Performance Pay in Public Health: Evidence from a Controlled Experiment

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Abstract

This paper provides evidence for the effectiveness of performance pay to government health workers and how performance pay interacts with demand-side information. In a controlled experiment covering 145 child day-care centers, I implement three separate treatments. First, I engineer an exogenous change in compensation for childcare workers from fixed wages to performance pay. Second, I only provide mothers with information without incentivizing the workers. Third, I combine the first two treatments. This helps us identify if performance pay and public information are complements or substitutes in reducing child malnutrition. I find that combining incentives to workers *and* information to mothers reduces weight-for-age malnutrition by 4.2% in 3 months, although individually the effects are negligible. This complementarity is shown to be driven by better mother-worker communication and the mother feeding more calorific food at home. There is also a sustained long-run positive impact of the combined treatment after the experiment concluded.

Keywords: Performance Pay; Public Health Information; Child Malnutrition

1 Introduction

Performance incentives seem to be very effective in private firms (Lazear, 2000; Bandiera et al., 2007). However, there is little evidence of their impact in the public sector, especially in public health. Besides, even if performance incentives could work to boost efforts of government health workers, the gains may be easily undone by informational failures on

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the demand-side. In this paper, I test if performance pay to government health workers is effective in improving health outcomes and how it interacts with public information.

I look at the specific context of a government childcare worker in India. She may affect the health of children through two channels: (i) providing mid-day meals in her day-care center and (ii) informing mothers on child nutrition. However, Gragnolati et al. (2005) find that leakage of meals to nontargeted beneficiaries is widespread and childcare workers do not give guidance to parents on improving nutrition within the family food budget[1]. A recent household survey in 100 Indian districts indicates 96% of the villages are served by government child-day care centers, although only 50 per cent provided food on the day of survey and just 19 per cent of the mothers reported that the workers provides nutrition counselling (Hungama Report, 2011). Not surprisingly, mothers seem to lack knowledge on what to feed especially when the child is undernourished. For instance, six out of ten mothers in India do not increase fluids if their child has diarrhea (DHS, 2007)[2]. An estimated 1.27 million children die every year in India because they are malnourished[3].

In an experiment covering 145 child day-care centers and 4101 children (aged 3-6 years) in urban slums of Chandigarh, India, I implement three separate treatments[4]. First, I engineer an exogenous change in compensation for childcare workers from fixed wages to performance pay. Second, I provide mothers with information without incentivizing the workers. Third, I combine the first two treatments, where along with the change in compensation for workers, I supply nutritional information to mothers directly. This helps us identify if performance pay and public information are complements or substitutes in affecting health outcomes.

The key findings of the experiment are as follows. Changing compensation from fixed wage to performance pay does not change a child's weight on average in 3 months relative to a control group. Only providing nutritional information to mothers also does not change weight relative

[1] Only 17% of the mothers were counselled by the workers after their child was weighed in a day-care centre in Punjab (DHS, 2007).

[2] It is generally understood that being underweight weakens the immune system, making children more susceptible to disease (Mason et al. 2003; Behrman et al. 2004). The fraction of disease attributable to being underweight is 61% for diarrhea, 57% for malaria, 53% for pneumonia, 45% for measles, and 53% for other infectious diseases (Fishman et al., 2002).

[3] 53% of child deaths are because of malnutrition (Caulfield et al., 2004).

[4] Ghosh and Shah (2004) report that the nutritional status of urban slum children is worst amongst all urban groups and also lower than the rural average. The slum population in India is 42.6 million, which is 22.6 per cent of the urban population (Census, 2001).

to control. However, providing incentives to workers and information to mothers reduces weight-for-age malnutrition by 4.2% in 3 months. This effect is equivalent to increasing the average income of a household by 51% to achieve the same reduction in malnutrition (via a simple baseline correlation between child being malnourished and income of family)[5]. The weight increase of 71 gms per month relative to a control is also comparable to the 100 gms per month increase achieved from iron and deworming implemented in urban slums of Delhi (Bobonis, Miguel and Sharma, 2004). This points to a complementarity in increasing weight when incentives and information are supplied together.

Next, I find some evidence on the mechanisms underlying the change in weight. In the combined treatment, there appears to be an increase in calories at home that is significantly greater than when we only provide incentives or only information. There are also changes in the nature of mother-worker interaction. Workers on performance pay start paying more personalized visits to homes and also talk more about the child's diet with the mother. In turn, mothers reduce their visits to the day-care center for meeting the worker.

This paper contributes to the empirical literature on the effects of incentive pay on performance in organizations. The literature highlights potential pitfalls in implementing performance pay. For example, providing incentives for improvement in only malnourished children may lead to the worker applying extra effort at the cost of children who are normal weight. Keeping this in mind, the incentive treatment in my experiment was designed to disincentivize the worker for a decline in weight-for-age grade. Similarly, there could be short-term manipulations or plain cheating by workers (Figlio and Winicki, 2005; Jacob and Levitt, 2003). These concerns are addressed by hiring, training and monitoring independent enumerators[6].

Empirically, most studies implement neither an exogenous change in compensation schemes nor have a valid control group (Prendergast, 1999; Chiappori and Salanie, 2003). This may be important if there are other management changes that are taking place at the same time or if unobservable factors can influence both outcome and compensation structure[7]. My experiment is in the same spirit as Bandiera, Barankay and Rasul (2007) who have an exogenous change in compensation for

[5]The magnitude may appear large because the income elasticity in improving weight is relatively low in my sample (due to the homogeneity of incomes in urban slums).

[6]Nevertheless, I check for presence of multi-tasking and gaming in Section 6 of this paper.

[7]There may also be an endogenous feedback of performance on the type of compensation.

managers in a private firm and a valid control group. Muralidharan and Sundararaman (2011) test for teacher performance pay in Andhra Pradesh in a unique experiment and show that performance pay works to improve student grades and find evidence of no teaching to the test. However, there exists almost no research on exogenously changing incentive schemes for workers in a public health organization within a controlled experiment. This, to my knowledge, is only the second such controlled intervention in the context of public health in a developing country[8]. Propper et al. (2010) find evidence from a natural experiment that performance pay in Britain's National Health Service met its goal of reducing waiting times without a deterioration in health services and patient health. Basinga et al. (2011) evaluate performance pay for primary health-care providers in Rwanda and find mixed results. Although facilities in the intervention group had a 23% increase in the number of institutional deliveries, there were no improvements in the number of women completing four prenatal care visits or in children receiving full immunisation schedules[9].

Optimal compensation schemes may be different in public organizations (Dixit, 2002; Besley and Ghatak, 2005). In the public sector, high-powered incentive schemes are rarely seen mainly because of a difficulty in measuring outcomes, multi-tasking by agents and intrinsic motivation[10]. In my specific context, we have a measurable health outcome (weight-for-age). Moreover, scope for multi-tasking by these childcare workers is very limited[11].

The paper also contributes to the growing literature of information on health. The central findings of this literature are that information does matter if it is customized to the person targeted and if the information is specific and intensive (Madajewicz et al., 2007; Dupas, 2011b; Dupas, 2011a). The recipe book provided to mothers in the experiment uses these findings to list ten recipes which are easy-to-make, economical and

[8] In the private sector in the US, medical studies have shown positive effects of performance pay for nursing homes (Petersen et al., 2006; Norton, 1992).

[9] There is also a working paper that evaluates the impact of performance-pay to health care providers in China (Miller et al., 2011). Also dealing with similar issues but perhaps not as well identified are Bhushan et al. (2002) and Bloom et al. (2006).

[10] It is possible that financial incentives may crowd out intrinsic motivation. My pilot interviews with the workers suggested that their intrinsic motivation had declined due to a lack of performance pay and there is no private information with the incentive provider that can lead to crowding out (Benabou and Tirole, 2003). Also, financial incentives may attract different types of workers. However, the workers remain the same for the duration of the experiment.

[11] We are unable to test the children for the effect of these treatments on their knowledge because their is no official syllabus and the children tested in these centres were unable to read digits from the weighing scale during the pilot.

use locally available ingredients. But, it is not known how supplying nutritional information to the mother would impact child health.

Supply-side interventions have been shown to be less effective if there is a failure on the demand-side. Banerjee et al. (2010) find that uptake of immunization is much higher if small non-financial incentives are provided on the demand-side along with an increase in supply[12]. However, they are not able to isolate the impact of incentives to demand-side from the complementarity effect by the very nature of their experiment. I find evidence to support that complementarity between demand and supply-side plays a major role in reducing child malnutrition, where changing a childcare worker's compensation from fixed to performance pay is effective only if specific information is supplied to mothers at the same time.

This paper opens the black box of how incentives interact with information in public health and illuminates the behavioral mechanisms at play. Not only is this important for a child's future and her family, it is relevant for policy makers in shaping compensation schemes for childcare workers and health policy in general. There may also be a societal gain from a reduction in malnutrition[13]. Finally, I also find that the effect of the combined treatment is sustainable in the long-run as the significant increase in weight is also observed nine months after the experiment was concluded. This is consistent with the mechanism of mothers changing their food and health behavior permanently when incentivized workers pay personalized visits temporarily for a period of three months.

Methodologically, this is not a randomized experiment due to the possibility of strong spillovers but a controlled experiment that uses a three-pronged approach of matching with a contemporaneous control group, difference-in-differences and placebo analysis to address endogeneity and reversion-to-the-mean[14].

The paper is organized as follows. Section 2 provides the context and develops a conceptual framework. Section 3 illustrates the experiment design. Section 4 describes the data and Section 5 presents the specification and main results. Section 6 reports the mechanisms. Section 7 checks for robustness of these mechanisms. Section 8 provides

[12]In a similar vein, Duflo et al. (2009) show that reducing pupil-teacher ratio is more effective when parents are involved in the management of schools. Figlio and Kenny (2007) find that merit pay for teachers matters and more so for parents who are more involved, although their study is based on cross-sectional non-experimental data.

[13]Malnutrition has been shown to seriously affect accumulation of human capital. See, for example, Yamauchi (2008), Alderman et al. (2003) and Martorell (1999). Adequate nutrition for children is also a human right (UN General Assembly, 1999).

[14]Matching is described in Section 3.1.

long-term impacts, Section 9 delineates policy implications and Section 10 concludes.

2 Context, treatments and conceptual framework

2.1 Context

In India, the government-run Integrated Child Development Services (ICDS) program targets close to 35 million children between the age of 3 to 6 years, through over 1.24 million government day-care centers or 'Anganwadis'. Each Anganwadi is run by an Anganwadi worker who takes care of children (aged 3-6 years) in a small room from 9 am to 1 pm and is on a fixed salary of Rs. 2000 ($44.44) per month[15]. All children who attend the Anganwadi are provided a meal, the distribution of which is supervised by the Anganwadi worker. These servings are of cooked food (e.g. porridge, gruel, etc.) transferred daily from a government approved agency and then distributed into the individual Anganwadis in containers. Here, the worker has discretion over its distribution. Under the ICDS Guidelines (2007), they are required to give double of the standard serving to those who are severely malnourished (600 kcal instead of 300 kcal), but in practice, this is not verified[16]. Workers are also required to hold Monday meetings with the mothers of the children enrolled in the Anganwadi, give tips on nutrition and health and make monthly visits to their homes. Anganwadi workers typically reside in the vicinity of the center. I focus on the particular case of urban slums in Chandigarh, a city in North India[17]. At baseline, 60% of the children are underweight[18].

2.2 Incentive treatment

Weight-for-age grade is the only child malnutrition indicator used by the Government of India in the ICDS program. Weight-for-age grades are classified for all children based on the recommendations of IAP (Indian

[15] Assuming 1$=Rs. 45. Absence among workers is low in my sample. When enumerators went unannounced in the endline, only 3 workers were unable to be quizzed.

[16] Linden and Shastry (2012) find evidence to suggest that primary school teachers in Mumbai manipulate attendance records to favour certain children within a food transfer programme conditional on attendance.

[17] Chandigarh had a population of over 9,00,000 in 2001. Spread over an area of 114 sq. km., Chandigarh is the capital of the states of Punjab and Haryana and also has the special status of a Union Territory. Its sex ratio is 777 females to 1000 males. The literacy rate is 81.9% compared to the national average of 64.8%. About 12% of the population is under 6 years of age. (Statistical Abstract of Chandigarh, 2007)

[18] Approximately 20 are underweight out of an average of 32 children weighed per Anganwadi.

Association of Paediatricians)[19]. The workers are familiar with calculating grades from a standard weight-for-age chart. For the purpose of the experiment, therefore, change in weight-for-age grade is used as the criterion for evaluating performance of an Anganwadi worker[20].

In the incentive treatment, the performance bonus promised to each Anganwadi worker equalled:

$$Rs.100 * n$$

where n = (# of children whose grade improved – # of children whose grade declined).

For example, if 5 children jump from moderate to mildly malnourished and 2 drop from normal to mildly malnourished, she would get Rs. 300 ($6.67). However, the bonus lower bound was 0, so workers would not be asked to pay if more children experience a grade decline than an improvement. All workers were given goal cards listing each malnourished child's minimum target weight (in July 2010) above which they would be given the bonus. For a child of normal weight, a minimum threshold was provided.

