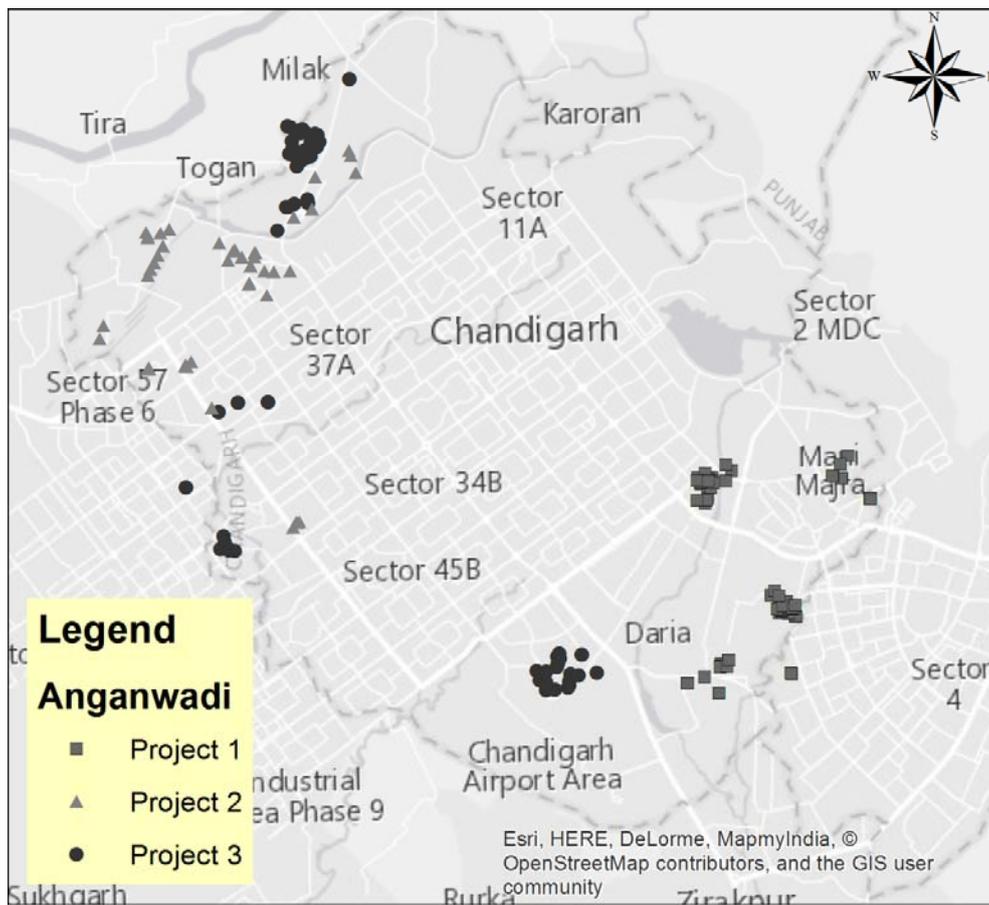


Figure 1: Map of Anganwadis in Chandigarh in three administratively and geographically distinct blocks

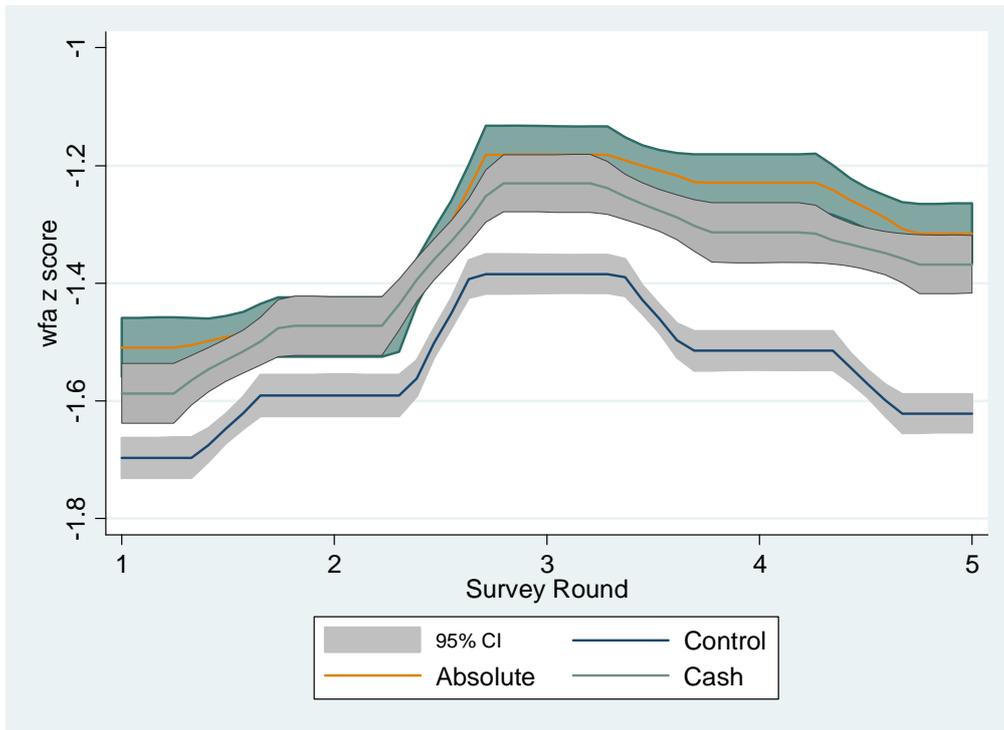


Figure 2: Graph of average weight-for-age z-score over the five consecutive rounds between July 2014 and July 2015 for the two treatment and control groups

## TABLES

Table 1: Timeline of the experiment

Round	Date	Block 1	Block 2		Block 3
Baseline-I	Jul-14	Control* (83)	Control (76)		Control (85)
Baseline-II	Oct-14	Control (84)	Performance Pay (38)	Fixed Bonus (38)	Control (85)
Endline-I	Jan-15	Control (84)	Performance Pay (38)		Control (85)
Endline-II	Apr-15	Control (84)			
Endline-III	Jul-15	Control (84)			

Notes: \* denotes that one center was not surveyed from Block 1 in Baseline-I as it was closed. Numbers in parentheses show the number of centers in each arm. Performance Pay is a bonus conditional on improvement in health outcomes promised at the end of Baseline-II and Endline-I. Payments were made at the end of Endline-I and Endline-II respectively. Fixed Bonus denotes a fixed bonus of Rs. 200 per worker at the end of Baseline-II. Blocks 1 and 3 are the control blocks for the first three rounds. Only Block 1 is the control block for last two rounds.

Table 2.1: Summary Statistics at Baseline-I across treatment and control groups

	Performance Pay	Fixed Bonus	Control	Performance Pay - Control	Performance Pay - Fixed Bonus
<b>Panel A: Child and Household Characteristics</b>					
Child's age	4.33 (0.93)	4.32 (0.94)	4.26 (0.90)	0.07 (0.05)	0.01 (0.06)
Gender (Male=1; Female=0)	0.48 (0.50)	0.50 (0.50)	0.50 (0.50)	-0.02 (0.01)	-0.01 (0.02)
Mother is SC/ST	0.64 (0.47)	0.66 (0.47)	0.59 (0.49)	0.06 (.03)*	-0.01 (0.04)
Mother is Hindu	0.90 (0.29)	0.92 (0.26)	0.90 (0.30)	0.01 (0.01)	-0.02 (0.02)
Mother's age	27.04 (3.58)	26.92 (3.32)	26.87 (3.74)	0.18 (0.17)	0.12 (0.18)
Grandmother at home	0.23 (0.42)	0.28 (0.43)	0.27 (0.45)	-0.04 (0.02)	-0.00 (0.03)
Total children in hh	2.01 (1.30)	1.99 (1.30)	2.28 (1.39)	-0.26 (0.06)***	0.02 (0.07)
Mother cannot read and write	0.27 (0.44)	0.25 (0.43)	0.39 (0.49)	-0.12 (0.03) ***	0.02 (0.03)
Husband cannot read and write	0.14 (0.35)	0.17 (0.38)	0.24 (0.43)	-0.09 (0.02) ***	-0.03 (0.03)
Mother is homemaker	0.79 (0.40)	0.77 (0.41)	0.78 (0.41)	0.01 (0.04)	0.02 (0.05)
Toilet communal	0.10 (0.29)	0.11 (0.31)	0.11 (0.31)	-0.02 (0.03)	-0.02 (0.04)
Toilet without flush	0.19 (0.39)	0.15 (0.35)	0.13 (0.34)	0.06 (0.04)	0.04 (0.06)
Fixed assets (out of 13)	0.52 (0.14)	0.54 (0.13)	0.47 (0.15)	0.05 (0.02) ***	-0.02 (0.02)
<b>Panel B: Child Health</b>					
Weight	13.67 (2.02)	13.48 (1.98)	13.27 (1.91)	0.40 (0.12) ***	0.20 (0.15)
Wfa Z-score	-1.50 (0.81)	-1.59 (0.83)	-1.65 (0.82)	0.14 (0.04) ***	0.08 (0.06)
Wfa grade	0.43 (0.63)	0.49 (0.67)	0.53 (0.70)	-0.11 (0.04) ***	-0.06 (0.05)
Wfa Malnutrition	0.36 (0.48)	0.39 (0.49)	0.41 (0.50)	-0.07 (0.03) **	-0.04 (0.04)
Height	97.21 (7.54)	97 (7.41)	96.88 (7.57)	0.34 (0.55)	0.23 (0.70)
Wfh Z-score	-0.78 (1.18)	-0.88 (1.14)	-1.05 (1.27)	0.27 (0.09) ***	0.10 (0.10)
Wfh grade	0.15 (0.42)	0.18 (0.43)	0.25 (0.53)	-0.10 (0.02) ***	-0.03 (0.03)
Wfh Malnutrition	0.13 (0.33)	0.16 (0.37)	0.20 (0.40)	-0.07 (0.02) ***	-0.03 (0.02)
<b>Panel C: Worker and Anganwadi Characteristics</b>					
Worker is SC/ST	0.52 (0.50)	0.21 (0.41)	0.45 (0.50)	0.07 (0.09)	0.30 (0.11) *
Worker is Hindu	0.83 (0.36)	0.84 (0.35)	0.87 (0.34)	-0.03 (0.07)	-0.01 (0.09)
Worker's age	41.21 (8.45)	39.11 (7.09)	38.43 (8.16)	2.78 (1.55) *	2.10 (1.86)
Worker is college educated	0.26 (0.43)	0.40 (0.49)	0.37 (0.48)	-0.11 (0.08)	-0.14 (0.11)
Electricity in AWC	0.97 (0.16)	0.96 (0.18)	0.93 (0.26)	0.05 (0.04)	0.00 (0.04)
Fan in AWC	0.97 (0.16)	0.96 (0.18)	0.91 (0.28)	0.06 (0.04)	0.00 (0.04)
Drinking water in AWC	0.60 (0.48)	0.57 (0.49)	0.47 (0.50)	0.13 (0.02) ***	0.03 (0.03)
Toilet in AWC	0.56 (0.49)	0.56 (0.50)	0.46 (0.50)	0.10 (0.03) ***	0.01 (0.04)

Table 2.2: Compliance and attrition rates

		Control	Performance Pay	Fixed Bonus	Total
<b>Baseline 1</b>	children weighed	2231	1028	1035	4294
	children whose mothers quizzed	1949	892	896	3737
	<b>% children whose mothers quizzed</b>	<b>0.87</b>	<b>0.87</b>	<b>0.87</b>	<b>0.87</b>
<b>Baseline 2</b>	children re-weighed	1526	809	800	3135
	children whose mothers re-quizzed	1270	645	640	2555
	<b>Attrition in children weighed</b>	<b>0.32</b>	<b>0.21</b>	<b>0.23</b>	<b>0.27</b>
	<b>total children weighed (1)</b>	<b>2219</b>	<b>1073</b>	<b>1058</b>	<b>4350</b>
	<b>total children whose mothers quizzed (2)</b>	<b>1968</b>	<b>942</b>	<b>959</b>	<b>3869</b>
<b>Endline 1</b>	children re-weighed from (1)	1753	855	835	3443
	children whose mothers re-quizzed from (2)	1451	701	700	2852
	<b>Attrition in children weighed</b>	<b>0.21</b>	<b>0.20</b>	<b>0.21</b>	<b>0.21</b>
	<b>total children weighed (3)</b>	<b>2448</b>	<b>1096</b>	<b>1122</b>	<b>4666</b>
	<b>total children whose mothers quizzed (4)</b>	<b>2158</b>	<b>970</b>	<b>1009</b>	<b>4137</b>
<b>Endline 2</b>	children re-weighed from (3)	1765	859	844	3468
	children whose mothers re-quizzed from (4)	1452	697	711	2860
	<b>Attrition in children weighed</b>	<b>0.28</b>	<b>0.22</b>	<b>0.25</b>	<b>0.26</b>
	<b>total children weighed (5)</b>	<b>2328</b>	<b>1081</b>	<b>1117</b>	<b>4526</b>
	<b>total children whose mothers quizzed (6)</b>	<b>2099</b>	<b>933</b>	<b>982</b>	<b>4014</b>
<b>Endline 3</b>	children re-weighed from (5)	1506	755	789	3050
	children whose mothers re-quizzed from (6)	1279	596	630	2505
	<b>Attrition in children weighed</b>	<b>0.35</b>	<b>0.30</b>	<b>0.29</b>	<b>0.33</b>
	<b>total children weighed</b>	<b>2330</b>	<b>1081</b>	<b>1139</b>	<b>4550</b>
	<b>total children whose mothers quizzed</b>	<b>2075</b>	<b>949</b>	<b>976</b>	<b>4000</b>

Table 2.3: Differential Attrition by Child Health between Rounds 2 and 4

	Between Round 2 and Round 3				Between Round 3 and Round 4			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Attrited	Attrited	Attrited	Attrited	Attrited	Attrited	Attrited	Attrited
Wfa z-score	-0.00400 (0.00827)	0.0121 (0.00849)	0.00986 (0.00902)	0.0109 (0.00886)	-0.0180* (0.00980)	-0.00358 (0.00985)	-0.00610 (0.0118)	-0.00641 (0.0116)
Performance Pay	-0.0111 (0.0400)	-0.0167 (0.0392)	-0.0333 (0.0333)	-0.0317 (0.0319)	-0.0921** (0.0360)	-0.0984*** (0.0365)	-0.121*** (0.0353)	-0.122*** (0.0364)
Fixed Bonus	-0.0155 (0.0405)	-0.0166 (0.0414)	-0.0348 (0.0353)	-0.0420 (0.0354)	-0.0112 (0.0355)	-0.0128 (0.0353)	-0.0395 (0.0387)	-0.0390 (0.0384)
Wfa z-score*Performance Pay	-0.00492 (0.0212)	-0.00704 (0.0209)	-0.00589 (0.0169)	-0.00863 (0.0165)	-0.0281 (0.0202)	-0.0299 (0.0204)	-0.0227 (0.0227)	-0.0217 (0.0224)
Wfa z-score*Fixed Bonus	-0.0160 (0.0209)	-0.0156 (0.0210)	-0.00959 (0.0181)	-0.00954 (0.0177)	0.0145 (0.0220)	0.0157 (0.0215)	0.0238 (0.0217)	0.0211 (0.0215)
No controls	X				X			
Child-level controls		X	X	X		X	X	X
Mother-level controls			X	X			X	X
Worker-level controls				X				X
N	6505	6505	4179	4179	6964	6964	4454	4454

Notes: Heteroscedasticity-consistent standard errors accounting for clustering at the center level in parentheses. Data are from two consecutive rounds of surveys carried out in October 2014 and January 2015 in columns (1) to (4) and from two consecutive rounds of surveys carried out in January 2015 and April 2015 for columns (5) to (8). Attrited is a dummy variable that takes value equal to 1 if the child attrited from the sample between rounds (2) and (3) in columns (1) to (4) and between rounds (3) and (4) in columns (5) to (8). Performance Pay was promised to workers in November 2014 based on individual weight-for-age targets and was paid out in February 2015. Fixed Bonus was an ex-ante incentive of Rs. 200 per worker in November 2014. All dependent variables are the changes in a child's health indicator over the two consecutive rounds. Child-level controls include age and sex of child, mother controls include dummy variables for if mother identifies herself as scheduled caste, if mother identifies herself as Hindu, if there is a grandmother at home, if mother cannot read and write, if husband cannot read and write, if mother is a homemaker, if toilet is communal, if toilet has no flush, mother's age, total children in household, household income and an index of 13 fixed assets in the household. Worker-level controls are dummy variables for if worker identifies herself as scheduled caste, if worker identifies herself as Hindu, if worker is college-educated, worker's age and dummy variables for the availability of the following resources at the center: electricity, fan, helper, chart, blackboard, drinking water and toilet. \*Significant at 10%, \*\*Significant at 5%, \*\*\*Significant at 1%.

Table 2.4 Mean of health indicators across treatments and rounds

	Block 1	Block 2	
	Control	Performance Pay	Fixed Bonus
	Round 1		
Weight	13.09 (1.95)	13.67 (2.02)	13.48 (1.98)
	Round 2		
Weight	13.47 (2.07)	13.74 (2.09)	13.73 (1.97)
	Round 3		
Weight	14.05 (2.05)	14.53 (2.08)	14.42 (1.99)
	Round 4		
Weight	13.90 (2.02)	14.49 (2.07)	14.29 (2.03)
	Round 5		
Weight	13.87 (2.09)	14.42 (2.26)	14.30 (2.04)
	Round 1		
Wfa Z-Score	-1.70 (0.82)	-1.51 (0.81)	-1.59 (0.83)
	Round 2		
Wfa Z-Score	-1.59 (0.85)	-1.47 (0.85)	-1.47 (0.83)
	Round 3		
Wfa Z-Score	-1.38 (0.83)	-1.18 (0.82)	-1.23 (0.82)
	Round 4		
Wfa Z-Score	-1.51 (0.81)	-1.23 (0.80)	-1.31 (0.88)
	Round 5		
Wfa Z-Score	-1.62 (0.79)	-1.32 (0.85)	-1.37 (0.83)
	Round 1		
Wfa Malnutrition	0.44 (0.50)	0.35 (0.48)	0.39 (0.49)
	Round 2		
Wfa Malnutrition	0.39 (0.49)	0.33 (0.47)	0.32 (0.47)
	Round 3		
Wfa Malnutrition	0.29 (0.45)	0.19 (0.39)	0.20 (0.40)
	Round 4		
Wfa Malnutrition	0.35 (0.48)	0.21 (0.40)	0.26 (0.44)
	Round 5		
Wfa Malnutrition	0.41 (0.49)	0.26 (0.44)	0.28 (0.45)

Table 3.1: Short term effects on health outcomes after introduction of treatments

<i>change in Dependent Variable</i>	(1) Weight	(2) Wfa z	(3) Wfa mal	(4) Weight	(5) Wfa z	(6) Wfa mal	(7) Weight	(8) Wfa z	(9) Wfa mal
Performance Pay	0.234*** (0.0618)	0.108*** (0.0302)	-0.0400* (0.0222)	0.196*** (0.0696)	0.0899*** (0.0335)	-0.0451* (0.0261)	0.219*** (0.0772)	0.101*** (0.0370)	-0.0561** (0.0269)
Fixed Bonus	0.107 (0.0757)	0.0490 (0.0352)	-0.0185 (0.0221)	0.103 (0.0860)	0.0474 (0.0405)	-0.0238 (0.0272)	0.123 (0.0933)	0.0557 (0.0442)	-0.0333 (0.0278)
No controls	X	X	X						
Mother and child-level controls				X	X	X	X	X	X
Worker-level controls							X	X	X
N	5203	5169	5174	3528	3522	3524	3528	3522	3524

Notes: Heteroscedasticity-consistent standard errors accounting for clustering at the center level in parentheses. Data are from two consecutive rounds of surveys carried out in October 2014 and January 2015. Performance Pay was promised to workers in November 2014 based on individual weight-for-age targets and was paid out in February 2015. Fixed Bonus was an ex-ante incentive of Rs. 200 per worker in November 2014. All dependent variables are the changes in a child's health indicator over the two consecutive rounds. Weight is measured in kilograms. Wfa z is the weight-for-age z score given the child's sex and age. Wfa mal is an indicator for malnutrition as measured by weight-for-height z score and Wfa mal is an indicator based on weight-for-age z score. Mother and child-level controls include age and sex of child, a dummy variables for if mother identifies herself as scheduled caste, if mother identifies herself as Hindu, if there is a grandmother at home, if mother cannot read and write, if husband cannot read and write, if mother is a homemaker, if toilet is communal, if toilet has no flush, mother's age, total children in household, household income and an index of 13 fixed assets in the household. Worker-level controls are dummy variables for if worker identifies herself as scheduled caste, if worker identifies herself as Hindu, if worker is college-educated, worker's age and dummy variables for the availability of the following resources at the center: electricity, fan, helper, chart, blackboard, drinking water and toilet. \*Significant at 10%, \*\*Significant at 5%, \*\*\*Significant at 1%.

Table 3.2: Medium term effects on health outcomes

<i>change in Dependent Variable</i>	(1) Weight	(2) Wfa z	(3) Wfa mal	(4) Weight	(5) Wfa z	(6) Wfa mal	(7) Weight	(8) Wfa z	(9) Wfa mal
Performance Pay	0.157*** (0.0554)	0.0631** (0.0266)	-0.0413** (0.0165)	0.192*** (0.0707)	0.0793** (0.0334)	-0.0487** (0.0213)	0.231*** (0.0687)	0.0976*** (0.0327)	-0.0522** (0.0219)
Fixed Bonus	0.131** (0.0657)	0.0568* (0.0321)	-0.0262 (0.0189)	0.159** (0.0753)	0.0681* (0.0371)	-0.0298 (0.0241)	0.196** (0.0776)	0.0878** (0.0380)	-0.0341 (0.0241)
No controls	X	X	X						
Mother and child-level controls				X	X	X	X	X	X
Worker-level controls							X	X	X
N	3468	3436	3445	2303	2301	2302	2303	2301	2302

Notes: Heteroscedasticity-consistent standard errors accounting for clustering at the center level in parentheses. Data are from two consecutive rounds of surveys carried out in January 2015 and April 2015. Performance Pay was promised to workers in November 2014 based on individual weight-for-age targets and was paid out in February 2015. Another round of promises was made in February 2015 and payments were made in May 2015. Fixed Bonus was an ex-ante incentive of Rs. 200 in November 2014. All dependent variables are the changes in a child's health indicator over the two consecutive rounds. Weight is measured in kilograms. Wfa z is the weight-for-age z score given the child's sex and age. Wfh mal is an indicator for malnutrition as measured by weight-for-height z score and Wfa mal is an indicator based on weight-for-age z score. Mother and child-level controls include age and sex of child, a dummy variables for if mother identifies herself as scheduled caste, if mother identifies herself as Hindu, if there is a grandmother at home, if mother cannot read and write, if husband cannot read and write, if mother is a homemaker, if toilet is communal, if toilet has no flush, mother's age, total children in household, household income and an index of 13 fixed assets in the household. Worker-level controls are dummy variables for if worker identifies herself as scheduled caste, if worker identifies herself as Hindu, if worker is college-educated, worker's age and dummy variables for the availability of the following resources at the center: electricity, fan, helper, chart, blackboard, drinking water and toilet. \*Significant at 10%, \*\*Significant at 5%, \*\*\*Significant at 1%.