After discussions with the Director, Social Welfare Department, Rs. 100 was finalized as the slope of the compensation scheme because it was deemed to be sufficient to motivate the Anganwadi worker based on her salary[21]. The bonus was also in line with feasible policy implications (based on benefit-cost ratios) arising from the experiment as discussed in Section 8[22].

[19] From Ramachandran (2006), IAP measures used in Anganwadis are as follows:
Normal: >=80% of the Harvard Median weight-for-age
Mild malnutrition: 70-79%
Moderate malnutrition: 60-69%
Severe malnutrition: 50-59%
Very severe malnutrition: <50%

[20] Two other malnutrition indicators used by the WHO are low weight-for-height (wasting) and low height-for-age (stunting). Deaton and Dreze (2008) state that if a single "summary" indicator is to be used, weight-for-age would claim special attention as both wasted and stunted children are likely to fall in the underweight category. Moreover, in a short-term intervention, weight-for-age is a recommended indicator as height is not likely to be affected significantly.

[21] As 20 children were underweight on average in an Anganwadi, improving grades for all would imply the worker would get an extra month's salary (Rs. 2000) after 3 months. The slope is comparable to Rs. 500 chosen by Muralidharan and Sundararaman (2011) for a teacher whose salary is Rs. 10,000 per month. Mothers were not told directly about the incentives being provided to the workers.

[22] Before the experiment, the probability of grade improvement was unknown and a pilot would have been too expensive.

2.3 Recipe treatment

For the recipe book treatment, a customized recipe-book based on locally available ingredients was especially designed and printed in the vernacular (Hindi). Ten recipes were taken from the Government's publicly available book on Nutritious Recipes for Complementary Feeding of Young Children. Each recipe was rich in calories and could be easily made at home within a budget of Rs. 4 for 150 gms[23]. The booklet contained information on ingredients, step-by-step instructions and nutritive value (calories, protein, iron and carotene) for each preparation. Each recipe had multiple boxes at the bottom which mothers were asked to tick when they prepared that recipe.

It also had information on hygiene and good food habits and highlighted food items rich in calories, protein, iron and carotene. According to Michaelsen et al (2008), energy density in recipes is the most important for underweight children, as they have an increased energy need for catch-up growth. Indeed, Radhakrishna (2006) argues for an increase in the calorie intake of the bottom 30 per cent of the population in India. The recipe book was distributed to all mothers who were quizzed in the recipe or the combined treatment groups. At baseline, only 45% of the mothers could read but they were given the book even if they could not read. However, 75% of the fathers were able to read (according to the mothers). Moreover, all workers are able to read and write and I test for changes in communication between workers and mothers by literacy of the mother. For instance, it is possible that workers focus more interacting with illiterate mothers with recipe books.

2.4 Conceptual framework

This section describes how the weight of a child may be affected by provision of incentives or information. The weight of a child can be modeled as follows.

$$w = w[f(e, R), g(e)] \equiv h(e, r)$$

Here, $f(e, R)$ is food at home as a function of effort of the worker e and mother having the Recipe book, R. Food at Anganwadi, $g(e)$ is a function of effort of the worker only.

I assume that a child's weight may be affected by food provided in Anganwadi or at home. Food in the Anganwadi depends on worker's effort in so far as the worker feeds more when she is incentivized. Similarly, the worker may put in more effort in informing the mother about nutrition for her child if she is incentivized. However, the recipe book

[23] This was calculated by a Nutritionist, Food and Nutrition Board.

can only act on weight by changing the diet at home[24]. The main question that I want to answer is how incentive to a worker interacts with information to a mother in affecting weight or what is the relationship between e and r in $h(e,r)$?

Denote the setup where the worker is incentivized *and* the mother has the recipe book as the "combined treatment". Also, designate where only the worker is incentivized as the "incentive treatment" and where only the mother has the recipe book as the "recipe treatment".

Assume:

$$e = \begin{cases} 1 & if \quad \text{incentive to worker} \\ 0 & if \quad \text{no incentive to worker} \end{cases}$$

$$R = \begin{cases} 1 & if \quad \text{recipe book provided} \\ 0 & if \quad \text{recipe book not provided} \end{cases}$$

If incentives and information are substitutes in the weight function, then in reduced form:

$$h(1,1) - h(0,0) < [h(1,0) - h(0,0)] + [h(0,1) - h(0,0)] \qquad (1)$$

Incentives and information can be substitutes if the combined treatment's effect is less than the sum of the individual treatment effects. This could happen, for instance, (in the extreme case) if the information that the mother obtains from the recipe book is same as the information that she gets from the worker. Here, the impact of the combined treatment will be no greater than that of the incentive treatment as the recipe book adds no additional value[25].

There can be a complementarity in improving weight if the combined treatment's effect is greater than the sum of the individual treatment effects. This is possible if there are complementarities between the worker and mother when incentives are combined with information[26]. There can be at least two sources of such a complementarity: first, if the incentivized worker starts reading out recipes to illiterate mothers. The incentive may make workers visit homes more often and explain recipes

[24] For example, it may do so by changing the composition of food towards more calories or it can also increase calories by lowering the price per calorie since the recipe book lists only low-cost calorific recipes.

[25] Substitutability may also exist if the health production function is concave in incentives and information.

[26] Complementarity in weight is also possible with biological complementarity between food at home and food in Anganwadi in the weight technology. A simple model in the Appendix shows how the mother optimizes food at home in this setting with and without biological complementarity.

from the book, especially to those mothers who cannot read. Second, if the incentivized worker uses the recipe book as an anchor point to monitor the mothers. The worker could refer to the specific recipes as a way of reminding mothers to make economical and nutritious preparations for her child. The monitoring process may have been made convenient because of the boxes provided at the bottom of each recipe that mothers were supposed to tick when they prepared that recipe (although there was no verifiability).

A priori, it is not obvious whether providing incentives and information are substitutes or complements in the weight production function of the child. However, with the three treatments we will have estimates of all the components of equation (1). Thus, it should be possible to disentangle the relationship between incentives and information[27].

3 Experiment Design

3.1 Matching of Anganwadis

In December 2009, data on malnutrition rates at the Anganwadi-level was collected from the local Health Department[28]. We only had information on the proportion of children who are malnourished in each center before the baseline. Chandigarh had 370 Anganwadis divided into 3 blocks. Each geographical block was further divided in clusters and each cluster has an average of 9 Anganwadis. I chose Anganwadis located only in urban slums for the experiment because of non-comparability with those located in rural or urban areas. The incentives to workers could not be randomized at the level of the center or at the level of the cluster because of possible spillovers between centers within a cluster or between clusters in the same administrative block. For example, due to monthly meetings between workers in the same block, randomizing within a block would have contaminated the control group. The incentive as well as the combined treatment were implemented in Block 1 as it had the maximum number of Anganwadis in slum areas. Therefore, incentives were provided to all workers in the same geographical area to minimize any informational leakages.

The next step was to select a group of 36 centers from Block 3 to receive the recipe book treatment and 36 centers from Block 2 to act as control. These were selected by a MATLAB algorithm that matched

[27] Conceptually, the impact of the treatments on food at home is analyzed in Section A3.

[28] This was information on children aged 0-6 because age-wise disaggregation was not available. Also, there was no malnutrition data on 10 Anganwadis in a colony in Block 1.

the malnutrition average for 36 centers from Block 2 and Block 3 to the aggregate malnutrition average of Block 1[29]. Thus, 36 Anganwadis were chosen from Block 2 and 36 were selected from Block 3 such that the selected group's malnutrition average was closest to that of the malnutrition average of Block 1. The map in Figure I illustrates the geographical location and number of Anganwadis in each cluster by treatment and control (for visual clarity, each square is equivalent to around 5 Anganwadis). Table I shows the total number of Anganwadis under each treatment.

Again, matching was preferred to randomization in recipe book assignment because of possible informational spillover effects among mothers within the same cluster. This is possible because mothers tend to live close to each other even if their children may be going to different Anganwadis within the same cluster. I also collected data on untreated Anganwadis in the same cluster where recipe treatment is implemented to measure spillover effects of information and the analysis is part of Singh (2011). I find evidence of spillovers in information and health behavior within the same slum area.

3.2 Implementation of treatments

In April 2010, a team of nine enumerators weighed children on digital weighing machines and interviewed mothers of these children[30]. Weights were recorded before the mid-day meal and it was ensured that children were not in heavy clothing. The interviews were taken by calling mothers to the Anganwadi at specified times. Enumerators collected information on demographics of the household, diet of the child and mother-worker interaction. A quiz was administered to judge the nutritional knowledge of all the mothers and the worker[31]. The multiple-choice quiz for mothers had 5 questions (worth 13 points because of multiple answers per question) that could be answered by reading the recipe book. The next 4 questions (worth 7 points) were "out-of-book". Mothers in the recipe treatment were provided with the recipe book after they were quizzed. Enumerators also noted the previous weights of all children recorded in

[29] Pair-wise comparison of mean t-tests of the Control and Recipe treatments with the Block 1 average led to acceptance of the null hypothesis of samples being drawn from populations with the same mean giving p-values of 0.68 and 0.99. See Appendix A7 for detailed outcomes of the matching process.

[30] Enumerators were trained and supervised by me on the ground throughout the experiment. The weighing machines used in both rounds were re-used for the same set of children for accuracy.

[31] A pilot of the quiz was conducted in out-of-sample Anganwadis in December 2009. The quiz was designed in line with similar quizzes made by the Food and Nutrition Board for Anganwadi workers.

the registers of the Anganwadi center.

A window of 3 months was chosen for the experiment because it is the average time duration between two medical check-ups by the local Health Department. The duration was verified to be sufficient for a grade improvement to occur by doctors at the local office of the Health Department, Government of India. An ethical concern was that the workers may feed the children "fatty foods" in order to make them gain weight in the short run. The Director as well as the Supervisors in the Social Welfare Department were of the view that these foods were quite expensive and a relatively small incentive of Rs. 100 per malnourished child over 3 months would never lead workers to purchase extra food for the children (even if it was good for their health)[32]. Also, the food provided by the government is more than sufficient for all children in the Anganwadi and there are also social controls in the form of supervisors, block officers, helper in the Anganwadi, parents of the children and normal weight children.

The second round of the experiment was conducted in July 2010. The children were weighed again and questionnaires re-administered to mothers. Cash bonuses were distributed to Anganwadi workers at a public program held on 31st August 2010. Figure II shows that timeline of the controlled experiment.

4 Data description

4.1 Compliance and attrition

Overall, 4101 children were weighed twice during the experiment. For 94% of these children, their mothers were also quizzed two times. Selective taking of the quiz by the smartest mothers may hinder us from finding the causal effect of the treatments. Therefore, it is necessary that the compliance rate among mothers is high. Table II illustrates the compliance and attrition rates. The compliance rate of the mothers is high due to three reasons: first, the workers were very cooperative with the enumerators in calling the mothers who stay in the same slum area. Second, mothers who came to drop their child to the Anganwadi were interviewed at the same time. Third, mothers had a chance to win a prize if they scored the highest marks in the quiz[33]. This encouraged both thinking effort and high compliance. No mother refused to be interviewed (even though there were 45 cases where the mother had to leave before answering the quiz).

[32] Rs. 100 is equivalent to $2.22 or 5% of the worker's monthly wage.

[33] Along with mothers, the 3 highest scoring Anganwadi workers in both rounds were also given a cash prize to induce thinking about the questions.

The attrition rate on average was 11% in the control. However, attrition cannot be attributed to the experiment alone because 71% of the children who were not weighed again had either left the Anganwadis and joined primary schools between the two rounds or had migrated elsewhere (it was "natural" attrition)[34]. Moreover, it would be a concern if the attrition rate was higher in the incentive or combined treatments, as workers here may be getting only "improved" children weighed. However, it can be seen from the table that attrition rates are actually lower in these treatments.

4.2 Summary statistics

Table III shows the summary statistics from the baseline and also the normalized differences[35]. Malnutrition is 36% according to the WHO measure[36]. A malnutrition rate of over 30% in a sample is regarded as "very high" (WHO, 1997). In a healthy population, only 2.3% of children should have a z-score less than -2. If the standard deviation of the z-score is less than 0.9, it implies that the sample population is very homogenous. On the other hand, a standard deviation exceeding 1.3 suggests inaccurate data due to measurement error (WHO, 1997). The z-score in this sample has a standard deviation of 0.78 confirming the homogeneity among weights of children living in slum areas.

The IAP measure shows malnutrition rates close to 60%. Families in my sample have an average of 3 children and a monthly income of Rs. 3634 ($80.76). Close to three-quarters of the mothers are housewives, and 38% of the mothers can read and write. Less than 5% of the mothers have a water filter at home but almost 70% households own a mobile phone.

We see that normalized differences do not exceed a quarter in the key variables (only having a fridge and the worker being educated till at least A-level have normalized differences in excess of 0.25)[37]. The malnutrition rates are close to each other because we are focusing only on urban slums within a city and also because of matching of average malnutrition rates in the treatments and control (based on Anganwadi-level malnutrition

[34] Moving into primary schools in my sample does not appear to be strongly correlated with age.

[35] All quiz scores and weight-for-age grades were calculated with the help of a computer program.

[36] According to the WHO, a child is malnourished if her weight-for-age z-score $<$ -2. For understanding the differences in outcomes between the two systems, see Seetharaman et al. (2007).