Table 3.3: Fading-out effects on health outcomes after discontinuation of treatments

<i>change in Dependent Variable</i>	(1) Weight	(2) Wfa z	(3) Wfa mal	(4) Weight	(5) Wfa z	(6) Wfa mal	(7) Weight	(8) Wfa z	(9) Wfa mal
Performance Pay	0.101 (0.0772)	0.0327 (0.0354)	-0.0171 (0.0195)	0.0709 (0.0873)	0.0269 (0.0392)	-0.0218 (0.0238)	0.0898 (0.0904)	0.0355 (0.0408)	-0.0338 (0.0235)
Fixed Bonus	0.0129 (0.0836)	0.00420 (0.0394)	0.00587 (0.0192)	0.0142 (0.0705)	0.00738 (0.0337)	0.00554 (0.0261)	0.00967 (0.0752)	0.00266 (0.0357)	0.00262 (0.0267)
No controls	X	X	X						
Mother and child-level controls				X	X	X	X	X	X
Worker-level controls							X	X	X
N	3050	3022	3023	2230	2223	2224	2230	2223	2224

Notes: Heteroscedasticity-consistent standard errors accounting for clustering at the center level in parentheses. Data are from two consecutive rounds of surveys carried out in April 2015 and July 2015. Performance Pay was promised to workers in November 2014 based on individual weight-for-age targets and was paid out in February 2015. Another round of promises was made in February 2015 and payments were made in May 2015. Fixed Bonus was an ex-ante incentive of Rs. 200 per worker in November 2014. All dependent variables are the changes in a child's health indicator over the two consecutive rounds. Weight is measured in kilograms. Wfa z is the weight-for-age z score given the child's sex and age. Wfa mal is an indicator for malnutrition as measured by weight-for-height z score and Wfa mal is an indicator based on weight-for-age z score. Mother and child-level controls include age and sex of child, a dummy variables for if mother identifies herself as scheduled caste, if mother identifies herself as Hindu, if there is a grandmother at home, if mother cannot read and write, if husband cannot read and write, if mother is a homemaker, if toilet is communal, if toilet has no flush, mother's age, total children in household, household income and an index of 13 fixed assets in the household. Worker-level controls are dummy variables for if worker identifies herself as scheduled caste, if worker identifies herself as Hindu, if worker is college-educated, worker's age and dummy variables for the availability of the following resources at the center: electricity, fan, helper, chart, blackboard, drinking water and toilet. \*Significant at 10%, \*\*Significant at 5%, \*\*\*Significant at 1%.

Table 4: Checking for pre-trends in health outcomes between Baseline-I and Baseline-II

<i>change in Dependent Variable</i>	(1) Weight	(2) Wfa z	(3) Wfa mal	(4) Weight	(5) Wfa z	(6) Wfa mal	(7) Weight	(8) Wfa z	(9) Wfa mal
Performance Pay	-0.0428 (0.103)	0.000595 (0.0359)	-0.0307 (0.0219)	-0.0888 (0.124)	0.000222 (0.0405)	-0.0313 (0.0222)	-0.0991 (0.119)	0.00620 (0.0411)	-0.0305 (0.0223)
Fixed Bonus	0.135* (0.0785)	0.0736* (0.0390)	-0.0409 (0.0256)	0.127 (0.0830)	0.0782* (0.0402)	-0.0404 (0.0277)	0.0971 (0.0884)	0.0694 (0.0423)	-0.0305 (0.0285)
No controls	X	X	X						
Mother and child-level controls				X	X	X	X	X	X
Worker-level controls							X	X	X
N	4674	4630	4642	3744	3730	3739	3744	3730	3739

Notes: Heteroscedasticity-consistent standard errors accounting for clustering at the center level in parentheses. Data are from two consecutive rounds of Baseline surveys carried out in July 2014 and October 2014. Performance Pay was promised to workers in November 2014 based on individual weight-for-age targets and was paid out in February 2015. Another round of promises was made in February 2015 and payments were made in May 2015. Fixed Bonus was an ex-ante incentive of Rs. 200 per worker in November 2014. All dependent variables are the changes in a child's health indicator over the two consecutive rounds. Weight is measured in kilograms. Wfa z is the weight-for-age z score given the child's sex and age. Wfh mal is an indicator for malnutrition as measured by weight-for-height z score and Wfa mal is an indicator based on weight-for-age z score. Mother and child-level controls include age and sex of child, a dummy variables for if mother identifies herself as scheduled caste, if mother identifies herself as Hindu, if there is a grandmother at home, if mother cannot read and write, if husband cannot read and write, if mother is a homemaker, if toilet is communal, if toilet has no flush, mother's age, total children in household, household income and an index of 13 fixed assets in the household. Worker-level controls are dummy variables for if worker identifies herself as scheduled caste, if worker identifies herself as Hindu, if worker is college-educated, worker's age and dummy variables for the availability of the following resources at the center: electricity, fan, helper, chart, blackboard, drinking water and toilet. \*Significant at 10%, \*\*Significant at 5%, \*\*\*Significant at 1%.

Table 5.1: Heterogeneity check for short term effects

	Boys	Girls	3-4 years	4-5 years	5-6 years	Literate mother	Illiterate mother	Literate father	Illiterate father	Total children <= 2	Total children > 2	Fixed assets > median	Fixed assets < median
<i>change in Dependent Variable</i>	(1) Weight	(2) Weight	(3) Weight	(4) Weight	(5) Weight	(6) Weight	(7) Weight	(8) Weight	(9) Weight	(10) Weight	(11) Weight	(12) Weight	(13) Weight
Performance Pay	0.202*** (0.0680)	0.264*** (0.0812)	0.257*** (0.0759)	0.212** (0.104)	0.277** (0.112)	0.203*** (0.0753)	0.297*** (0.0972)	0.236*** (0.0727)	0.172 (0.133)	0.266*** (0.0713)	0.190** (0.0835)	0.200** (0.0906)	0.234*** (0.0866)
Fixed Bonus	0.201** (0.0886)	0.0102 (0.0939)	0.145* (0.0865)	0.0820 (0.106)	0.0668 (0.141)	0.123 (0.0998)	0.0348 (0.102)	0.0874 (0.0877)	0.114 (0.182)	0.134 (0.0823)	0.0690 (0.0944)	0.0498 (0.105)	0.126 (0.107)
N	2545	2650	2005	1807	1175	2729	1524	3239	977	2802	2401	1904	2442

Notes: Heteroscedasticity-consistent standard errors accounting for clustering at the center level in parentheses. Data are from two consecutive rounds of surveys carried out in October 2014 and January 2015. Performance Pay was promised to workers in November 2014 based on individual weight-for-age targets and was paid out in February 2015. Fixed Bonus was an ex-ante incentive of Rs. 200 per worker in November 2014. All dependent variables are the changes in a child's health indicator over the two consecutive rounds. Weight is measured in kilograms. Columns (1) and (2) split the sample by sex of child, columns (3)-(5) by age of child, column (6)-(9) by literacy of parents, columns (9) and (10) by total children in household less than or greater than the median of 2, and columns (12) and (13) by the median proportion of 13 fixed assets owned by household (46%). \*Significant at 10%, \*\*Significant at 5%, \*\*\*Significant at 1%.

Table 5.2: Heterogeneity check for medium term effects

<i>change in Dependent Variable</i>	Boys	Girls	3-4 years	4-5 years	5-6 years	Literate mother	Illiterate mother	Literate father	Illiterate father	Total children <= 2	Total children > 2	Fixed assets > median	Fixed assets < median
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight
Performance Pay	0.154* (0.0860)	0.161** (0.0681)	0.140** (0.0697)	0.134 (0.0970)	0.197** (0.0920)	0.133* (0.0785)	0.142 (0.102)	0.133* (0.0754)	0.199* (0.119)	0.120* (0.0658)	0.200** (0.0818)	0.217*** (0.0828)	0.107 (0.0878)
Fixed Bonus	0.133 (0.0851)	0.133 (0.0873)	0.186* (0.0980)	0.125 (0.0884)	0.0145 (0.108)	0.141* (0.0827)	0.149 (0.0943)	0.127 (0.0832)	0.234** (0.111)	0.128* (0.0740)	0.103 (0.0824)	0.227** (0.0954)	0.101 (0.0774)
N	1681	1780	1202	1229	852	1766	940	2128	548	2070	1398	1346	1468

Notes: Heteroscedasticity-consistent standard errors accounting for clustering at the center level in parentheses. Data are from two consecutive rounds of surveys carried out in January 2015 and April 2015. Performance Pay was promised to workers in November 2014 based on individual weight-for-age targets and was paid out in February 2015. Another round of promises was made in February 2015 and payments were made in May 2015. Fixed Bonus was an ex-ante incentive of Rs. 200 in November 2014. All dependent variables are the changes in a child's health indicator over the two consecutive rounds. Weight is measured in kilograms. Columns (1) and (2) split the sample by sex of child, columns (3)-(5) by age of child, column (6)-(9) by literacy of parents, columns (9) and (10) by total children in household less than or greater than the median of 2, and columns (12) and (13) by the median proportion of 13 fixed assets owned by household (46%). \*Significant at 10%, \*\*Significant at 5%, \*\*\*Significant at 1%.

Table 5.3: Threshold effects

<i>change in Dependent Variable</i>	Near	Far	Near	Far	Near	Far
	Moderate		Severe		Normal	
	(1)	(2)	(3)	(4)	(5)	(6)
	Wfa z	Wfa z	Wfa z	Wfa z	Wfa z	Wfa z
Performance Pay	0.142*** (0.0472)	0.0689 (0.0521)	0.101 (0.121)	0.0659 (0.142)	0.138*** (0.0409)	0.199*** (0.0432)
Fixed Bonus	0.0795* (0.0479)	0.109 (0.0783)	0.0297 (0.0977)	-0.0293 (0.165)	0.0843** (0.0414)	0.121** (0.0512)
N	710	767	250	224	1650	1568

Notes: Heteroscedasticity-consistent standard errors accounting for clustering at the center level in parentheses. Data are from two consecutive rounds of surveys carried out in October 2014 and January 2015. Performance Pay was promised to workers in November 2014 based on individual weight-for-age targets and was paid out in February 2015. Fixed Bonus was an ex-ante incentive of Rs. 200 per worker in November 2014. Near means that in Round 2, child was closer to the target weight than the median difference between present weight and target weight for a child in the Moderate category (within 1 kg of the Normal target), Severe category (within 2.5 kg of the Moderate target), and Normal category (within 0.900 kg of the Moderate threshold). Far is defined as not Near. \*Significant at 10%, \*\*Significant at 5%, \*\*\*Significant at 1%.