[37] The rule of thumb is that normalized differences should not be greater than 0.25 in absolute value as otherwise, linear regressions tend to be sensitive to specification (Imbens and Rubin, 2005).

data obtained from health authorities) before the baseline.

5 Specification and main results

5.1 Specification

The main regression specification for finding the average effect of the treatments on weight of a child is as follows:

$w_{ijt} = \alpha(post)_t + \beta(incentive)_j + \gamma(recipe)_j + \rho(combined)_j + \eta(post * incentive)_{jt} + \theta(post * recipe)_{jt} + \omega(post * combined)_{jt} + X_{ijt} + \varepsilon_{ijt}$

w_{ijt} is the weight of a child i in Anganwadi j at time t. The variable *post* is a dummy that is 0 for baseline and 1 for endline. The variables *incentive*, *recipe* and *combined* are 1 if the child is in the treatment specified and 0 otherwise. X_{ijt} are individual and Anganwadi specific controls. The error term is clustered by Anganwadi. The variable *post* accounts for the natural increase in weight in 3 months, all seasonal effects on weight, regional shocks to food prices and any management changes or unobservables that would impact all groups in the same way. β, γ and ρ are the baseline differences between the individual treatments and the control. η, θ and ω give us the difference-in-differences estimates for the effect of each of the three treatments. This interpretation rests on the identification assumption that there are no time varying and block-specific effects that are correlated with the treatments (common trend assumption).

If $\omega > \eta + \theta$, it would imply that there is complementarity between the incentive and the recipe-book treatments and if $\omega < \eta + \theta$, it would signal substitutability (or a possible concave production function).

5.2 Main results

First, I provide evidence for the impact of the treatments on weight, grade (as measured in the Anganwadi), z-score and the WHO malnourished status of the child. Table IV shows the results using the difference-in-differences strategy. The first column shows a 171 gms increase in the combined treatment over and on top of the 275 gms increase in the control. The estimate is significant at the 5% level. There is no effect of the incentive or the recipe treatments individually on weight gain[38].

When we control for factors such as worker's nutritional knowledge, experience and education, the infrastructure in Anganwadi, household demographics, food expenditure and assets, the estimate of the treatment effect becomes larger (213 gms) and the baseline difference loses significance. The combined treatment increases the average grade and z-score by 0.10, and reduces malnutrition (according to WHO standard)

[38] All results are robust to clustering the error at the level of a slum cluster.

by 4.2% and there is virtually no effect on grade, z-score and malnutrition in the individual treatments[39].

Note, however, that the difference-in-differences estimate relies on the common trend assumption which may not hold in practice. If there are differential pre-treatment trends in (say) the combined treatment group, we would get a spurious positive coefficient on $post * combined$. These trends may exist, for example, if the government assigns better workers or more infrastructure to the Anganwadi (for e.g. drinking water) in the combined treatment. The trends could also exist if mothers in the combined group start spending more on food or cooking more productively before the treatment. These explanations should not be taken lightly because at baseline, the combined group has a significantly lower average weight than the control group. There could also be a natural reversion to the mean such that children who are more underweight are also more likely to grow more. To check if this is indeed the case, we can conduct a simple test where a "Placebo treatment" is applied to the respective treatment groups on weights measured pre-baseline that were recorded in Anganwadi registers (and copied by enumerators).

In Table V, a Placebo Post is defined as a dummy variable that takes value 0 for the weight pre-recorded in the registers (on average 3 months before the baseline) and 1 in the baseline. We see significant pre-existing differences between the "combined treatment" and control that are of similar magnitude as were seen in the baseline, implying that children who would eventually get the combined treatment still weighed less 3 months before the treatment. However, we see that the coefficients on all interaction terms are small and insignificant. The findings lead us to believe that there is no reversion to the mean[40]. Thus, the placebo test validates the common trends assumption in the main specification.

The core results show that there is a positive impact of the combined treatment even though there is no effect of either the incentive or the recipe treatments individually. To check for complementarity between information and incentives, I test if the sum of the effects under individual treatments is equal to the combined treatment's effect. This is rejected (with a p-value of 0.085), implying that the relationship between incentives and information is that of complements. Not surprisingly, I also find a significant difference between the difference-in-differences estimates of the combined and the incentive treatments as the p-value of

[39] These results are robust to excluding outliers (if z-score is more than 4 or less than -4). See Figures 1 and 2 in the Appendix for a Kernel estimation showing the distribution of changes in weights under treatments and control.

[40] The results for placebo specification remain robust to excluding previous weights recorded either within the past two months or more than four months ago.

a t-test of equality between the two coefficents is 0.016.

6 Mechanisms

This section focuses on the main mechanisms that could be driving the change in weight and relates the findings to extension of conceptual framework.

6.1 Diet at home

I measure the intake of food at home through questions about composition and frequency of dietary items to the mother in both rounds. We see from Table VI that in the incentive treatment, there is an increase in mother's reported intake of eggs and traditional sweets (Indian desserts) by their children. As sweets are a rich source of calories and eggs are high in protein, it makes sense to focus on these foods as protein-energy deficient malnutrition is the most common reason for low weight-for-age among children[41]. Secondly, we find negligible impact of the recipe treatment on intake of these foods at home, although porridge consumption goes up in the recipe treatment.

Finally, there is a big increase in the intake of eggs and traditional sweets in the combined treatment. The proportion of children who are provided sweets at least twice a week goes up by 30% in the combined treatment. This is significantly different from the incentive treatment where the consumption goes up by 18%[42].

Conceptually, a worker can talk to the mother and influence her feeding to the child. Therefore, the combined treatment can be more effective than the incentive treatment through two channels. First, simply having the recipe book available to the mother may increase food at home. Second, there may be a complementarity between incentive and information in making the mother-worker communication more effective.

As the recipe book has no effect on weight but we still observe the combined treatment's effect on food at home to be greater than the incentive treatment, this would imply presence of a complementarity between incentive and information in changing food at home through better communication[43].

[41] Everyday consumption of pulses as well as fruits goes up in the combined treatment. However, there is no change in the consumption of non-vegetarian food (table not shown).

[42] The equality test rejects the null with a p-value of 0.0635.

[43] For more details, see Section A3.3 in Appendix.

6.2 Communication complementarity

The communication complementarity in the combined treatment may happen because of two channels. First, the incentivized workers may be reading the recipes to the illiterate mothers. If incentivized workers interact more often with illiterate mothers (relative to literate mothers) and if these mothers in turn change the diet, this sub-channel may be important[44]. Second, the incentivized workers use the book as a reference point to monitor the preparation by mothers. This may have been aided by the fact that each recipe in the book had been designed to contain multiple check boxes at the bottom which mothers were asked to tick when they prepared the recipe (although there was no verifiability)[45].

We can test the first channel by looking at the change in worker's visits in the incentive and combined treatments for literate and illiterate mothers. Table VII reports results on weight, worker visits and sweet consumption by whether mother can read or not. The workers appear to visit illiterate mothers no more (in fact, insignificantly less) than literate mothers in the combined treatment. There is also no significant differential effect on effort between the workers in the incentive or combined treatments for illiterate mothers. The robustness check on diet at home is also consistent because illiterate mothers do not provide more sweets to their children in the combined treatment relative to the incentive treatment. This suggests that the first channel is not strong[46].

Although there is no direct evidence for the second channel, the recipe book is likely to have acted as a physical reference during mother-worker meetings which helped workers better monitor mothers.

6.3 Mother-worker interaction

In this section, I look at how the nature and quantity of mother-worker interactions change with the three treatments. The mother's questionnaire included questions on the number of worker visits to home and mother visits to the Anganwadi in the past month. As an additional check, I also ask the worker to report the number of home visits to mothers made during the last month for each child enrolled in her An-

[44] The incentivized workers may also increase the credibility of the book by telling them that they should trust the book and prepare from it, but this effect is not likely to increase worker visits to the home.

[45] Anecdotal evidence from interviews with incentive-winning workers revealed that the book as a reference point was thought to be the most important channel by the workers in the combined treatment.

[46] There is also a heterogeneity in the recipe treatment's effect on weight by mother's literacy. Literate mothers seem to be better at using the recipe book to increase the weight of their child relative to illiterate mothers, but the average effect is small.

ganwadi.

Table VIII illustrates the changes in the quantity of social interaction between mothers and workers. We find from column (1) that worker visits reported by mother seem to decrease in the control group and increase in all the treatments. This is corroborated by column (4) which shows the worker visits reported by worker also increase in the incentive and combined treatments. However, in the recipe treatment, workers do not report an increase in visits. The other interesting result that emerges from this table is that the mothers in the incentive and combined treatments seem to go to the Anganwadi less often when workers visit more at home. There seems to be a substitution of effort from the mother to the worker in these two treatments. Column (3) shows that the decrease in mother's visits almost compensates for the increase in the worker's visits. Home visits by the worker with personal attention to the mother may be more likely to change dietary intake of the child at home. These patterns hold even after controlling for all other relevant variables.

Although the workers seem to increase the home visits, it would be useful to know if the content of their interaction was altered. In both rounds, mothers were also asked questions on whether or not the worker spoke with them about their child's diet, showed them their child's growth chart or told them consequences of child malnutrition, in the past three months. Table IX demonstrates that the workers do seem to advise mothers about the right diet for their children more in the incentive and combined treatments even when other controls are included[47].

It appears that even in the incentive treatment, worker's effort is affected and mothers also seem to feed more calorific food. However, the child's weight does not seem to be increasing perhaps because the calorie intake may not be sufficient for weight to increase. The worker does appear to respond to incentives, but it does not help improve health outcomes. It implies that the effort of the worker alone is not effective to change dietary behavior at home.

Randomized evaluations on home visits by para-professionals to improve parenting show that it is very difficult to change parental be-

[47] One channel through which the weight increase could take place may be increased attendance of children that is influenced by worker's performance bonus. However, I do not find any evidence of an increase in recorded attendance in the incentive or the combined treatment. The attendance records are not likely to be accurate because food is distributed to the Anganwadi according to how many children are marked present. It was observed that children were often marked present if mothers collected the food of the 'absent' children. If incentivized workers tend to reduce over-reporting of attendance in the second round, we may not be able to find evidence of an increase in attendance, even if there was an actual increase.

havior (Almond and Currie, 2011 and Olds et al., 2002). Gragnolati et al. (2005) remark in the context of an Anganwadi worker in India: "Although communication for behavior change through the worker is a crucial weapon in the fight against malnutrition, the information the worker is conveying to the mothers is not being communicated effectively enough to positively affect mothers' behavior." However, the combination of performance pay and information seems to be making the difference to mother's behavior such that food at home is increasing (more than the individual treatments) and so is the weight.

6.4 Mother's knowledge

Table X shows the change in mother's theoretical knowledge as measured by a quiz. The estimates confirm that providing the recipe book increases the theoretical knowledge even though there is no increase in weight as shown before[48]. Also, the incentive to the worker does not appear to improve mother's knowledge. The estimate is unlikely to be driven by reversion to the mean as the incentive treatment also starts with a lower score compared to the control but there is no increase in the post-treatment. It may be surprising to see no effect of the combined scheme on the quiz score of the mother. However, there are baseline differences between the combined treatment and the control that remain significant even after including other controls. Thus, although it is difficult to compare effects of the incentive and the combined treatments, it can be seen that the net scores 3 months post-treatment are similar. Moreover, as the quiz score is a censored variable, most of the increase in the scores in the recipe treatment comes from the easier questions on the quiz that tend to be answered correctly in the baseline by mothers in the combined treatment[49]. This implies that there is little room for improvement for the mothers in the combined treatment. One concern could be that the combined treatment group is different because the mothers' general nutritional knowledge was higher than the control group in the pre-test. However, nutritional knowledge by itself has no impact on change in weight when it is included as a control. Moreover, the combined treatment is not less effective in increasing weight when mothers have lower nutritional knowledge than if they have higher nutritional knowledge at baseline.

[48] The result is in line with Bonvecchio et al. (2007) which looks at the effect of providing information to mother on uptake of papilla distributed through PROGRESA and finds significant effects on mother's knowledge 5 months later.

[49] When I run a standard regression by taking quiz score from toughest questions (comprising 6 points), there is no significant difference between the recipe and the combined treatments at the 10% level (table not shown).

6.5 Multi-tasking and gaming

It is possible that the incentivized workers could have tried to focus on only the malnourished children near their target threshold weight. However, I do not find evidence of such multi-tasking by the workers, possibly because there was a disincentive if the child slipped into the grade below[50].

Moreover, the workers could have engaged in gaming strategies to increase the measured weight of the children in the very short-run. Examples of such activities could include filling up children with water or increasing food supply just before the weighing is done. Care was taken by the enumerators while weighing children such that they were without shoes and all weights were taken before the mid-day meal had been served. Also, the workers did not know the exact date when children would be re-weighed, so the timing was uncertain for the workers, casting doubts on the possibility of gaming. Enumerators did not observe any "stuffing" of children before they were weighed[51].

The following points also seem to suggest that gaming was not resorted to by the incentivized workers. First, there is no impact on weight of the incentive treatment. If gaming was the reason for the weight increase in the combined treatment, it should have also been carried out in the incentive treatment. Second, the weight increase only happens to moderately malnourished children and not mildly malnourished children (see Figure A.2). It is unlikely that filling of water could only be done for moderately malnourished children. Third, looking at Figure A.2, we observe that close to 20% of the children gain weight by 1.5 kg in the combined treatment, whereas the proportion is about 10% for the incentive treatment. This also points against water-filling as a possible explanation because that is not likely to lead to such increases in weight. Finally, when we include the control dummy "Drinking water in Anganwadi" in our baseline weight regression, we find that its coefficient is actually negative and insignificant which gives further evidence against gaming.

7 Robustness checks

7.1 Cooking recipes

As quiz score may not be able to capture the increase in a mother's "practical" information, so questions on frequency of cooking each recipe from the book in the past three months were posed to mothers in the

[50] See Table A.5 in the Appendix for results.

[51] Randomly selected children were also weighed by me during my supervisory visits to each centre.

recipe and combined treatments in the post-treatment round. We see from Table XI that mothers in the recipe treatment only prepared special recipes an average of 8 times in three months. On the other hand, mothers in the combined treatment prepared more than 5 times as many recipes that led to a daily increase in calories of 266 over the recipe treatment assuming no substitution from other foods. Although, we do not have a pure control group and also not the pre-treatment frequency for testing the causality of the two treatments, we can infer that mothers were much more likely to prepare special recipes under the combined treatment. This result is in line with the result on higher dietary intake of traditional sweets since 6 out of the 10 recipes in the book could be classified as traditional sweets. Also, it seems that personalized visits of the workers as well as their focus on diet managed to make a difference to the mother's cooking of the recipes.

7.2 Food expenditure

From Table A.1, we see that food expenditure increased in the incentive treatment, decreased in the recipe treatment and remained unchanged in the combined treatment. The decrease in food expenditure in the recipe treatment points towards reducing cost for the mother for a similar amount of food provided. The increase in food expenditure in the incentive treatment may imply that when workers push mothers to feed better food, the mothers spend more when they do not have access to the book. Finally, mothers in the combined treatment increase the calorie intake at home but this does not seem to come on average from any additional expenditures.

7.3 Heterogeneity by income

It is intuitive that if the household has a higher income, the incentivized worker may be able to convince the mother to buy more food than if the household has a lower income (this is also shown in a simple model in the Appendix even when the price per calorie goes down). In Table XII, I find that the impact of the combined treatment on weight seems to be higher for richer households (almost twice as large as the poorer households) but this is imprecisely estimated. In Table XIII, there appears to be an even stronger differential effect for wealthier households, but here too, the triple interaction coefficients are not significant.

Interestingly, we find a heterogeneity in the impact of the recipe treatment on weight. The recipe treatment seems to be more effective for the rich relative to the poor in increasing weight. Moreover, this seems to be strongly driven by ownership of kitchen assets, implying a complementarity between food production technology and the availabil-

ity of only a recipe book. This is consistent with the earlier finding of the heterogeneity in the recipe treatment's effect on weight by mother's literacy.

8 Long-run impact

In order to check if there was a long-run impact of the combined treatment's effect after the conclusion of the three-month experiment, I measured the weights of children in these Anganwadis in April 2011. There could also have been a lagged effect of providing the recipe book on malnutrition or only performance pay which was not detected after three months. I find in Table XIV that the combined treatment has a positive impact of a similar magnitude even nine months after the incentive scheme was withdrawn[52]. Note, however, that there is no additional growth but the increased level obtained after three months is sustained. This is significant at the 10% level. However, the recipe and incentive only treatments have almost no impact in the long-run. This suggests that the nudge towards increasing the number of home visits by Anganwadi workers to change behavior at home in the presence of a recipe book is extremely effective even if the nudge is present temporarily. However, this can also mean that malnourished children show persistence biologically once their weight is increased. The increase appears to be the concentrated for the moderately and severely malnourished, who were the main beneficiaries in the short run.

9 Policy implications

Often, public health programs focus only on distribution of nutritional information or an increase in the supply-side. This study reinforces the view that distribution of nutritional information if complemented with a performance incentive to the supply-side improves the chances of the program's success.

The combined treatment led to a decline in weight-for-age malnutrition by 4.2% in 3 months. We can estimate a 15.8% annual reduction in malnutrition, assuming the probability of improvement in the combined treatment remains constant throughout the year. Relative risk of death from infection by malnutrition is 4.24 times as high for moderately malnourished and 2.06 times for mildly malnourished as compared to normal weight children (Caulfield et al, 2004)[53]. Pelletier et al. (1995) find that of 100 deaths due to malnutrition, 83 are due to mild or moderate mal-

[52] There were no interviews with mothers in this round.

[53] According to WHO standards, for moderately malnourished children, z-score >= -3 and < -2. For mildly malnourished, z-score >= -2 and <-1.

nutrition. The division between the two is 42 from mild and 41 from moderate (which I have calculated from their relative proportion in my sample and relative risk of death). This implies that if all moderately malnourished children were transformed into mildly malnourished, we would save 21 lives per 100 who would die of malnutrition. The effect of the combined treatment would imply a reduction of 3.3 deaths per 100 or saving 34,650 lives every year by implementing the combined treatment, if all malnourished children are targeted by ICDS.

Overall, 35 Anganwadi workers out of a possible of 73 managed to get cash bonuses of at least Rs. 100 ($2.22). 25 of these workers belonged to the combined treatment and 10 to the incentive treatment group. The average payout to the 25 workers in the combined treatment was equivalent to a 6.8% increase in their monthly salaries for 3 months. The 10 bonus winning workers in the incentive treatment got an equivalent of a 5.8% increase in their monthly salaries for 3 months[54]. However, if we include those who were eligible but did not get any incentive, the average payout per worker for the government would be equivalent to an increase of 4.9% in the salary of a worker in the combined treatment and 1.5% in the salary of a worker in an incentive-only treatment.

In the combined treatment, the incentive cost is $0.21 per child per quarter and the recipe book cost is $0.22 per mother per year. As mothers with more than 1 child may be given only 1 book, we get a cost of $0.20 per child per year instead of $0.22. For bulk printing, the cost to the government is likely to be much lower. The total cost works out to be $1.04 per child per year. The government spends 10 cents per child currently on their daily mid-day meal (ICDS Guidelines, 2007). Alternatively, the combined scheme could be thought of as costing the same as 10 additional meals for a child in a year.

Iron supplementation and deworming drugs have been amongst the most effective in reducing malnutrition. Bobonis, Miguel and Sharma (2004) find that an increase in weight of 0.5 kg in five months for 2-6 year old slum children in Delhi due to iron supplementation and deworming drugs. This led to participation rates increasing by 5.8%. The higher wages that resulted from increased pre-school participation rates using Kingdon's (1998) estimates provided a net benefit of $29 per child for a cost of $1.70 per child per year. In the combined treatment, the average weight gain per month is 71 gms as opposed to 100 gms per month in the iron and deworming treatment. Assuming a linear relationship between participation rates and change in weight, the combined treatment should result in a net benefit of $20.60 per child. Moreover, the cost of the

[54]The average payout to those who were awarded was Rs. 408 ($9.06) in the combined treatment and Rs. 350 ($7.78) in the incentive treatment.

treatment (assuming the incentive payouts happen 4 times a year) is only \$1.04 per child per year, where \$0.84 is from annual expected incentive payouts to the workers and \$0.20 from one-time recipe book printing and distribution[55]. The benefit-cost ratio is close to 20 as compared to 17 for Bobonis, Miguel and Sharma (2004). This is, to my knowledge, the most cost effective intervention to improve the status of underweight children in the short-run. Perhaps, most importantly, the benefits seem to last even after the experiment was concluded.

Björkman and Svensson (2009) look at the effect of encouraging community-based monitoring on child health and finds an increase of 0.14 in the z-score after 1 year. The comparative increase for the combined treatment is much higher at 0.10 after only 3 months.

10 Conclusion

This paper provides evidence for the impact of performance pay in the public sector and how it interacts with demand-side information in impacting health. By designing an experiment in the specific context of a government childcare worker in India and implementing three separate treatments, we find that providing performance pay alone may not be effective in improving health outcomes. The worker does respond to incentives by making additional visits to homes, but it does not help improve child health. However, when performance pay is combined with practical and specific information to the demand-side, there is a significant increase in weight and reduction in child malnutrition. The complementarity in incentives and information is consistent with better communication between the worker and the mother, wherein the incentivized worker makes efforts to monitor mothers through personalized home visits. There is an increase in the self-reported calorific and protein-rich food cooked at home in the combined treatment relative to the incentive treatment. When workers increase their home visits, mothers reduce their visits to the centers. This result highlights the substitution between the demand and supply sides that is often ignored in expansion of public sector programs.

Use of a recipe book as a monitoring device by workers is consistent with all the results we find. Another policy implication of these results is for the public information distribution system to work in tandem with incentivized community health workers in a developing country as they are likely to reinforce each other. By uncovering behavioral mechanisms

[55]The cost for our treatment is much lower than the World Bank (2006) figures for a nutrition education program of \$2.50 per person per year. The simple reason is that we are exploiting the infrastructure of Anganwadis that is already in place with performance-based incentives.

underlying the change in weight, we shed light on pathways of reducing child malnutrition in urban slums. The result points towards the possibilities for future research to have interventions that target both the supply-side and demand-side as well as incorporating insights from behavioral economics into designing interventions that try to increase complementarity between the two.

Child malnutrition has often been called the most difficult challenge facing development economists, but there appears to be a glimmer of hope if performance pay to workers is combined with specific information to mothers.

11 Tables and Figures

Table I: Total Anganwadis under each Treatment and Block

		Incentive	
		Yes	No
Recipe Book	Yes	35 from Block 1	36 from Block 3
	No	38 from Block 1	36 from Block 2

Table II: Compliance and attrition rates

		Incentive	**Recipe**	**Combined**	**Control**	**Total**
Round 1	children weighed	1188	1145	1081	1231	4645
	children whose mothers quizzed	1178	1089	963	1207	4437
	% children whose mothers quizzed	**99**	**95**	**89**	**98**	**96**
Round 2	children weighed	1061	964	985	1091	4101
	children whose mothers quizzed	1008	908	869	1053	3838
	% children whose mothers quizzed	**95**	**94**	**88**	**97**	**94**
	% children weighed again	**89**	**84**	**91**	**89**	**88**
	% mothers quizzed again	**86**	**83**	**90**	**87**	**86**

Table III: Summary statistics from the baseline

					Normalized Differences		
VARIABLES	Incentive	Recipe	Combined	Control	Incentive	Recipe	Combined
Weight (in kgs)	13.12	13.21	12.97	13.29	-0.07	-0.03	-0.12
	(1.79)	(1.84)	(1.81)	(1.86)			
Grade (according to IAP)	4.17	4.17	4.04	4.21	-0.04	-0.04	-0.15
	(0.79)	(0.78)	(0.82)	(0.78)			
z-score (according to WHO, 2007)	-1.66	-1.7	-1.81	-1.66	0.00	-0.04	-0.14
	(0.8)	(0.76)	0.76	(0.78)			
Malnutrition (according to WHO, 2007)	.32	.36	.43	.33	-0.02	0.04	0.15
	(.47)	(.48)	(.5)	(.47)			
Malnutrition (according to IAP)	.61	.62	.67	.59	0.03	0.04	0.12
	(.49)	(.49)	(.47)	(.49)			
Quiz score (out of 20)	11.92	12.00	13.58	12.55	-0.16	-0.14	0.25
	(3.04)	(3.25)	(2.75)	(2.55)			
Age of child (in years)	4.16	4.28	4.28	4.27	-0.10	0.01	0.01
	(.79)	(.86)	(.84)	(.83)			
Age of mother (in years)	28.80	28.39	28.31	28.53	0.04	-0.02	-0.03
	(4.66)	(4.73)	(4.57)	(4.33)			
Number of children	2.87	3.02	3.00	2.76	0.06	0.15	0.13
	(1.24)	(1.30)	(1.33)	(1.25)			
Income (in Rs.)	3802	3384	3513	3796	0.00	-0.16	-0.12
	(1770)	(1475)	(1306)	(1770)			
Housewife	.79	.71	.78	.78	0.02	-0.12	0.00
	(.41)	(.45)	(.40)	(.41)			
Fridge	.30	.24*	.30	.45	-0.22	-0.31	-0.23
	(.46)	(.43)	(.46)	(.50)			
Mobile	.72	.65	.71	.69	0.05	-0.06	0.03
	(.45)	(.47)	(.45)	(.46)			
Water filter	.03	.03	.02	.09	-0.18	-0.18	-0.21
	(.18)	(.18)	(.13)	(.28)			
Literate mother (can read and write)	.41	.32	.36	.42	-0.01	-0.15	-0.09
	(.49)	(.47)	(.48)	(.49)			
Educated worker (till at least A-level)	.48	.54	.43*	.65	-0.25	-0.16	-0.32
	(.50)	(.50)	(.50)	(.48)			

Notes: Standard deviations in parenthesis. Grades calculated according to IAP (Indian Association of Paediatricians) that is used in Anganwadis have been re-ordered from severely malnourished (1) to Normal (5). Normalized differences are calculated using the formula as in Imbens and Wooldridge (2009) for a scale-free measure of the difference in distributions. A rule of thumb is that when normalized difference exceeds 0.25 in absolute value, linear regression methods tend to be sensitive to the specification (Imbens and Rubin (2007)). * indicate a normalized difference exceeding 0.25.