Table 5.4: Dose Response effects

<i>change in Dependent Variable</i>	Low #mal	High #mal	Low malp	High malp	Low #mal	High #mal	Low malp	High malp
	Short-term		Short-term		Medium-term		Medium-term	
	(1)	(2)	(3)	(4)	(5)	(6)	(1)	(2)
	Wfa z	Wfa z	Wfa z	Wfa z	Wfa z	Wfa z	Wfa z	Wfa z
Performance Pay	0.119*** (0.0311)	0.140*** (0.0525)	0.149*** (0.0382)	0.138*** (0.0435)	0.0404 (0.0406)	0.0751** (0.0315)	0.0411 (0.0440)	0.0874*** (0.0318)
Fixed Bonus	0.0338 (0.0399)	0.0865* (0.0518)	0.0764 (0.0465)	0.0625 (0.0502)	0.0714 (0.0505)	0.0378 (0.0380)	0.0766 (0.0556)	0.0373 (0.0350)
N	3014	2155	2636	2533	1607	1829	1482	1954

Notes: Heteroscedasticity-consistent standard errors accounting for clustering at the center level in parentheses. Data are from two consecutive rounds of surveys carried out in October 2014 and January 2015. Performance Pay was promised to workers in November 2014 based on individual weight-for-age targets and was paid out in February 2015. The performance pay was then promised again to the same set of workers in February 2015 and paid out in May 2015. Fixed Bonus was an ex-ante incentive of Rs. 200 per worker in November 2014. Medium-term is measurement between January 2015 and April 2015. Low #mal is the subset of centers where total malnourished children at baseline were less than or equal to the median (10 children). Low malp is defined as the subset of centers where the proportion of malnourished children at baseline were less than or equal to the median (0.36). High #mal and High malp are the centers that are not Low #mal and Low malp respectively. \*Significant at 10%, \*\*Significant at 5%, \*\*\*Significant at 1%.

Table 6.1: Mechanism of short-term effect - Quantity of interaction between worker and mother

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<i>change in Dependent Variable</i>	Home visits by worker	Center visits by mother	Frequency of worker talking about child	Home visits by worker	Center visits by mother	Frequency of worker talking about child	Home visits by worker	Center visits by mother	Frequency of worker talking about child
Performance Pay	-1.453 (0.968)	-1.743 (1.560)	4.311*** (0.937)	-1.229 (0.898)	-1.327 (1.525)	4.323*** (0.934)	-1.256 (0.915)	-1.141 (1.438)	4.410*** (0.970)
Fixed Bonus	-2.085* (1.148)	-1.111 (0.890)	5.325*** (1.119)	-1.835 (1.144)	-0.995 (0.869)	4.996*** (1.020)	-2.019* (1.092)	-1.223 (0.855)	5.012*** (1.029)
No controls	X	X	X						
Mother and child-level controls				X	X	X	X	X	X
Worker-level controls							X	X	X
N	4260	3714	3990	3275	2831	3062	3275	2831	3062

Notes: Heteroscedasticity-consistent standard errors accounting for clustering at the center level in parentheses. Data are from two consecutive rounds of surveys carried out in October 2014 and January 2015. Performance Pay was promised to workers in November 2014 based on individual weight-for-age targets and was paid out in February 2015. Fixed Bonus was an ex-ante incentive of Rs. 200 per worker in November 2014. All dependent variables are the changes in the indicator over the two consecutive rounds. Home visits by worker are number of visits by Anganwadi worker to the household in the previous month as reported by the mother. Center visits by mother are mother's visits to the Anganwadi in the previous month as reported by the mother. Frequency of worker talking about child is the number of times worker spoke about child with mother in the previous month as reported by the mother. Mother and child-level controls include age and sex of child, a dummy variables for if mother identifies herself as scheduled caste, if mother identifies herself as Hindu, if there is a grandmother at home, if mother cannot read and write, if husband cannot read and write, if mother is a homemaker, if toilet is communal, if toilet has no flush, mother's age, total children in household, household income and an index of 13 fixed assets in the household. Worker-level controls are dummy variables for if worker identifies herself as scheduled caste, if worker identifies herself as Hindu, if worker is college-educated, worker's age and dummy variables for the availability of the following resources at the center: electricity, fan, helper, chart, blackboard, drinking water and toilet. \*Significant at 10%, \*\*Significant at 5%, \*\*\*Significant at 1%.

Table 6.2: Mechanism of medium term effects - Quantity of interaction between worker and mother

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<i>change in Dependent Variable</i>	Home visits by worker	Center visits by mother	Frequency of worker talking about child	Home visits by worker	Center visits by mother	Frequency of worker talking about child	Home visits by worker	Center visits by mother	Frequency of worker talking about child
Performance Pay	3.730*** (0.834)	-1.158 (1.144)	1.270 (1.353)	4.424*** (0.859)	-0.883 (1.190)	1.008 (1.394)	4.434*** (0.869)	-1.468 (1.229)	0.834 (1.323)
Fixed Bonus	4.106*** (0.892)	-0.00817 (1.205)	1.441 (1.402)	4.495*** (0.918)	0.0936 (1.244)	1.250 (1.385)	4.570*** (0.929)	-0.841 (1.248)	1.876 (1.354)
No controls	X	X	X						
Mother and child-level controls				X	X	X	X	X	X
Worker-level controls							X	X	X
N	2758	2305	2607	2108	1753	1997	2108	1753	1997

Notes: Heteroscedasticity-consistent standard errors accounting for clustering at the center level in parentheses. Data are from two consecutive rounds of surveys carried out in January 2015 and April 2015. Performance Pay was promised to workers in November 2014 based on individual weight-for-age targets and was paid out in February 2015. Another round of promises was made in February 2015 and bonuses were paid out in May 2015. Fixed Bonus was an ex-ante incentive of Rs. 200 per worker in November 2014. All dependent variables are the changes in the indicator over the two consecutive rounds. Home visits by worker are number of visits by Anganwadi worker to the household in the previous month as reported by the mother. Center visits by mother are mother's visits to the Anganwadi in the previous month as reported by the mother. Frequency of worker talking about child is the number of times worker spoke about child with mother in the previous month as reported by the mother. Mother and child-level controls include age and sex of child, a dummy variables for if mother identifies herself as scheduled caste, if mother identifies herself as Hindu, if there is a grandmother at home, if mother cannot read and write, if husband cannot read and write, if mother is a homemaker, if toilet is communal, if toilet has no flush, mother's age, total children in household, household income and an index of 13 fixed assets in the household. Worker-level controls are dummy variables for if worker identifies herself as scheduled caste, if worker identifies herself as Hindu, if worker is college-educated, worker's age and dummy variables for the availability of the following resources at the center: electricity, fan, helper, chart, blackboard, drinking water and toilet. \*Significant at 10%, \*\*Significant at 5%, \*\*\*Significant at 1%.

Table 7.1: Mechanism of short term effects - Quality of information provided by worker to mother

<i>change in Dependent Variable</i>	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Nutrition	Hygiene	Chart	Scare	Nutrition	Hygiene	Chart	Scare	Nutrition	Hygiene	Chart	Scare
Performance Pay	0.189** (0.0770)	0.0795 (0.0806)	0.0658 (0.0841)	0.00478 (0.0836)	0.214*** (0.0750)	0.108 (0.0817)	0.0551 (0.0796)	0.0116 (0.0854)	0.226*** (0.0767)	0.0949 (0.0832)	0.0712 (0.0780)	-0.0206 (0.0866)
Fixed Bonus	0.240*** (0.0638)	0.0470 (0.0948)	-0.00634 (0.0805)	-0.101 (0.0705)	0.264*** (0.0646)	0.0778 (0.0923)	0.0159 (0.0782)	-0.0939 (0.0734)	0.245*** (0.0633)	0.0757 (0.0907)	0.0138 (0.0792)	-0.0922 (0.0725)
No controls	X	X	X	X								
Mother and child-level controls					X	X	X	X	X	X	X	X
Worker-level controls									X	X	X	X
N	4197	4197	4197	4197	3223	3223	3223	3223	3223	3223	3223	3223

Notes: Heteroscedasticity-consistent standard errors accounting for clustering at the center level in parentheses. Data are from two consecutive rounds of surveys carried out in October 2014 and January 2015. Performance Pay was promised to workers in November 2014 based on individual weight-for-age targets and was paid out in February 2015. Fixed Bonus was an ex-ante incentive of Rs. 200 per worker in November 2014. All dependent variables are the changes in an indicator over the two consecutive rounds. Nutrition is a dummy variable equal to 1 if, in the last month, the worker spoke to the mother about her child's nutrition. Hygiene is a dummy variable equal to 1 if, in the last month, the worker talked with the mother about maintaining child's hygiene. Chart is a dummy variable equal to 1 if, in the last month, the worker showed the mother a growth chart. Scare is a dummy variable equal to one if, in the last month, the worker scared the mother with consequences of malnutrition. Mother and child-level controls include age and sex of child, a dummy variables for if mother identifies herself as scheduled caste, if mother identifies herself as Hindu, if there is a grandmother at home, if mother cannot read and write, if husband cannot read and write, if mother is a homemaker, if toilet is communal, if toilet has no flush, mother's age, total children in household, household income and an index of 13 fixed assets in the household. Worker-level controls are dummy variables for if worker identifies herself as scheduled caste, if worker identifies herself as Hindu, if worker is college-educated, worker's age and dummy variables for the availability of the following resources at the center: electricity, fan, helper, chart, blackboard, drinking water and toilet. \*Significant at 10%, \*\*Significant at 5%, \*\*\*Significant at 1%.

Table 7.2: Mechanism of medium term effects - Quality of information provided by worker to mother

<i>change in Dependent Variable</i>	(1) Nutrition	(2) Hygiene	(3) Chart	(4) Scare	(5) Nutrition	(6) Hygiene	(7) Chart	(8) Scare	(9) Nutrition	(10) Hygiene	(11) Chart	(12) Scare
Performance Pay	-0.231*** (0.0824)	0.0667 (0.0875)	-0.355*** (0.108)	-0.119 (0.0808)	-0.275*** (0.0763)	0.108 (0.0871)	-0.378*** (0.103)	-0.139* (0.0826)	-0.306*** (0.0802)	0.0843 (0.0805)	-0.341*** (0.105)	-0.133 (0.0876)
Fixed Bonus	-0.120 (0.0760)	0.164** (0.0759)	-0.433*** (0.0985)	0.0672 (0.0773)	-0.174** (0.0784)	0.222*** (0.0785)	-0.496*** (0.0987)	-0.000201 (0.0820)	-0.177** (0.0747)	0.246*** (0.0795)	-0.487*** (0.0981)	-0.0122 (0.0916)
No controls	X	X	X	X								
Mother and child-level controls					X	X	X	X	X	X	X	X
Worker-level controls									X	X	X	X
N	2645	2645	2645	2645	2024	2024	2024	2024	2024	2024	2024	2024

Notes: Heteroscedasticity-consistent standard errors accounting for clustering at the center level in parentheses. Data are from two consecutive rounds of surveys carried out in January 2015 and April 2015. Performance Pay was promised to workers in November 2014 based on individual weight-for-age targets and was paid out in February 2015. Another round of promises was made in February 2015 and bonuses were paid out in May 2015. Fixed Bonus was an ex-ante incentive of Rs. 200 per worker in November 2014. All dependent variables are the changes in the indicator over the two consecutive rounds. All dependent variables are the changes in an indicator over the two consecutive rounds. Nutrition is a dummy variable equal to 1 if, in the last month, the worker spoke to the mother about her child's nutrition. Hygiene is a dummy variable equal to 1 if, in the last month, the worker talked with the mother about maintaining child's hygiene. Chart is a dummy variable equal to 1 if, in the last month, the worker showed the mother a growth chart. Scare is a dummy variable equal to one if, in the last month, the worker scared the mother with consequences of malnutrition. Mother and child-level controls include age and sex of child, a dummy variables for if mother identifies herself as scheduled caste, if mother identifies herself as Hindu, if there is a grandmother at home, if mother cannot read and write, if husband cannot read and write, if mother is a homemaker, if toilet is communal, if toilet has no flush, mother's age, total children in household, household income and an index of 13 fixed assets in the household. Worker-level controls are dummy variables for if worker identifies herself as scheduled caste, if worker identifies herself as Hindu, if worker is college-educated, worker's age and dummy variables for the availability of the following resources at the center: electricity, fan, helper, chart, blackboard, drinking water and toilet. \*Significant at 10%, \*\*Significant at 5%, \*\*\*Significant at 1%.

Table 8.1: Mechanisms of short term effects - Diet at home

<i>change in Dependent Variable</i>	(1) Milk	(2) Green veg	(3) Dessert	(4) Porridge	(5) Milk	(6) Green veg	(7) Dessert	(8) Porridge	(9) Milk	(10) Green veg	(11) Dessert	(12) Porridge
Performance Pay	0.0604*** (0.0216)	-0.147*** (0.0308)	0.165** (0.0654)	0.119* (0.0657)	0.0624*** (0.0168)	-0.143*** (0.0323)	0.215*** (0.0628)	0.119* (0.0631)	0.0616*** (0.0182)	-0.130*** (0.0341)	0.228*** (0.0608)	0.105* (0.0617)
Fixed Bonus	0.0776*** (0.0203)	-0.161*** (0.0299)	0.183*** (0.0560)	0.253*** (0.0597)	0.0730*** (0.0207)	-0.150*** (0.0299)	0.238*** (0.0608)	0.282*** (0.0582)	0.0666*** (0.0228)	-0.148*** (0.0312)	0.213*** (0.0582)	0.293*** (0.0573)
No controls	X	X	X	X								
Mother and child-level controls					X	X	X	X	X	X	X	X
Worker-level controls									X	X	X	X
N	3084	3061	3033	3016	2358	2354	2326	2321	2358	2354	2326	2321

Notes: Heteroscedasticity-consistent standard errors accounting for clustering at the center level in parentheses. Data are from two consecutive rounds of surveys carried out in October 2014 and January 2015. Performance Pay was promised to workers in November 2014 based on individual weight-for-age targets and was paid out in February 2015. Fixed Bonus was an ex-ante incentive of Rs. 200 per worker in November 2014. All dependent variables are the changes in an indicator over the two consecutive rounds. Milk, Green veg, Dessert (traditional) and Porridge are dummy variables equal to 1 if the mother reports feeding these items at least twice a week to her child. Mother and child-level controls include age and sex of child, a dummy variables for if mother identifies herself as scheduled caste, if mother identifies herself as Hindu, if there is a grandmother at home, if mother cannot read and write, if husband cannot read and write, if mother is a homemaker, if toilet is communal, if toilet has no flush, mother's age, total children in household, household income and an index of 13 fixed assets in the household. Worker-level controls are dummy variables for if worker identifies herself as scheduled caste, if worker identifies herself as Hindu, if worker is college-educated, worker's age and dummy variables for the availability of the following resources at the center: electricity, fan, helper, chart, blackboard, drinking water and toilet. \*Significant at 10%, \*\*Significant at 5%, \*\*\*Significant at 1%.

Table 8.2: Mechanisms of medium term effects - Diet at home

<i>change in Dependent Variable</i>	(1) Milk	(2) Green veg	(3) Dessert	(4) Porridge	(5) Milk	(6) Green veg	(7) Dessert	(8) Porridge	(9) Milk	(10) Green veg	(11) Dessert	(12) Porridge
Performance Pay	0.108*** (0.0301)	0.00789 (0.0329)	0.0260 (0.0640)	0.208*** (0.0663)	0.108*** (0.0317)	0.0228 (0.0373)	0.00145 (0.0632)	0.219*** (0.0729)	0.112*** (0.0333)	-0.0114 (0.0435)	-0.0269 (0.0631)	0.201*** (0.0679)
Fixed Bonus	0.0486** (0.0235)	-0.0260 (0.0302)	0.00225 (0.0595)	0.0247 (0.0572)	0.0404 (0.0275)	-0.0266 (0.0347)	-0.0495 (0.0606)	-0.00697 (0.0629)	0.0467* (0.0280)	-0.0485 (0.0402)	-0.0648 (0.0628)	0.00953 (0.0674)
No controls	X	X	X	X								
Mother and child-level controls					X	X	X	X	X	X	X	X
Worker-level controls									X	X	X	X
N	2012	2007	1998	1993	1516	1512	1507	1502	1516	1512	1507	1502

Notes: Heteroscedasticity-consistent standard errors accounting for clustering at the center level in parentheses. Data are from two consecutive rounds of surveys carried out in January 2015 and April 2015. Performance Pay was promised to workers in November 2014 based on individual weight-for-age targets and was paid out in February 2015. Another round of promises was made in February 2015 and bonuses were paid out in May 2015. Fixed Bonus was an ex-ante incentive of Rs. 200 per worker in November 2014. All dependent variables are the changes in an indicator over the two consecutive rounds. Milk, Green veg, Dessert (traditional) and Porridge are dummy variables equal to 1 if the mother reports feeding these items at least twice a week to her child. Mother and child-level controls include age and sex of child, a dummy variables for if mother identifies herself as scheduled caste, if mother identifies herself as Hindu, if there is a grandmother at home, if mother cannot read and write, if husband cannot read and write, if mother is a homemaker, if toilet is communal, if toilet has no flush, mother's age, total children in household, household income and an index of 13 fixed assets in the household. Worker-level controls are dummy variables for if worker identifies herself as scheduled caste, if worker identifies herself as Hindu, if worker is college-educated, worker's age and dummy variables for the availability of the following resources at the center: electricity, fan, helper, chart, blackboard, drinking water and toilet. \*Significant at 10%, \*\*Significant at 5%, \*\*\*Significant at 1%.

Table 9: Attendance of worker as measured through announced visit by independent supervisor between rounds

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	2014				2015			
	August	September	November	December	February	March	May	June
Performance Pay	0.0336 (0.0774)	-0.0303 (0.0862)	0.274*** (0.0519)	0.132 (0.0855)	-0.0809 (0.0947)	-0.0702 (0.103)	0.102 (0.0850)	0.175 (0.145)
Fixed Bonus	0.0733 (0.0702)	0.130* (0.0693)	0.186*** (0.0703)	0.133 (0.0869)	0.130* (0.0771)	0.194** (0.0773)	0.0596 (0.0865)	0.0791 (0.144)
Control	0.795*** (0.0319)	0.730*** (0.0347)	0.662*** (0.0371)	0.576*** (0.0389)	0.721*** (0.0502)	0.685*** (0.0513)	0.765*** (0.0464)	0.353*** (0.0532)
N	11689	12197	12325	12249	8035	7342	7176	5514

Notes: Heteroscedasticity-consistent standard errors accounting for clustering at the center level in parentheses. Data are from two consecutive rounds of surveys carried out in October 2014 and January 2015. Performance Pay was promised to workers in November 2014 based on individual weight-for-age targets and was paid out in February 2015. Another round of promises was made in February 2015 and bonuses were paid out in May 2015. Fixed Bonus was an ex-ante incentive of Rs. 200 per worker in November 2014. All dependent variables are the dummy variables for worker attendance during an unannounced visit in the specified inter-survey period. No other controls are included. \*Significant at 10%, \*\*Significant at 5%, \*\*\*Significant at 1%.

## APPENDIX - TABLES

Table A1: Baseline correlations between health and individual covariates

	(1) Weight	(2) Wfa z-score	(3) Wfh mal	(4) Wfa mal	(5) Height
Age of chld	1.109*** (0.0323)	-0.206*** (0.0158)	0.0256*** (0.00819)	0.0884*** (0.00856)	4.851*** (0.132)
Sex of Child (Male=1, Female=0)	0.440*** (0.0446)	-0.0132 (0.0221)	0.0287** (0.0116)	-0.00982 (0.0134)	0.877*** (0.172)
Mother is SC	-0.151*** (0.0575)	-0.0743*** (0.0279)	0.00236 (0.0124)	0.0405** (0.0159)	-0.475** (0.201)
Mother is Hindu	0.0611 (0.115)	0.0267 (0.0582)	-0.0199 (0.0252)	-0.0203 (0.0290)	-0.106 (0.346)
Mother's age	0.0304*** (0.00824)	0.0154*** (0.00402)	-0.00105 (0.00180)	-0.00589** (0.00228)	0.0940*** (0.0294)
Grandmother is home	0.142** (0.0563)	0.0750*** (0.0277)	-0.00244 (0.0147)	-0.0450*** (0.0156)	0.809*** (0.236)
Total children in hh	-0.109*** (0.0253)	-0.0543*** (0.0123)	-0.00274 (0.00622)	0.0270*** (0.00707)	-0.377*** (0.0881)
Total hh income ('0000)	0.131* (0.0771)	0.0696* (0.0376)	0.0157 (0.0202)	-0.0306 (0.0231)	0.853*** (0.309)
Mother is illiterate	-0.136** (0.0609)	-0.0685** (0.0297)	-0.00118 (0.0143)	0.0193 (0.0174)	-0.409** (0.206)
Father is illiterate	-0.00597 (0.0658)	-0.00907 (0.0328)	-0.000306 (0.0164)	0.0303 (0.0191)	-0.00916 (0.249)
Mother is homemaker	-0.0269 (0.0649)	-0.00969 (0.0305)	0.0285* (0.0155)	0.0120 (0.0188)	0.427 (0.266)
Toilet is communal	0.0842 (0.102)	0.0515 (0.0499)	0.0233 (0.0257)	-0.0156 (0.0289)	-0.0764 (0.432)
Toilet has no flush	-0.0510 (0.112)	-0.00859 (0.0563)	-0.0536 (0.0355)	0.0379 (0.0349)	-0.890** (0.351)
Fixed assets Index	0.488** (0.230)	0.234** (0.110)	0.0584 (0.0501)	-0.126* (0.0654)	2.402*** (0.840)
Worker is SC	-0.0155 (0.0754)	-0.00638 (0.0368)	-0.000291 (0.0191)	-0.00513 (0.0202)	-0.247 (0.312)
Worker is Hindu	0.00568 (0.121)	0.00744 (0.0589)	0.0584** (0.0272)	-0.00619 (0.0334)	1.152** (0.501)
Worker's age	0.00439 (0.00507)	0.00250 (0.00246)	0.000640 (0.00132)	-0.00166 (0.00139)	-0.00417 (0.0242)
Worker is College educated	0.0779 (0.0808)	0.0385 (0.0399)	-0.0268 (0.0209)	-0.00830 (0.0228)	-0.352 (0.333)
N	4942	4926	4674	4938	4935
adj. R-sq	0.297	0.065	0.010	0.037	0.366

Notes: Heteroscedasticity-consistent standard errors accounting for clustering at the center level in parentheses. Data are from the Baseline survey carried out in July 2014. Weight is measured in kilograms. Wfa z is the weight-for-age z score given the child's sex and age. Wfh mal is an indicator for malnutrition as measured by weight-for-height z score and Wfa mal is an indicator based on weight-for-age z score. Mother and child-level controls include age and sex of child, a dummy variables for if mother identifies herself as scheduled caste, if mother identifies herself as Hindu, if there is a grandmother at home, if mother cannot read and write, if husband cannot read and write, if mother is a homemaker, if toilet is communal, if toilet has no flush, mother's age, total children in household, household income and an index of 13 fixed assets in the household. Worker-level controls are dummy variables for if worker identifies herself as scheduled caste, if worker identifies herself as Hindu, if worker is college-educated, worker's age and center's infrastructure. \*Significant at 10%, \*\*Significant at 5%, \*\*\*Significant at 1%.