Table IV: Main results on weight, grade, z-score and malnourished status

VARIABLES	Weight	Grade	z-score	Malnourished	Weight	Grade	z-score	Malnourished
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Post	0.275***	-0.051*	-0.048**	0.027*	0.264***	-0.047*	-0.057**	0.019
	(0.049)	(0.027)	(0.024)	(0.015)	(0.051)	(0.028)	(0.025)	(0.016)
Incentive	-0.135	-0.040	0.008	-0.011	-0.046	0.018	0.089	-0.034
	(0.112)	(0.049)	(0.052)	(0.029)	(0.141)	(0.050)	(0.055)	(0.032)
Recipe	-0.012	-0.010	-0.013	0.017	-0.009	0.084*	0.073	-0.037
	(0.112)	(0.046)	(0.048)	(0.028)	(0.120)	(0.045)	(0.049)	(0.032)
Combined	-0.300**	-0.179***	-0.148***	0.097***	-0.208	-0.046	-0.002	0.031
	(0.127)	(0.053)	(0.053)	(0.032)	(0.142)	(0.057)	(0.058)	(0.035)
Post*Incentive	-0.004	0.025	0.001	0.011	0.003	0.018	0.002	0.013
	(0.065)	(0.037)	(0.031)	(0.021)	(0.071)	(0.040)	(0.034)	(0.023)
Post*Recipe	-0.017	0.009	-0.003	-0.014	0.006	0.002	0.010	-0.001
	(0.073)	(0.042)	(0.035)	(0.023)	(0.078)	(0.046)	(0.038)	(0.027)
Post*Combined	0.171**	0.103**	0.080**	-0.046*	0.213**	0.105**	0.100**	-0.042*
	(0.082)	(0.045)	(0.039)	(0.024)	(0.087)	(0.048)	(0.041)	(0.025)
Other controls					**Yes**	**Yes**	**Yes**	**Yes**
Constant	13.268***	4.203***	-1.674***	0.338***	11.940***	3.834***	-2.095***	0.535***
	(0.082)	(0.032)	(0.032)	(0.020)	(0.481)	(0.157)	(0.162)	(0.094)
Observations	8202	8202	8202	8202	6318	6318	6318	6318
R-squared	0.010	0.005	0.004	0.005	0.026	0.028	0.037	0.024

Notes: Robust standard errors in parentheses clustered at the Anganwadi level. Grades have been ordered from very severely malnourished (1) to normal (5) according to thresholds used in Anganwadis and also for the bonus incentive in this experiment. Weight-for-age z-score for each child is calculated by the following formula from WHO Reference (2007):
(observed weight – median weight-for-age from reference population)/(Std. deviation of weight-for-age from reference population).
Malnourished status is a dummy which takes value 1 if child is malnourished according to WHO classification (if z-score < -2). Other controls include: Age of mother, Proportion kitchen, Proportion non-kitchen, Household Income, Food expenditure, No. of family members who are children, adult members, and the following dummy variables: Mother housewife, Electricity in Anganwadi, Fan in Anganwadi, Blackboard in Anganwadi, Drinking water in Anganwadi, Mother is Hindu, Grandmother at home, High quiz score worker (if quiz score is higher than median in the baseline), High quiz score mother, High experienced worker (if experience of the worker is more than the median experience), Literate mother (if the mother can read and write), Literate father, Educated worker (at least till A-level), Worker is very satisfied with work, Worker is very satisfied with life. Proportion kitchen means proportion of kitchen assets owned. Kitchen assets are fridge, water filter, water tap, cooking gas and pressure cooker. Non-kitchen assets are mobile, television, scooter, radio and a flush toilet. *** p<0.01, ** p<0.05, * p<0.1.

Table V: Placebo test for weight, grade, z-score and malnourished status

VARIABLES	Weight	Grade	z-score	Malnourished	Weight	Grade	z-score	Malnourished
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Placebo Post	0.291***	-0.018	-0.015	0.020	0.279***	-0.018	-0.018	0.023
	(0.084)	(0.040)	(0.039)	(0.026)	(0.096)	(0.046)	(0.045)	(0.029)
Incentive	-0.186	0.024	0.007	-0.014	-0.061	0.106*	0.100*	-0.053
	(0.122)	(0.064)	(0.062)	(0.036)	(0.142)	(0.061)	(0.057)	(0.034)
Recipe	-0.137	-0.019	-0.045	0.018	-0.154	0.059	0.038	-0.023
	(0.138)	(0.070)	(0.071)	(0.040)	(0.147)	(0.066)	(0.066)	(0.040)
Combined	-0.279*	-0.145**	-0.143**	0.081*	-0.223	-0.037	-0.014	0.031
	(0.149)	(0.071)	(0.071)	(0.041)	(0.170)	(0.076)	(0.075)	(0.043)
Placebo Post*Incentive	0.051	-0.065	0.001	0.003	0.064	-0.067	0.008	0.006
	(0.107)	(0.054)	(0.054)	(0.034)	(0.121)	(0.061)	(0.062)	(0.037)
Placebo Post*Recipe	0.125	0.009	0.032	-0.001	0.138	0.012	0.032	-0.009
	(0.108)	(0.054)	(0.056)	(0.039)	(0.123)	(0.062)	(0.064)	(0.045)
Placebo Post*Combined	-0.021	-0.035	-0.005	0.017	0.012	-0.017	0.008	0.004
	(0.107)	(0.054)	(0.052)	(0.036)	(0.122)	(0.060)	(0.060)	(0.039)
Other Controls					**Yes**	**Yes**	**Yes**	**Yes**
Constant	12.976***	4.221***	-1.658***	0.318***	11.658***	3.845***	-2.129***	0.519***
	(0.098)	(0.052)	(0.049)	(0.028)	(0.504)	(0.183)	(0.183)	(0.115)
Observations	8106	8106	8106	8106	6336	6336	6336	6336
R-squared	0.013	0.008	0.006	0.007	0.031	0.031	0.042	0.027

Notes: Robust standard errors in parentheses clustered at the Anganwadi level. Placebo Post is a dummy that takes value 1 at the Baseline and 0 for the weight recorded in the registers before the baseline (on average 3 months before). Grade, weight-for-age z-score and malnourished are defined as before. Other controls include: Age of mother, Proportion kitchen, Proportion non-kitchen, No. of family members who are children, adult members, and the following dummy variables: Mother housewife, Electricity in Anganwadi, Fan in Anganwadi, Blackboard in Anganwadi, Drinking water in Anganwadi, Mother is Hindu, Grandmother at home, High quiz score worker (if quiz score is higher than median in the baseline), High quiz score mother, High experienced worker (if experience of the worker is more than the median experience), Literate mother (if the mother can read and write), Literate father, Educated worker (at least till A-level), Worker is very satisfied with work, Worker is very satisfied with life. Proportion kitchen means proportion of kitchen assets owned. Kitchen assets are fridge, water filter, water tap, cooking gas and pressure cooker. Non-kitchen assets are mobile, television, scooter, radio and a flush toilet. *** p<0.01, ** p<0.05, * p<0.1.

Table VI: Diet (at least twice a week)

VARIABLES	**Green Veg**	**Egg**	**Pulses**	**Sweet**	**Green Veg**	**Egg**	**Pulses**	**Sweet**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Post	-0.074	-0.130***	0.004	-0.070***	-0.084	-0.142***	-0.013	-0.080***
	(0.054)	(0.030)	(0.046)	(0.026)	(0.056)	(0.033)	(0.049)	(0.029)
Incentive	0.075	-0.050	0.043	-0.037	0.052	-0.088**	0.030	-0.045
	(0.051)	(0.034)	(0.048)	(0.029)	(0.049)	(0.040)	(0.046)	(0.034)
Recipe	0.042	0.075*	0.069	0.043	0.036	0.044	0.046	0.051
	(0.049)	(0.041)	(0.044)	(0.032)	(0.048)	(0.048)	(0.043)	(0.038)
Combined	0.114**	-0.052	0.082*	-0.066**	0.106**	-0.091**	0.076*	-0.067*
	(0.053)	(0.037)	(0.049)	(0.028)	(0.051)	(0.042)	(0.045)	(0.036)
Post*Incentive	0.074	0.197***	0.076	0.186***	0.067	0.185***	0.087	0.177***
	(0.062)	(0.048)	(0.052)	(0.048)	(0.066)	(0.052)	(0.058)	(0.050)
Post*Recipe	0.054	0.066	0.037	0.033	0.045	0.071	0.050	0.054
	(0.069)	(0.041)	(0.054)	(0.039)	(0.073)	(0.045)	(0.059)	(0.044)
Post*Combined	0.089	0.292***	0.077	0.292***	0.092	0.303***	0.079	0.307***
	(0.063)	(0.065)	(0.052)	(0.060)	(0.065)	(0.066)	(0.053)	(0.062)
Other controls					**Yes**	**Yes**	**Yes**	**Yes**
Constant	0.750***	0.228***	0.785***	0.124***	0.566***	0.394***	0.660***	0.010
	(0.046)	(0.026)	(0.041)	(0.025)	(0.100)	(0.106)	(0.100)	(0.058)
Observations	7766	7766	7766	7766	6539	6539	6539	6539
R-squared	0.023	0.029	0.024	0.042	0.052	0.052	0.061	0.076

Notes: Robust standard errors clustered at the Anganwadi level in parentheses. Green Veg, Egg, Pulses and Sweet are dummy variables equal to one when their intake by the child is on average at least twice a week and 0 otherwise based on mother's recall data from the past three months. Other controls include: Age of mother, Proportion kitchen, Proportion non-kitchen, Household Income, Food expenditure, No. of family members who are children, adult members, and the following dummy variables: Mother housewife, Electricity in Anganwadi, Fan in Anganwadi, Blackboard in Anganwadi, Drinking water in Anganwadi, Mother is Hindu, Grandmother at home, High quiz score worker (if quiz score is higher than median in the baseline), High quiz score mother, High experienced worker (if experience of the worker is more than the median experience), Literate mother (if the mother can read and write), Literate father, Educated worker (at least till A-level), Worker is very satisfied with work, Worker is very satisfied with life. Proportion kitchen means proportion of kitchen assets owned. Kitchen assets are fridge, water filter, water tap, cooking gas and pressure cooker. Non-kitchen assets are mobile, television, scooter, radio and a flush toilet.

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

Table VII: Testing the Channel of Complementarity by Mother's literacy

VARIABLES	Weight	Worker visit Reported by Mother	Worker visit Reported by Worker	Sweet
	(1)	(2)	(3)	(4)
Post	0.193**	-2.377***	-1.741*	0.078
	(0.074)	(0.653)	(0.898)	(0.114)
Post*Incentive	0.116	3.860***	3.987***	-0.361**
	(0.081)	(0.806)	(1.415)	(0.147)
Post*Recipe	0.159	3.270***	1.902*	-0.009
	(0.117)	(0.742)	(0.974)	(0.146)
Post*Combined	0.282***	4.249***	4.576***	-0.665***
	(0.101)	(0.825)	(1.516)	(0.163)
Post*Illiterate*Incentive	-0.174	0.001	-0.548	-0.109
	(0.109)	(0.687)	(0.978)	(0.143)
Post*Illiterate*Recipe	-0.254*	-1.213*	-0.589	-0.066
	(0.131)	(0.700)	(0.794)	(0.136)
Post*Illiterate*Combined	-0.093	-0.403	0.718	-0.185
	(0.106)	(0.689)	(1.104)	(0.152)
Other Controls	**Yes**	**Yes**	**Yes**	**Yes**
Constant	11.861***	7.115***	2.381	3.920***
	(0.469)	(1.274)	(1.822)	(0.177)
Observations	6520	6519	6369	6520
R-squared	0.025	0.124	0.348	0.092

Notes: Robust standard errors clustered at the Anganwadi level in parentheses. Illiterate is a dummy for mother who cannot read. Other controls include: Illiterate, Post*Illiterate, Incentive, Recipe, Combined, Illiterate*Incentive, Illiterate*Recipe, Illiterate*Combined, Age of mother, No. of family members who are children, adult members, and the following dummy variables: Mother housewife, Electricity in Anganwadi, Fan in Anganwadi, Blackboard in Anganwadi, Drinking water in Anganwadi, Mother is Hindu, Grandmother at home, High experienced worker (if experience of the worker is more than the median experience), Educated worker (at least till A-level), ownership of kitchen and non-kitchen assets, income, food expenditure, Worker is very satisfied with work, Worker is very satisfied with life. *** p<0.01, ** p<0.05, * p<0.1.