Table A2: Checking for effects on height

	Between	R1 & R2	R2 & R3	R3 & R4	R4 & R5	R1 & R2	R2 & R3	R3 & R4	R4 & R5	R1 & R2	R2 & R3	R3 & R4	R4 & R5
<i>change in Dependent Variable</i>	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	
	Height	Height	Height	Height	Height	Height	Height	Height	Height	Height	Height	Height	
Performance Pay	0.803 (0.496)	0.964** (0.417)	-0.141 (0.362)	-0.0891 (0.319)	0.359 (0.513)	1.104** (0.474)	-0.310 (0.355)	-0.0836 (0.354)	0.381 (0.480)	1.077** (0.502)	-0.263 (0.375)	-0.0946 (0.382)	
Fixed Bonus	0.852* (0.490)	0.651* (0.378)	-0.0590 (0.296)	-0.549* (0.315)	0.623 (0.509)	0.795* (0.454)	-0.184 (0.325)	-0.548 (0.345)	0.571 (0.494)	0.988* (0.511)	-0.206 (0.332)	-0.546 (0.353)	
No controls	X	X	X	X									
Mother and child-level controls					X	X	X	X	X	X	X	X	
Worker-level controls									X	X	X	X	
N	4634	5146	3428	3035	3721	3497	2286	2220	3721	3497	2286	2220	

Notes: Heteroscedasticity-consistent standard errors accounting for clustering at the center level in parentheses. Data are from all five rounds of surveys carried out between July 2014 and July 2015. Performance Pay was promised to workers in November 2014 based on individual weight-for-age targets and was paid out in February 2015. Another round of promises was made in February 2015 and payments were made in May 2015. Fixed Bonus was an ex-ante incentive of Rs. 200 per worker in November 2014. All dependent variables are the changes in a child's height (in cms) over two consecutive rounds. Mother and child-level controls include age and sex of child, a dummy variables for if mother identifies herself as scheduled caste, if mother identifies herself as Hindu, if there is a grandmother at home, if mother cannot read and write, if husband cannot read and write, if mother is a homemaker, if toilet is communal, if toilet has no flush, mother's age, total children in household, household income and an index of 13 fixed assets in the household. Worker-level controls are dummy variables for if worker identifies herself as scheduled caste, if worker identifies herself as Hindu, if worker is college-educated, worker's age and dummy variables for the availability of the following resources at the center: electricity, fan, helper, chart, blackboard, drinking water and toilet. \*Significant at 10%, \*\*Significant at 5%, \*\*\*Significant at 1%.

Table A3: Checking pre-trends for mechanisms

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
<i>change in Dependent Variable</i>	Home visits by worker	Center visits by mother	Frequency of worker talking about child	Nutrition	Hygiene	Chart	Scare	Milk	Green veg	Dessert	Porridge
Performance Pay	0.120 (1.144)	0.633 (1.070)	-1.419 (0.880)	0.0294 (0.0756)	0.104 (0.0887)	0.104 (0.0823)	0.0552 (0.0664)	0.00532 (0.0181)	-0.0634* (0.0370)	0.0442 (0.0871)	-0.0184 (0.0476)
Fixed Bonus	1.056 (1.105)	-1.020 (1.322)	-1.571 (0.982)	0.0115 (0.0727)	0.0662 (0.0978)	0.230*** (0.0774)	0.0703 (0.0589)	-0.00176 (0.0166)	-0.0140 (0.0523)	0.0429 (0.0692)	0.0289 (0.0527)
Mother and child-level controls	X	X	X	X	X	X	X	X	X	X	X
Worker-level controls	X	X	X	X	X	X	X	X	X	X	X
N	3412	3002	3178	3329	3329	3329	3329	2248	2244	2195	2215

Notes: Heteroscedasticity-consistent standard errors accounting for clustering at the center level in parentheses. Data are from two consecutive rounds of surveys carried out in July 2014 and October 2014. Performance Pay was promised to workers in November 2014 based on individual weight-for-age targets and was paid out in February 2015. Another round of promises was made in February 2015 and bonuses were paid out in May 2015. Fixed Bonus was an ex-ante incentive of Rs. 200 per worker in November 2014. All dependent variables are the changes in the indicator over the two consecutive rounds. Home visits by worker are number of visits by Anganwadi worker to the household in the previous month as reported by the mother. Center visits by mother are mother's visits to the Anganwadi in the previous month as reported by the mother. Frequency of worker talking about child is the number of times worker spoke about child with mother in the previous month as reported by the mother. Nutrition is a dummy variable equal to 1 if, in the last month, the worker spoke to the mother about her child's nutrition. Hygiene is a dummy variable equal to 1 if, in the last month, the worker talked with the mother about maintaining child's hygiene. Chart is a dummy variable equal to 1 if, in the last month, the worker showed the mother a growth chart. Scare is a dummy variable equal to one if, in the last month, the worker scared the mother with consequences of malnutrition. Milk, Green veg, Dessert (traditional) and Porridge are dummy variables equal to 1 if the mother reports feeding these items at least twice a week to her child. Mother and child-level controls include age and sex of child, a dummy variables for if mother identifies herself as scheduled caste, if mother identifies herself as Hindu, if there is a grandmother at home, if mother cannot read and write, if husband cannot read and write, if mother is a homemaker, if toilet is communal, if toilet has no flush, mother's age, total children in household, household income and an index of 13 fixed assets in the household. Worker-level controls are dummy variables for if worker identifies herself as scheduled caste, if worker identifies herself as Hindu, if worker is college-educated, worker's age and dummy variables for the availability of the following resources at the center: electricity, fan, helper, chart, blackboard, drinking water and toilet. \*Significant at 10%, \*\*Significant at 5%, \*\*\*Significant at 1%.

Table A4: Lee (2009) treatment effect bounds

Weight change between Rounds 2 and 3				
Performance Pay	Coef.	Std. Err.	z	P> z
lower	0.057	0.052	1.100	0.270
upper	0.388	0.051	7.630	0.000
Fixed Bonus				
Coef.	Std. Err.	z	P> z	
lower	0.044	0.072	0.610	0.540
upper	0.181	0.084	2.140	0.032
Weight change between Rounds 3 and 4				
Performance Pay	Coef.	Std. Err.	z	P> z
lower	0.050	0.049	1.030	0.305
upper	0.275	0.047	5.830	0.000
Fixed Bonus				
Coef.	Std. Err.	z	P> z	
lower	0.115	0.110	1.040	0.298
upper	0.147	0.117	1.260	0.207

Table A5: Net gains and transitions between malnutrition categories by treatment arm (percent of children)

	Short-term (from R2 to R3)				N
	Net Gain	Improved	No Change	Worsened	(# of obs.)
Performance Pay	13.3	16.4	80.6	3.1	850
Fixed Bonus	11.1	15.5	80.2	4.4	826
Control	9.3	15.0	79.3	5.7	3498

	Medium-term (from R3 to R4)				N
	Net Gain	Improved	No Change	Worsened	(# of obs.)
Performance Pay	-3.0	3.2	90.6	6.2	855
Fixed Bonus	-4.6	5.8	83.9	10.3	834
Control	-7.2	5.9	81.1	13.0	1756

Table A6: Regressions clustering Moulton standard errors to correct for small sample size

<i>change in Dependent Variable</i>	Short term			Medium term		
	(1) Weight	(2) Wfa z	(3) Wfa Mal	(4) Weight	(5) Wfa z	(6) Wfa Mal
Performance Pay	0.219** (0.0977)	0.101** (0.0460)	-0.0561** (0.0274)	0.231*** (0.0764)	0.0976*** (0.0371)	-0.0522** (0.0236)
Fixed Bonus	0.123 (0.0968)	0.0557 (0.0455)	-0.0333 (0.0271)	0.196** (0.0765)	0.0878** (0.0372)	-0.0341 (0.0237)
Mother and child-level controls	X	X	X	X	X	X
Worker-level controls	X	X	X	X	X	X
N	3528	3522	3524	2303	2301	2302

Notes: Heteroscedasticity-consistent Moulton standard errors accounting for clustering at the center level in parentheses. Data are from two consecutive rounds of surveys carried out in October 2014 and January 2015. Performance Pay was promised to workers in November 2014 based on individual weight-for-age targets and was paid out in February 2015. Fixed Bonus was an ex-ante incentive of Rs. 200 per worker in November 2014. All dependent variables are the changes in a child's health indicator over the two consecutive rounds. Weight is measured in kilograms. Wfa z is the weight-for-age z score given the child's sex and age. Wfa mal is an indicator based on weight-for-age z score. Mother and child-level controls include age and sex of child, a dummy variables for if mother identifies herself as scheduled caste, if mother identifies herself as Hindu, if there is a grandmother at home, if mother cannot read and write, if husband cannot read and write, if mother is a homemaker, if toilet is communal, if toilet has no flush, mother's age, total children in household, household income and an index of 13 fixed assets in the household. Worker-level controls are dummy variables for if worker identifies herself as scheduled caste, if worker identifies herself as Hindu, if worker is college-educated, worker's age and dummy variables for the availability of the following resources at the center: electricity, fan, helper, chart, blackboard, drinking water and toilet. \*Significant at 10%, \*\*Significant at 5%, \*\*\*Significant at 1%.