Table VIII: Social Interaction between Mother and Worker

VARIABLES	**Worker visits** Reported by Mother	**Mother visits** Reported by Mother	**Total visits** Reported by Mother	**Worker visits** Reported by Worker	**Worker Visits** Reported by Mother	**Mother visits** Reported by Mother	**Total visits** Reported by Mother	**Worker visits** Reported by Worker
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Post	-2.005***	-1.138*	-3.143***	-1.367**	-1.949***	-0.730	-2.680***	-1.534**
	(0.474)	(0.619)	(1.022)	(0.618)	(0.478)	(0.612)	(1.000)	(0.695)
Incentive	-0.922	6.044***	5.127***	4.820***	-0.962	5.773***	4.814***	3.825***
	(0.580)	(1.040)	(1.392)	(1.258)	(0.614)	(1.066)	(1.447)	(1.179)
Recipe	-2.107***	2.910***	0.799	-1.748**	-2.041***	3.165***	1.118	-1.699**
	(0.560)	(1.051)	(1.401)	(0.728)	(0.560)	(1.069)	(1.434)	(0.775)
Combined	-2.206***	5.170***	2.964*	0.515	-2.489***	5.432***	2.943*	-0.517
	(0.559)	(1.267)	(1.600)	(0.958)	(0.595)	(1.297)	(1.653)	(1.169)
Post*Incentive	3.963***	-2.215**	1.745	2.337**	3.728***	-2.176**	1.552	3.254***
	(0.609)	(1.053)	(1.438)	(1.071)	(0.636)	(1.083)	(1.462)	(1.164)
Post*Recipe	2.459***	0.243	2.694*	0.892	2.493***	0.246	2.734*	1.306
	(0.545)	(1.129)	(1.495)	(0.714)	(0.574)	(1.132)	(1.496)	(0.815)
Post*Combined	3.871***	-1.929	1.942	4.263***	3.807***	-1.949	1.858	5.227***
	(0.634)	(1.433)	(1.628)	(1.375)	(0.637)	(1.424)	(1.628)	(1.457)
Other controls					**Yes**	**Yes**	**Yes**	**Yes**
Constant	5.565***	7.423***	12.989***	5.733***	6.437***	4.807	11.240***	2.486
	(0.520)	(0.673)	(1.135)	(0.590)	(1.163)	(2.979)	(3.333)	(1.880)
Observations	7764	7762	7761	9350	6537	6539	6538	6223
R-squared	0.098	0.087	0.073	0.211	0.122	0.112	0.092	0.347

Notes: Number of Worker Visits and Mother Visits in the previous month are reported by the mother in both rounds. Worker visits in the previous month are reported by worker for each child in both rounds. Robust standard errors clustered at the Anganwadi level in parentheses. Other controls include: Age of mother, Proportion kitchen, Proportion non-kitchen, Household Income, Food expenditure, No. of family members who are children, adult members, and the following dummy variables: Mother housewife, Electricity in Anganwadi, Fan in Anganwadi, Blackboard in Anganwadi, Drinking water in Anganwadi, Mother is Hindu, Grandmother at home, High quiz score worker (if quiz score is higher than median in the baseline), High quiz score mother, High experienced worker (if experience of the worker is more than the median experience), Literate mother (if the mother can read and write), Literate father, Educated worker (at least till A-level), Worker is very satisfied with work, Worker is very satisfied with life. Proportion kitchen means proportion of kitchen assets owned. Kitchen assets are fridge, water filter, water tap, cooking gas and pressure cooker. Non-kitchen assets are mobile, television, scooter, radio and a flush toilet. *** p<0.01, ** p<0.05, * p<0.1.

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Table IX: Content of Interaction between Worker and Mother

VARIABLES	Talked about Diet	Showed Growth Chart	Talked about Consequences of Malnutrition	Talked about Diet	Showed Growth Chart	Talked about Consequences of Malnutrition
	(1)	(2)	(3)	(4)	(5)	(6)
Post	-0.014	-0.156***	-0.066	-0.010	-0.127**	-0.079
	(0.018)	(0.053)	(0.049)	(0.015)	(0.051)	(0.054)
Incentive	-0.048**	0.043	-0.149***	-0.044*	0.114**	-0.108*
	(0.023)	(0.040)	(0.053)	(0.025)	(0.051)	(0.060)
Recipe	-0.035*	-0.103**	-0.062	-0.035*	-0.040	-0.051
	(0.021)	(0.049)	(0.049)	(0.020)	(0.056)	(0.056)
Combined	-0.073*	0.018	0.002	-0.077**	0.101**	0.016
	(0.037)	(0.049)	(0.055)	(0.035)	(0.051)	(0.056)
Post*Incentive	0.074**	-0.053	0.048	0.061**	-0.088	0.061
	(0.029)	(0.086)	(0.086)	(0.030)	(0.087)	(0.092)
Post*Recipe	0.014	0.165**	0.092	0.021	0.124	0.101
	(0.038)	(0.075)	(0.070)	(0.030)	(0.075)	(0.074)
Post*Combined	0.116***	0.057	-0.036	0.101***	0.032	-0.029
	(0.039)	(0.070)	(0.068)	(0.036)	(0.069)	(0.074)
Other controls				**Yes**	**Yes**	**Yes**
Constant	0.963***	0.840***	0.840***	0.962***	0.875***	1.041***
	(0.012)	(0.034)	(0.036)	(0.039)	(0.104)	(0.100)
Observations	7676	7672	7675	6525	6521	6524
R-squared	0.017	0.032	0.020	0.047	0.089	0.087

Notes: Dependent Variables are all dummy variables that take value 1 if the worker talked to the mother in the past 3 months on these topics as reported by the mother. Robust standard errors clustered at the Anganwadi level in parentheses. Other controls include: Age of mother, Proportion kitchen, Proportion non-kitchen, Household Income, Food expenditure, No. of family members who are children, adult members, and the following dummy variables: Mother housewife, Electricity in Anganwadi, Fan in Anganwadi, Blackboard in Anganwadi, Drinking water in Anganwadi, Mother is Hindu, Grandmother at home, High quiz score worker (if quiz score is higher than median in the baseline), High quiz score mother, High experienced worker (if experience of the worker is more than the median experience), Literate mother (if the mother can read and write), Literate father, Educated worker (at least till A-level), Worker is very satisfied with work, Worker is very satisfied with life. Proportion kitchen means proportion of kitchen assets owned. Kitchen assets are fridge, water filter, water tap, cooking gas and pressure cooker. Non-kitchen assets are mobile, television, scooter, radio and a flush toilet. *** p<0.01, ** p<0.05, * p<0.1.

Table X: Quiz score and its components

VARIABLES	Quiz Score	Recipe Score	Non-recipe Score	Quiz Score	Recipe Score	Non-recipe Score
	(1)	(2)	(3)	(4)	(5)	(6)
Post	0.076	-0.180	0.256**	0.115	-0.172	0.287**
	(0.289)	(0.200)	(0.129)	(0.288)	(0.202)	(0.130)
Incentive	-0.604*	-0.642**	0.038	-0.297	-0.381	0.084
	(0.350)	(0.260)	(0.128)	(0.385)	(0.305)	(0.134)
Recipe	-0.473	-0.490*	0.017	-0.574	-0.580*	0.006
	(0.363)	(0.273)	(0.142)	(0.406)	(0.303)	(0.155)
Combined	1.030***	0.826***	0.204*	0.956***	0.772***	0.184
	(0.349)	(0.281)	(0.123)	(0.349)	(0.270)	(0.129)
Post*Incentive	-0.428	-0.411	-0.017	-0.495	-0.415	-0.080
	(0.547)	(0.423)	(0.169)	(0.586)	(0.459)	(0.177)
Post*Recipe	1.312***	1.118***	0.194	1.303***	1.178***	0.124
	(0.395)	(0.288)	(0.163)	(0.410)	(0.299)	(0.166)
Post*Combined	0.273	0.223	0.050	0.366	0.319	0.047
	(0.386)	(0.273)	(0.187)	(0.396)	(0.282)	(0.186)
Other controls				**Yes**	**Yes**	**Yes**
Constant	12.521***	7.497***	5.025***	13.603***	8.359***	5.244***
	(0.208)	(0.142)	(0.096)	(0.908)	(0.711)	(0.315)
Observations	7676	7676	7676	6628	6628	6628
R-squared	0.075	0.091	0.025	0.091	0.113	0.046

Notes: Robust standard errors in parentheses clustered at the Anganwadi level. Quiz score is out of 20 where recipe and non-recipe scores are out of 13 and 7 respectively. Other controls include: Age of mother, Proportion kitchen, Proportion non-kitchen, Household Income, Food expenditure, No. of family members who are children, adult members, and the following dummy variables: Mother housewife, Electricity in Anganwadi, Fan in Anganwadi, Blackboard in Anganwadi, Drinking water in Anganwadi, Mother is Hindu, Grandmother at home, High experienced worker (if experience of the worker is more than the median experience), Literate mother (if the mother can read and write), Literate father, Educated worker (at least till A-level), Worker is very satisfied with work, Worker is very satisfied with life. Proportion kitchen means proportion of kitchen assets owned. Kitchen assets are fridge, water filter, water tap, cooking gas and pressure cooker. Non-kitchen assets are mobile, television, scooter, radio and a flush toilet. *** p<0.01, ** p<0.05, * p<0.1.

Table XI: Calories from recipes cooked using book

VARIABLES	**Total calories from recipes**	**Number of times recipes cooked**
	(1)	(2)
Combined	266.183***	44.238***
	(34.416)	(5.520)
Constant	44.798***	8.178***
	(7.519)	(1.398)
Observations	1960	1960
R-squared	0.377	0.393

Note: Results are from a cross-sectional regression. Robust standard errors clustered at the Anganwadi level in parentheses. Mothers in the recipe and combined treatment were asked how many times they cooked each of the ten recipes from the recipe book in the past three months between baseline and post-treatment round. The recipe book had boxes underneath each recipe that could be ticked by the mother every time she prepared a recipe. Calories have been calculated assuming 150 gms of the recipe was given to the child and total calories have been divided by 90 to get average calories from recipes per day. *** p<0.01, ** p<0.05, * p<0.1.

Table XII: Heterogeneous impact of treatments on weight by income

VARIABLES	Weight	Grade	z-score	Malnourished
	(1)	(2)	(3)	(4)
Post	0.298***	-0.002	-0.043	0.010
	(0.067)	(0.034)	(0.033)	(0.016)
Post*Incentive	0.011	-0.020	0.021	0.026
	(0.080)	(0.045)	(0.040)	(0.026)
Post*Recipe	-0.064	-0.060	-0.019	0.010
	(0.097)	(0.056)	(0.047)	(0.029)
Post*Combined	0.132	0.037	0.069	-0.028
	(0.116)	(0.064)	(0.055)	(0.032)
Post*Rich*Incentive	-0.085	0.041	-0.067	-0.008
	(0.111)	(0.065)	(0.053)	(0.041)
Post*Rich*Recipe	0.140	0.114*	0.055	-0.023
	(0.126)	(0.068)	(0.061)	(0.049)
Post*Rich*Combined	0.117	0.111	0.041	-0.021
	(0.139)	(0.080)	(0.068)	(0.048)
Other controls	**Yes**	**Yes**	**Yes**	**Yes**
Constant	12.129***	3.939***	-1.953***	0.481***
	(0.502)	(0.161)	(0.172)	(0.097)
Observations	6376	6376	6376	6376
R-squared	0.027	0.026	0.036	0.024

Notes: Robust standard errors clustered at the Anganwadi level in parentheses. Rich is a dummy for a household which has a greater than the median income at baseline (Rs. 3000). Other controls include: Rich, Post*Rich, Incentive, Recipe, Combined, Rich*Incentive, Rich*Recipe, Rich*Combined, Age of mother, No. of family members who are children, adult members, and the following dummy variables: Mother housewife, Electricity in Anganwadi, Fan in Anganwadi, Blackboard in Anganwadi, Drinking water in Anganwadi, Mother is Hindu, Grandmother at home, High quiz score worker (if quiz score is higher than median in the baseline), High quiz score mother, High experienced worker (if experience of the worker is more than the median experience), Literate mother (if the mother can read and write), Literate father, Educated worker (at least till A-level), Worker is very satisfied with work, Worker is very satisfied with life. *** p<0.01, ** p<0.05, * p<0.1.

Table XIII: Heterogeneous impact of treatments on weight by assets

VARIABLES	Weight	Grade	z-score	Malnourished
	(1)	(2)	(3)	(4)
Post	0.354***	-0.012	-0.002	0.008
	(0.082)	(0.039)	(0.041)	(0.022)
Post*Incentive	-0.035	0.007	-0.020	0.021
	(0.106)	(0.050)	(0.055)	(0.033)
Post*Recipe	-0.158	-0.094	-0.075	0.016
	(0.113)	(0.066)	(0.054)	(0.037)
Post*Combined	0.064	0.002	0.031	-0.028
	(0.154)	(0.085)	(0.074)	(0.041)
Post*Highpropkitchen*Incentive	0.021	-0.001	0.018	-0.005
	(0.120)	(0.054)	(0.062)	(0.038)
Post*Highpropkitchen*Recipe	0.272*	0.170**	0.134**	-0.029
	(0.139)	(0.072)	(0.066)	(0.043)
Post*Highpropkitchen*Combined	0.188	0.145	0.086	-0.020
	(0.162)	(0.088)	(0.078)	(0.040)
Other controls	**Yes**	**Yes**	**Yes**	**Yes**
Constant	12.054***	3.928***	-1.975***	0.458***
	(0.518)	(0.157)	(0.165)	(0.098)
Observations	6398	6398	6398	6398
R-squared	0.026	0.025	0.033	0.022

Notes: Robust standard errors clustered at the Anganwadi level in parentheses. Highpropkitchen means 3 or more of the following kitchen assets are owned: fridge, water filter, water tap, cooking gas and pressure cooker. Other controls include: Highpropkitchen, Post*Highpropkitchen, Incentive, Recipe, Combined, Highpropkitchen*Incentive, Highpropkitchen*Recipe, Highpropkitchen*Combined, Age of mother, No. of family members who are children, adult members, and the following dummy variables: Mother housewife, Electricity in Anganwadi, Fan in Anganwadi, Blackboard in Anganwadi, Drinking water in Anganwadi, Mother is Hindu, Grandmother at home, High quiz score worker (if quiz score is higher than median in the baseline), High quiz score mother, High experienced worker (if experience of the worker is more than the median experience), Literate mother (if the mother can read and write), Literate father, Educated worker (at least till A-level), Worker is very satisfied with work, Worker is very satisfied with life. *** p<0.01, ** p<0.05, * p<0.1.

Table XIV: Long-run impact on weight, grade, z-score and malnourished status

VARIABLES	**Weight**	**Grade**	**z-score**	**Malnourished**
	(1)	(2)	(3)	(4)
Post	1.680***	0.085***	0.061**	-0.045**
	(0.067)	(0.025)	(0.029)	(0.017)
Incentive	-0.176*	-0.043	0.000	-0.006
	(0.105)	(0.047)	(0.051)	(0.028)
Recipe	-0.087	-0.041	-0.038	0.030
	(0.101)	(0.044)	(0.046)	(0.027)
Combined	-0.324***	-0.174***	-0.151***	0.101***
	(0.123)	(0.052)	(0.054)	(0.032)
Post*Incentive	0.006	-0.030	-0.002	0.041*
	(0.089)	(0.038)	(0.038)	(0.022)
Post*Recipe	-0.175	-0.051	-0.059	0.014
	(0.115)	(0.049)	(0.047)	(0.030)
Post*Combined	0.183*	0.725	0.087*	-0.057*
	(0.107)	(0.049)	(0.046)	(0.030)
Constant	13.292***	4.210***	-1.662***	0.323***
	(0.072)	(0.029)	(0.030)	(0.019)
Observations	8439	8420	8420	8420
R-squared	0.162	0.838	0.007	0.007

Notes: Post is a dummy equal to 1 for the long-run survey in April, 2011 and 0 for baseline in April, 2010. Robust standard errors in parentheses clustered at the Anganwadi level. Grades have been ordered from very severely malnourished (1) to normal (5) according to thresholds used in Anganwadis and also for the bonus incentive in this experiment. Weight-for-age z-score for each child is calculated by the following formula from WHO Reference (2007):
(observed weight – median weight-for-age from reference population)/(Std. deviation of weight-for-age from reference population).
Malnourished status is a dummy which takes value 1 if child is malnourished according to WHO classification (if z-score < -2). *** p<0.01, ** p<0.05, * p<0.1.

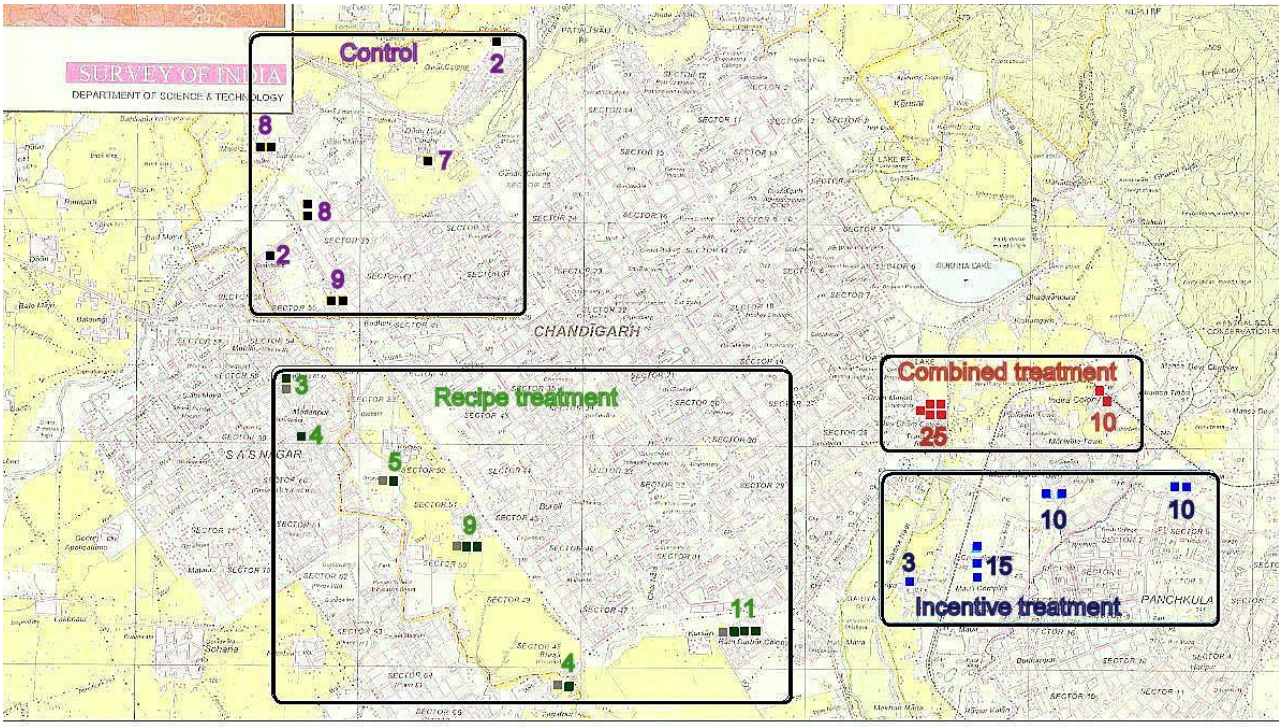

Figure I: Map showing the Location and number of Anganwadis in each cluster by Treatment and Control

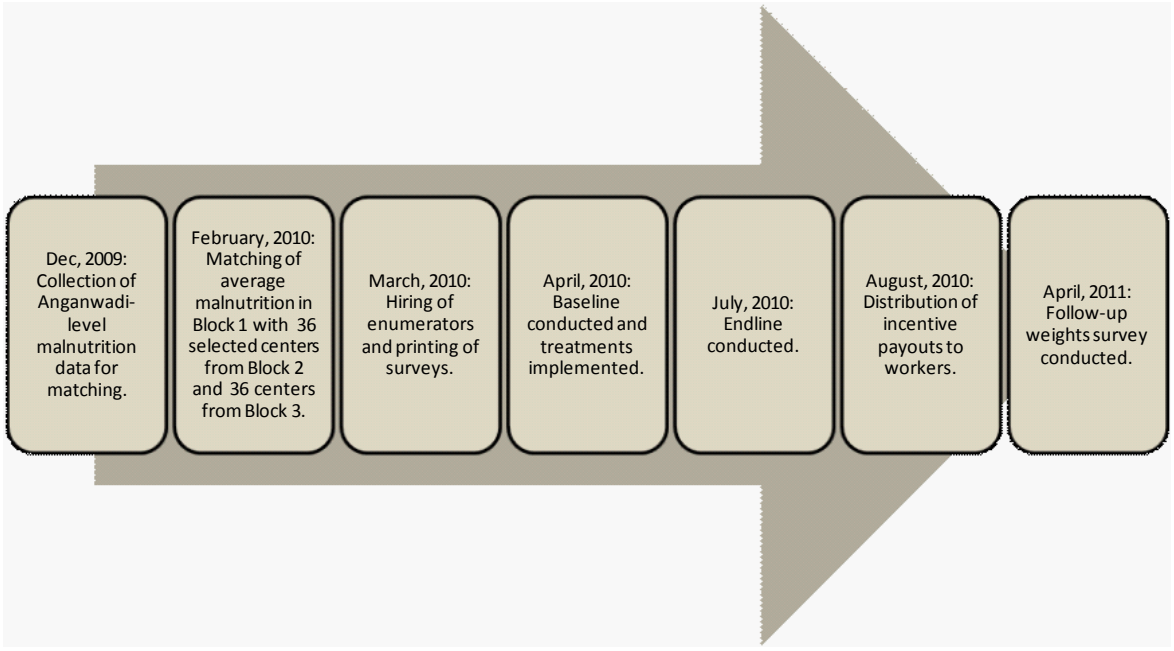

Figure II: Timeline of the Experiment

Appendix

A1 A simple model

The following section shows one possible channel (price per calorie) through which the recipe and incentive treatments may be affecting weight of the child.

A child's weight can be affected by calories provided in Anganwadi or at home. It makes no difference to the weight if the child gets calories at home or in the Anganwadi. Denoting food (calories) at home as f_1, food in Anganwadi as f_2, and the productivity of turning calories into weight as γ, the weight of a child is:

$$w = \gamma(f_1 + f_2)$$

The effort of the worker e can be either high, e_h or low, e_l. Worker may exert either high or low effort in both feeding children at Anganwadi *and* informing the mother. She exerts high effort when she is incentivized and low when she is not.

Assume:

$$e = \begin{cases} 1 & if \;\; e = e_h \\ 0 & if \;\; e = \;\; e_l \end{cases}$$

Calories provided in Anganwadi are greater if worker puts in high effort. On the other hand, calories at home are provided by the mother who has limited information on the price per calorie of food items. She can reduce the price per calorie if she is more informed. Her ignorance I may depend on the worker's effort in informing her about low-cost nutritious recipes and her access to the recipe book, R where:

$$R = \begin{cases} 1 & if \quad \text{recipe book is provided} \\ 0 & if \quad \text{recipe book is not provided} \end{cases}$$

The mother's utility function is Cobb-Douglas in weight of her child, w and other non-food household items, x :

$$u = x^{\delta} w^{\beta}$$

When I only depends on R, the maximization problem for the mother is:

$$\max_{x, f_1} \; u = x^{\delta} \gamma^{\beta} (f_1 + f_2)^{\beta} - \lambda_1 (I(R) f_1 + p_x x - m)$$

Taking first-order conditions and solving, we get:

$$f_1 = \frac{1}{\beta + \delta}(\frac{\beta m}{I(R)} - \delta f_2)$$

Substituting value of f_1 in w:

$$w = \gamma(\frac{1}{\beta + \delta}(\frac{\beta m}{I(R)} - \delta f_2) + f_2)$$

When I depends on R and e, the maximization problem for the mother is:

$$\max_{x,f_1} \; u = x^{\delta}\gamma^{\beta}(f_1 + f_2)^{\beta} - \lambda_1(I(e,R)f_1 + p_x x - m)$$

Taking first-order conditions and solving, we get:

$$f_1 = \frac{1}{\delta + \beta}[\frac{m\beta}{I(e,R)} - \frac{f_2\delta}{1 + \alpha f_2}]$$

The difference in the impact of the combined treatment and the incentive treatment is:

$$\Delta w_{ci} = w(1,1) - w(1,0) = \gamma\frac{\beta m}{\beta + \delta}[\frac{1}{I(1,1)} - \frac{1}{I(1,0)}]$$

The recipe book treatment effect is:

$$\Delta w_r = w(0,1) - w(0,0) = \gamma\frac{\beta m}{\beta + \delta}[\frac{1}{I(0,1)} - \frac{1}{I(0,0)}]$$

For testing complementarity, the effect of the combined treatment should be greater than the sum of the incentive and recipe book treatment:

$$\Delta w_{ci} - \Delta w_r = \gamma\frac{\beta m}{\beta + \delta}[\frac{1}{I(1,1)} - \frac{1}{I(1,0)} - \frac{1}{I(0,1)} + \frac{1}{I(0,0)}]$$

Complementarity exists if:

$$\frac{1}{I(1,1)} - \frac{1}{I(1,0)} - \frac{1}{I(0,1)} + \frac{1}{I(0,0)} > 0$$

A2 Biological complementarity and social interaction

Now consider the most general case when I is a function of e and R , and there is biological complementarity.

Assume:

$$w = f_1 + f_2 + \alpha f_1 f_2$$

The maximization problem for the mother is:

$$\max_{x,f_1} \; u = x^{\delta}\gamma^{\beta}(f_1 + f_2 + \alpha f_1 f_2)^{\beta} - \lambda_1(I(e,R)f_1 + p_x x - m)$$

Taking first-order conditions and solving, we get:

$$f_1 = \frac{1}{\delta+\beta}[\frac{m\beta}{I(e,R)} - \frac{f_2\delta}{1+\alpha f_2}]$$

The difference between the effect of combined and incentive treatments:

$$\Delta w_{ci} = \gamma\frac{\beta m}{\beta+\delta}(1+\alpha f_2(1))[\frac{1}{I(1,1)} - \frac{1}{I(1,0)}]$$

The recipe book treatment:

$$\Delta w_r = \gamma\frac{\beta m}{\beta+\delta}(1+\alpha f_2(0))[\frac{1}{I(0,1)} - \frac{1}{I(0,0)}]$$

The complementarity effect is as follows:

$\Delta w_{ci} - \Delta w_r = \gamma\frac{\beta m}{\beta+\delta}\{[\frac{1}{I(1,1)} - \frac{1}{I(1,0)} - \frac{1}{I(0,1)} + \frac{1}{I(0,0)}] + \alpha[f_2(1)(\frac{1}{I(1,1)} - \frac{1}{I(1,0)}) - f_2(0)(\frac{1}{I(0,1)} - \frac{1}{I(0,0)})]\}$

Complementarity may exist because of two channels as embodied by the two composite terms in square brackets:

The first term is due to the social interaction alone and the second is due to the biological complementarity (if $\alpha > 0$).