### APPENDIX - FIGURES

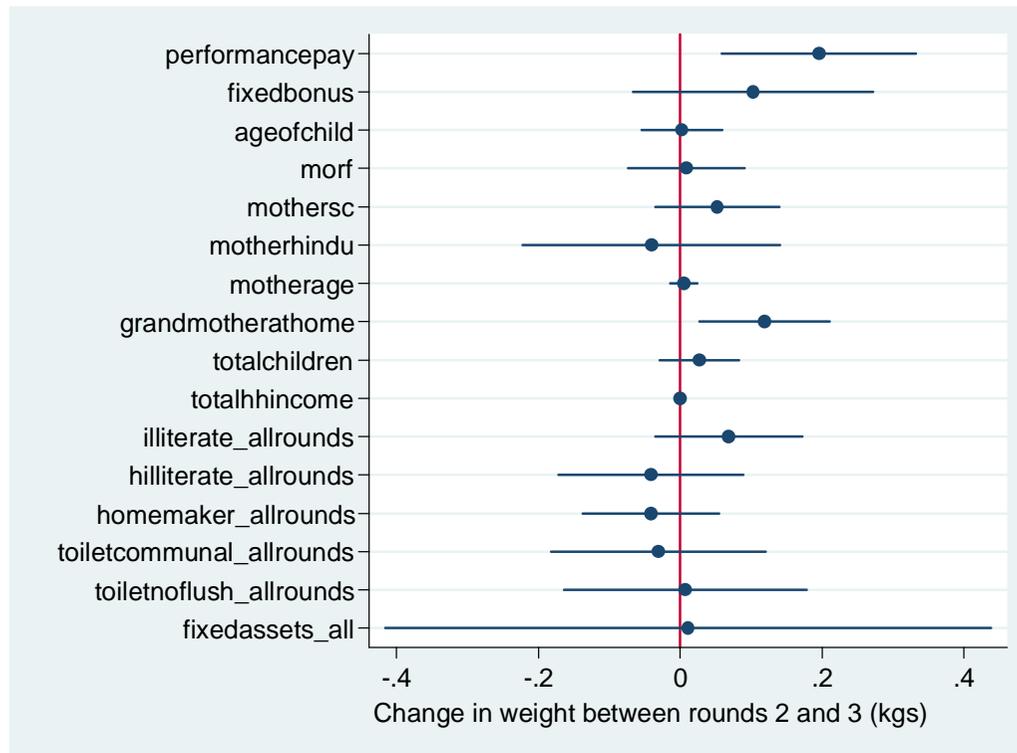


Figure A1: Change in weight between rounds 2 and 3 (kgs)

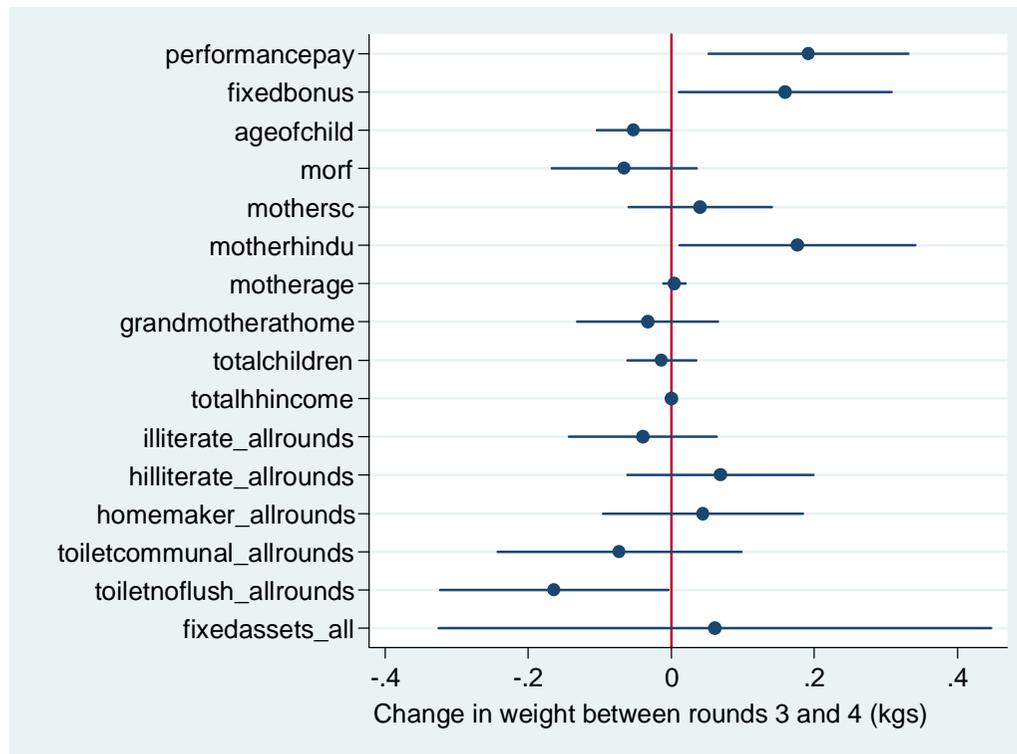


Figure A2: Change in weight between rounds 3 and 4 (kgs)

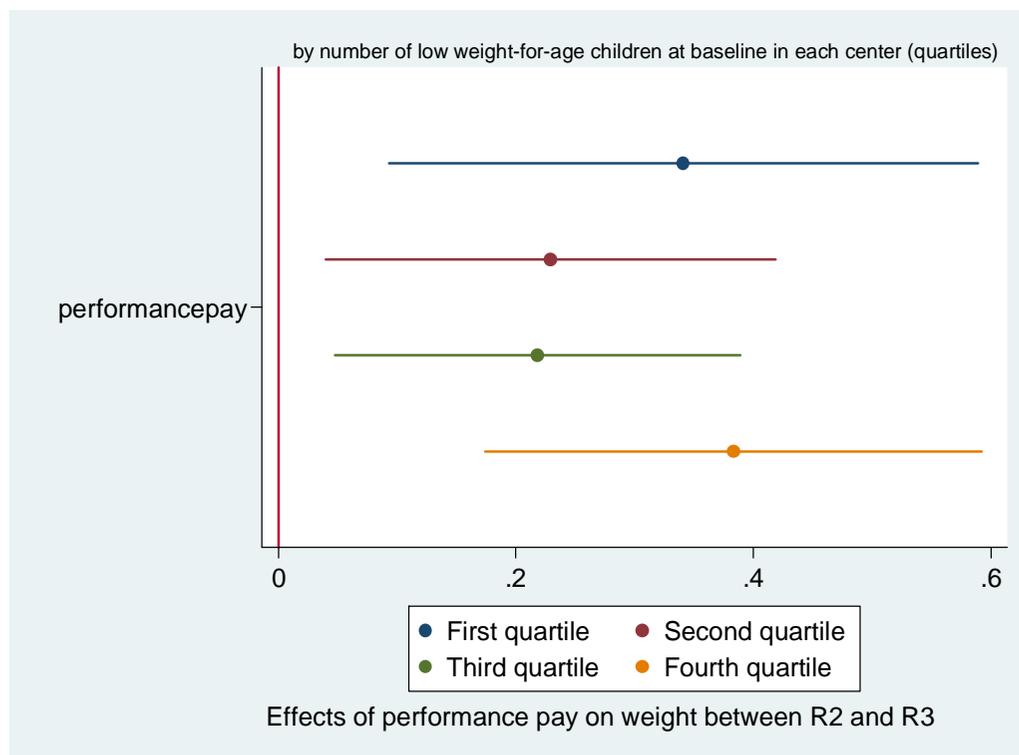


Figure A3: Effects of performance pay on weight between R2 and R3

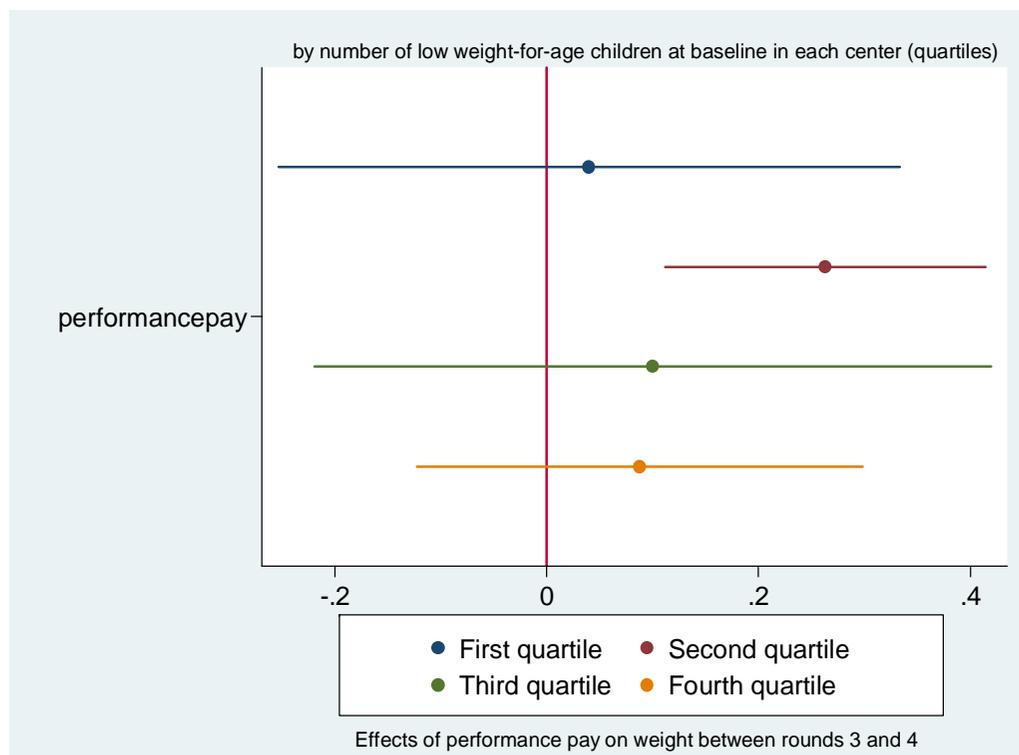


Figure A4: Effects of performance pay on weight between rounds 3 and 4

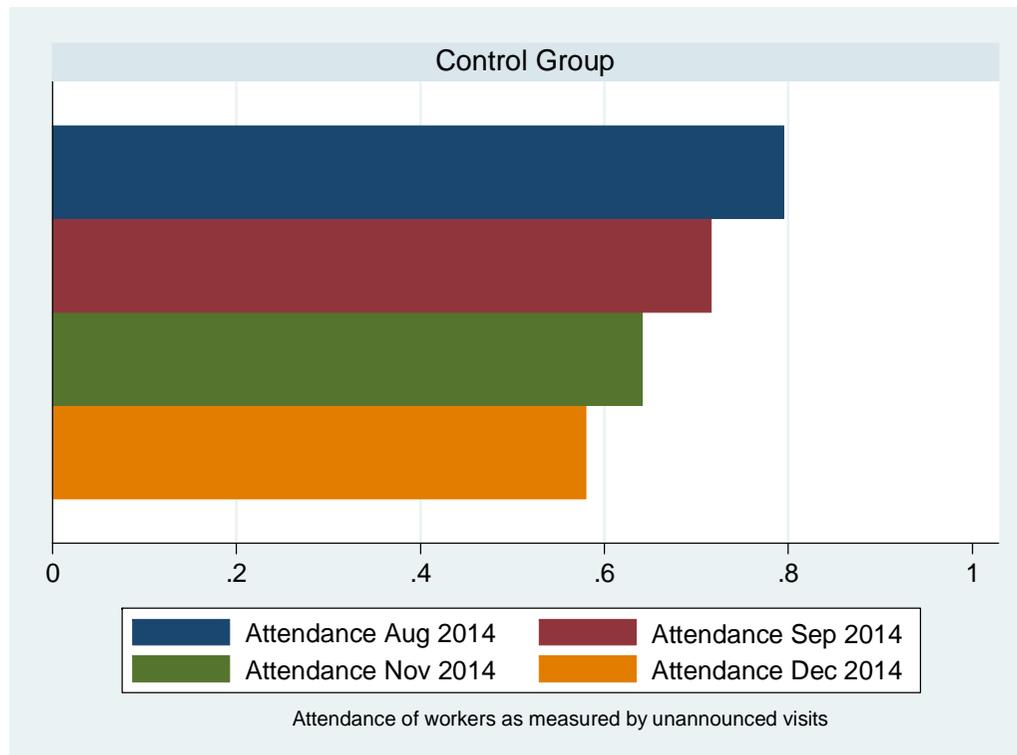


Figure A5: Worker Attendance in the Control group

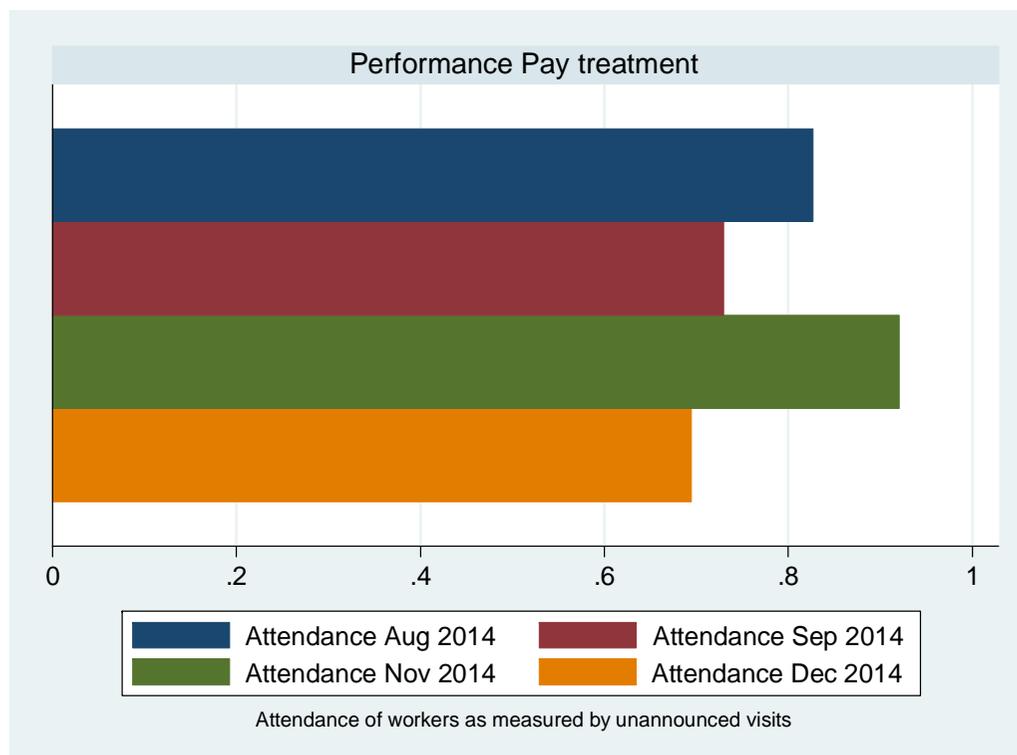


Figure A6 Worker Attendance in the Performance Pay treatment

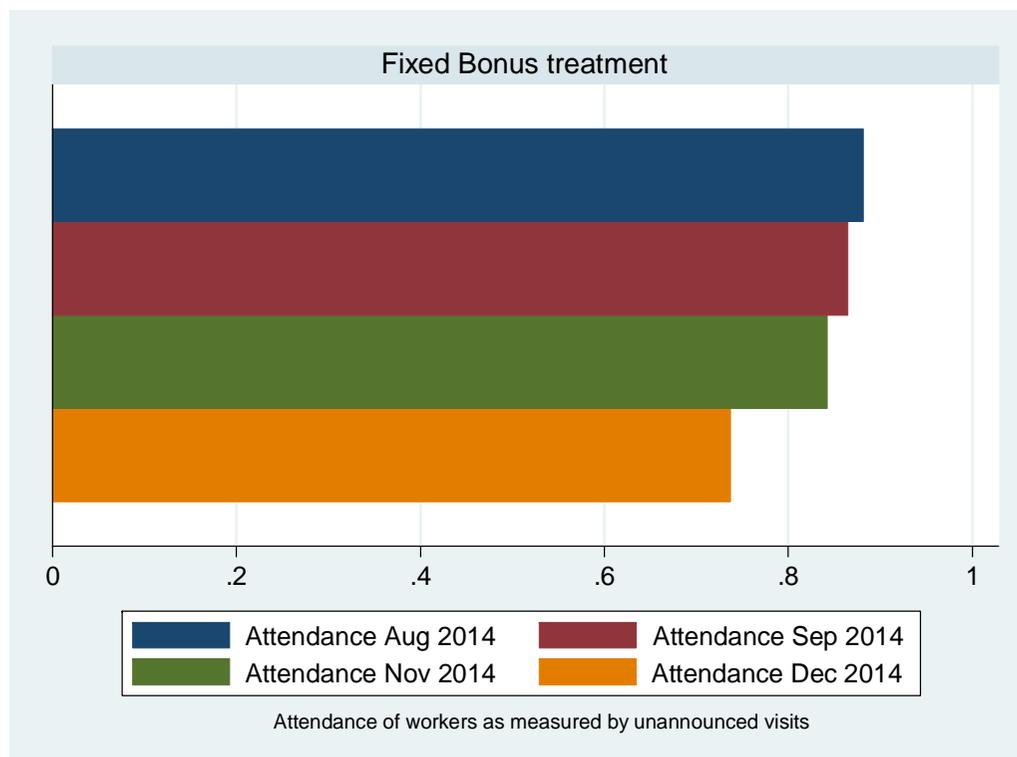


Figure A7: Worker Attendance in the Fixed Bonus treatment

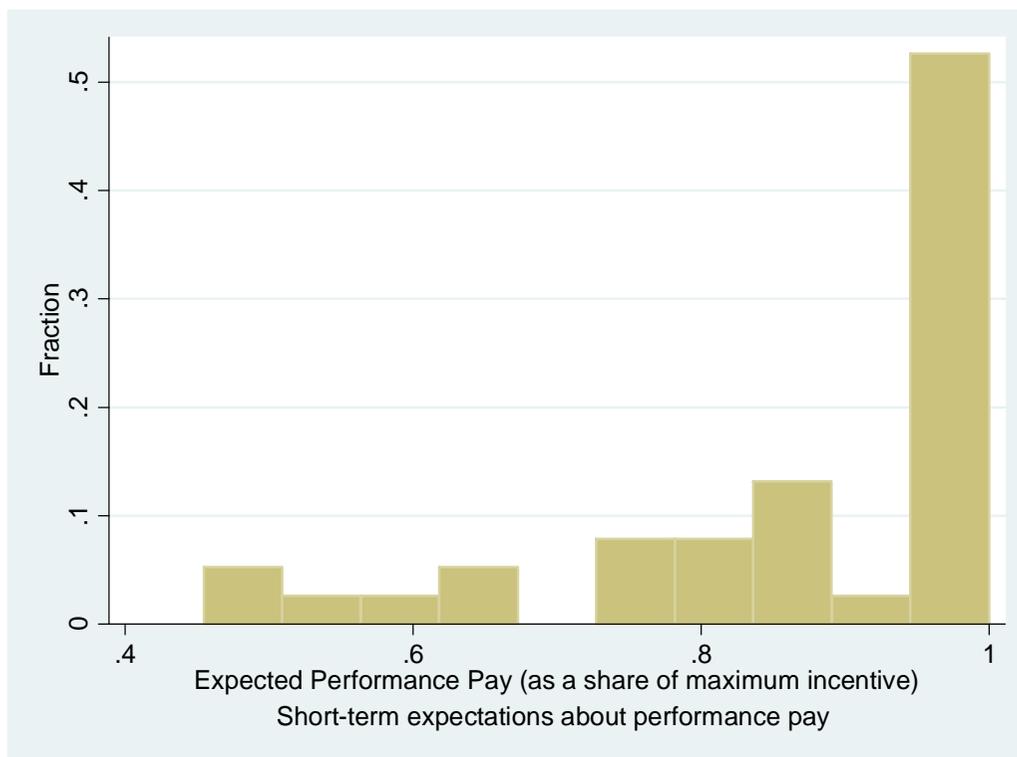


Figure A8: Expected Performance Pay (as a share of maximum incentive)

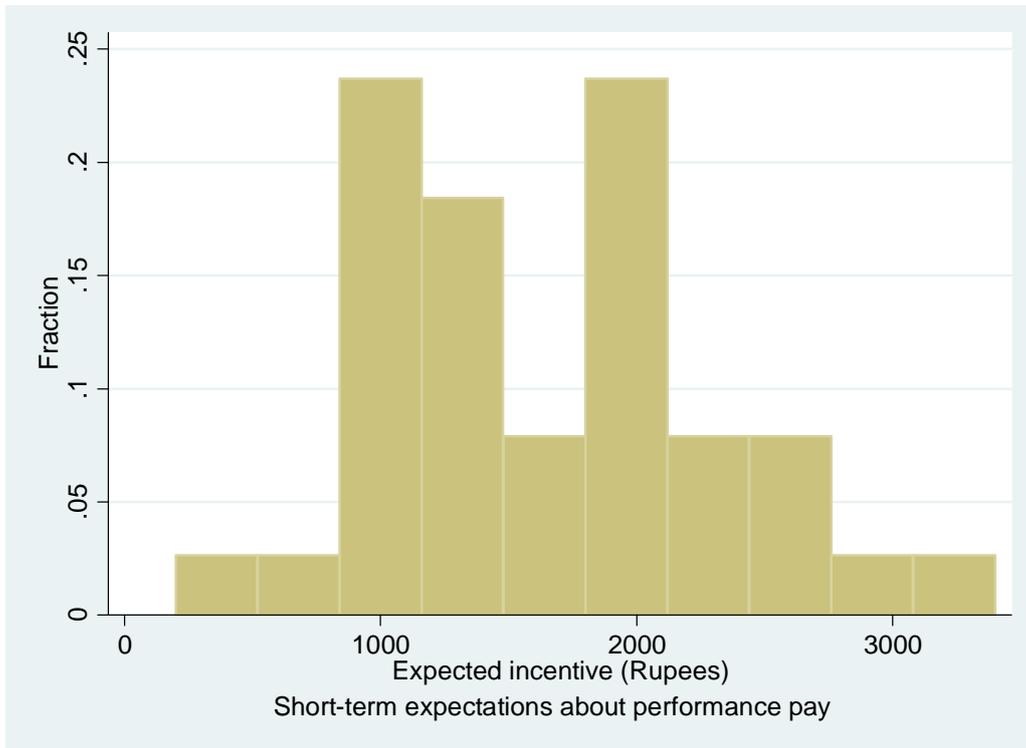


Figure A9: Expected incentive (Rupees)