Assume:

$$I = 1 - \eta_1 e - \eta_2 R - \eta_3 eR.$$

Now, as before:

$$\Delta w_{ci} = \gamma\frac{\beta m}{\beta+\delta}(1+\alpha f_2(1))[\frac{1}{1-\eta_1-\eta_2-\eta_3} - \frac{1}{1-\eta_1}]$$

$$\Delta w_r = \gamma\frac{\beta m}{\beta+\delta}(1+\alpha f_2(0))[\frac{1}{1-\eta_2} - 1]$$

The complementarity effect is:

$\Delta w_{ci} - \Delta w_r = \gamma \frac{\beta m}{\beta+\delta}\{[\frac{1}{1-\eta_1-\eta_2-\eta_3} - \frac{1}{1-\eta_1} - \frac{1}{1-\eta_2} + 1] + \alpha[f_2(1)(\frac{1}{1-\eta_1-\eta_2-\eta_3} - \frac{1}{1-\eta_1}) - f_2(0)(\frac{1}{1-\eta_2} - 1)]\}$

Case A: $\eta_1 = 0$

Now, if a significant difference exists between the combined and the recipe treatment in affecting weight, it can only come from η_2 and η_3. We can check if η_2 is significant from the equation linking difference in weight between the recipe treatment and the control group.

Case B: $\eta_2 = 0$

If there is a significant difference between the combined and the incentive treatment, it will be present only because $\eta_3 > 0$. This effect may be enhanced by the biological complementarity. Similarly, the complementarity effect will only exist if $\eta_3 > 0$ and because $w(0,1) - w(0,0) = 0$.

A3 Relating mechanisms to conceptual framework

1. Impact on food at home of incentive treatment: It is not obvious that food at home increases in the incentive treatment as the mother may substitute away food at home when food at Anganwadi increases due to the worker being incentivized. However, we observe:

$$f(1,0) - f(0,0) > 0 \tag{2}$$

This may mean that the mother is getting enough information from the worker to not decrease her food inputs even if food at Anganwadi may be increasing.

2. Impact on food at home of recipe treatment: The recipe book should have either no effect or a positive effect on food at home. We find no effect:

$$f(0,1) - f(0,0) = 0 \tag{3}$$

3. Impact on food at home of combined treatment:

a) No mother-worker interaction: Consider the simple case where the worker and mother cannot interact with each other. In this case, the impact of the combined treatment on weight can be greater than the incentive treatment if and only if there is an effect of the recipe treatment on weight through food at home.

b) Mother-worker interaction: In the more general case, a worker can talk to the mother and influence her feeding to the child. Here, the combined treatment can be more effective than the incentive treatment through two channels. First, as before, simply having the recipe book available to the mother increases food at home. Second, there may be

a complementarity between incentive and information in making the mother-worker communication more effective.

As the recipe book has no effect on weight but we still observe the combined treatment's effect on food at home to be greater than the incentive treatment, it would imply presence of a complementarity between incentive and information in changing food at home through better communication. In other words, communication channel is enhanced by combining incentives and information if:

$$f(1,1) - f(1,0) > 0 \text{ and } (4) \text{ holds.}$$

A4 Food expenditure

Table A.1 seems to suggest that food expenditure increased in the incentive treatment (as the recipe book was unavailable and food intake increased) and decreased in the recipe (relative to control) and remained unchanged in the combined treatment. Mothers in the combined treatment appear to cook from the recipe book to increase the calorie intake of their children and are monitored in their tasks by the incentivized worker. The decline in the food expenditure in the recipe treatment may be due to mothers using general ideas from the recipe book to lower their food expenditure as they do not appear to use the recipe book extensively.

Even though self-reported weekly food expenditure is not as objective as measuring weight, it gives us clues about how much the mothers are saving due to preparation of cheaper calorific foods at home. It appears that the mothers in the combined treatment are able to substitute low-calorie and highly priced foods with home-made nutritious recipes that are much more economical.

Table A.1: Food expenditure per week

VARIABLES	Food exp	Food exp
	(1)	(2)
Post	83.161***	60.748***
	(18.572)	(14.429)
Incentive	-31.421	-29.717
	(24.746)	(25.235)
Recipe	-16.927	0.807
	(23.918)	(23.216)
Combined	72.136**	86.986***
	(30.889)	(29.984)
Post*Incentive	69.263**	57.007*
	(33.429)	(31.710)
Post*Recipe	-66.776**	-54.388**
	(27.280)	(24.234)
Post*Combined	-50.787	-70.169
	(54.145)	(42.624)
Other controls		**Yes**
Constant	440.026***	203.878***
	(14.035)	(49.384)
Observations	7558	6456
R-squared	0.049	0.308

Notes: Robust standard errors in parentheses clustered at the Anganwadi level. Food expenditure is measured by asking the mother, "On average, what is the weekly expenditure on food for the household?" *** p<0.01, ** p<0.05, * p<0.1

A5 Kernel estimation

Looking at the kernel estimates for change in weight in treatments and control, we observe a distinct performance of the combined scheme in increasing the weights of children relative to the other schemes. The incentive-only treatment seems to be a distant second and there appears to be virtually no difference of providing the recipe book on the change in weight. It is also interesting to note that for intervals of decrease in weight, the combined treatment seems to perform better than the incentive or the recipe scheme.

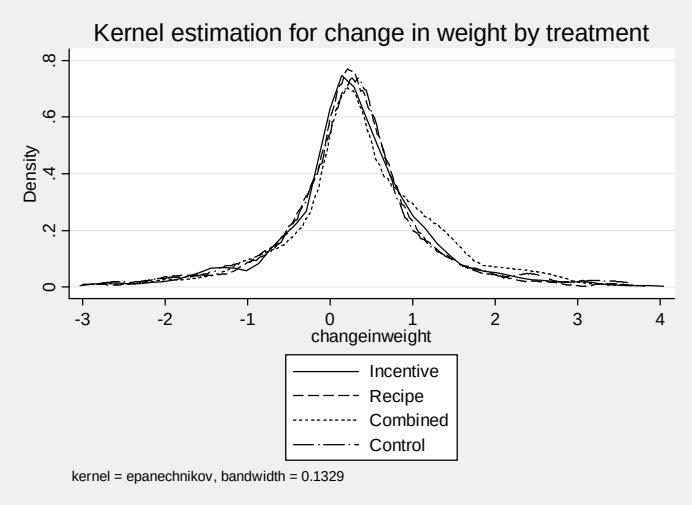

Figure A.1: Kernel estimation for change in weight by treatment

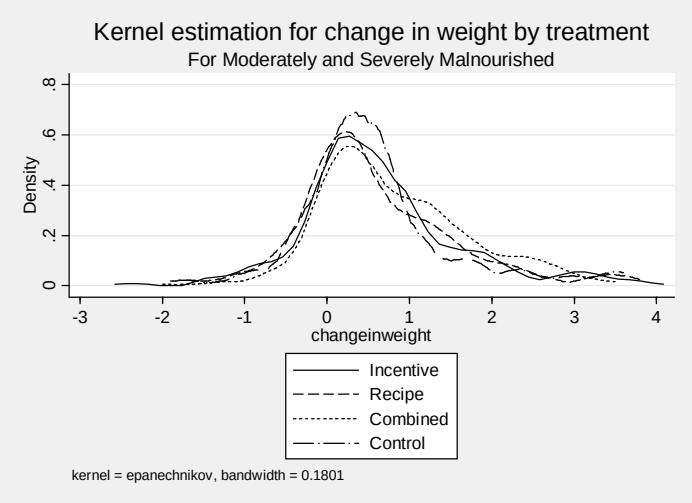

Figure A.2: Kernel estimation for change in weight for moderately and severely malnourished by treatment

A6 Threshold effect

Table A.5: Testing threshold effects on weight, worker effort and food at home

VARIABLES	Weight Near threshold	Weight Far threshold	Worker visits Near threshold	Worker visits Far threshold	Sweet Near threshold	Sweet Far threshold
	(1)	(2)	(3)	(4)	(5)	(6)
Post	0.420***	0.446***	-1.836***	-2.140***	-0.059*	-0.099***
	(0.079)	(0.067)	(0.495)	(0.599)	(0.032)	(0.035)
Incentive	-0.136	-0.096	-0.631	-1.194*	-0.027	-0.072*
	(0.147)	(0.129)	(0.661)	(0.712)	(0.043)	(0.044)
Recipe	-0.258*	0.100	-1.940***	-2.192***	0.056	-0.016
	(0.135)	(0.151)	(0.568)	(0.690)	(0.037)	(0.048)
Combined	-0.257	-0.104	-2.586***	-2.800***	-0.078**	-0.093*
	(0.158)	(0.136)	(0.612)	(0.701)	(0.034)	(0.047)
Post*Incentive	0.038	-0.021	3.544***	3.951***	0.125**	0.237***
	(0.105)	(0.093)	(0.701)	(0.805)	(0.055)	(0.060)
Post*Recipe	0.039	-0.031	2.356***	2.702***	0.045	0.070
	(0.110)	(0.122)	(0.602)	(0.728)	(0.057)	(0.052)
Post*Combined	0.205*	0.212	3.734***	4.183***	0.289***	0.353***
	(0.108)	(0.128)	(0.647)	(0.756)	(0.062)	(0.079)
Other controls	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Constant	11.919***	11.212***	6.964***	7.102***	0.100	0.153
	(0.514)	(0.674)	(1.351)	(1.418)	(0.086)	(0.106)
Observations	2107	1803	2107	1803	2107	1803
R-squared	0.071	0.080	0.135	0.129	0.069	0.105

Notes: Robust standard errors clustered at the Anganwadi level in parentheses. Worker visits in the past month are reported by mother. Sweet means intake of traditional sweets is at least twice a week. Near threshold implies that baseline weight of child was less than her target weight by a maximum of 1.12 kg, which is half of the mean difference between two grades. Other controls include: Age of mother, Proportion kitchen, Proportion non-kitchen, Household Income, Food expenditure, No. of family members who are children, adult members, and the following dummy variables: Mother housewife, Electricity in Anganwadi, Fan in Anganwadi, Blackboard in Anganwadi, Drinking water in Anganwadi, Mother is Hindu, Grandmother at home, High experienced worker (if experience of the worker is more than the median experience), Educated worker (at least till A-level), Worker is very satisfied with work, Worker is very satisfied with life. Proportion kitchen means proportion of kitchen assets owned. Kitchen assets are fridge, water filter, water tap, cooking gas and pressure cooker. Non-kitchen assets are mobile, television, scooter, radio and a flush toilet. *** p<0.01, ** p<0.05, * p<0.1.

A7 Matching

370 Anganwadis are administered through 3 geographical blocks in Chandigarh and are further classified as either rural, urban or slum. Preliminary data was collected in December '09 for 361 Anganwadis when I conducted a pilot to finalize the details of the experiment. Table A.3 shows the break-up of the Anganwadis by location and block.

Table A.3: No. of Anganwadi centres in Chandigarh by block and location

	Block 1	Block 2	Block 3	Total
Rural	18	28	42	88
Urban	25	13	20	58
Slum	77	76	71	224
Total	120	117	133	370

Before matching similar centers from Blocks 2 and 3 to Block 1, I dropped all centers from my sample that were shared within the same

cluster by two blocks in order to avoid any spillover effects of different treatments. These amounted to 4 centers from Block 1, 9 centers from Block 2 and 15 centers from Block 3. The sample sizes for treatment and control groups have been based on power calculations run in Optimal Design and the selection of 36 centers each in recipe and control group has been done through a MATLAB algorithm that matches the total proportion of malnourished kids in Blocks 2 and 3 to the Block 1 average of 0.5297. Comparison of average proportion of malnourished kids (under 6 years) in the four groups is given in Table A.4 showing similarity between the means for different degrees of malnutrition across the four groups.

Table A.4: Summary statistics by groups from data collected before baseline

	T1	**T2**	**T3**	**C**
	Incentive	**Book**	**Combined**	**Control**
Total centres in slums	38	36	35	36
Block Number	1	3	1	2
Mean proportion of malnourished	**0.5144**	**0.5295**	**0.5531**	**0.5176**
Standard deviation	0.1584	0.1310	0.1679	0.0916
Proportion of Grade I	0.3197	0.3224	0.3169	0.3271
Proportion of Grade II	0.1657	0.1796	0.2066	0.1697
Proportion of Grade III	0.0280	0.0269	0.0277	0.0194
Proportion of Grade IV	0.0009	0.0005	0.0019	0.0015

The summary statistics for combined treatment have been calculated by excluding 10 centers from Indira Colony as preliminary data was unavailable for that cluster.

For selecting the adequate sample size, I used the software, Optimal Design Version 1.77. The number of children per center or n was taken to be 25. Figure below shows power against intra-class correlation for different size effects. For instance, the intra-class correlation needed to detect a small effect of 0.2 standard deviations at the 5% significance level and a power of 0.8 is about 0.05 . If the effect size is slightly larger at δ =0.30, intra-class correlation can be as high as 0.15 and the power would still be sufficiently high.

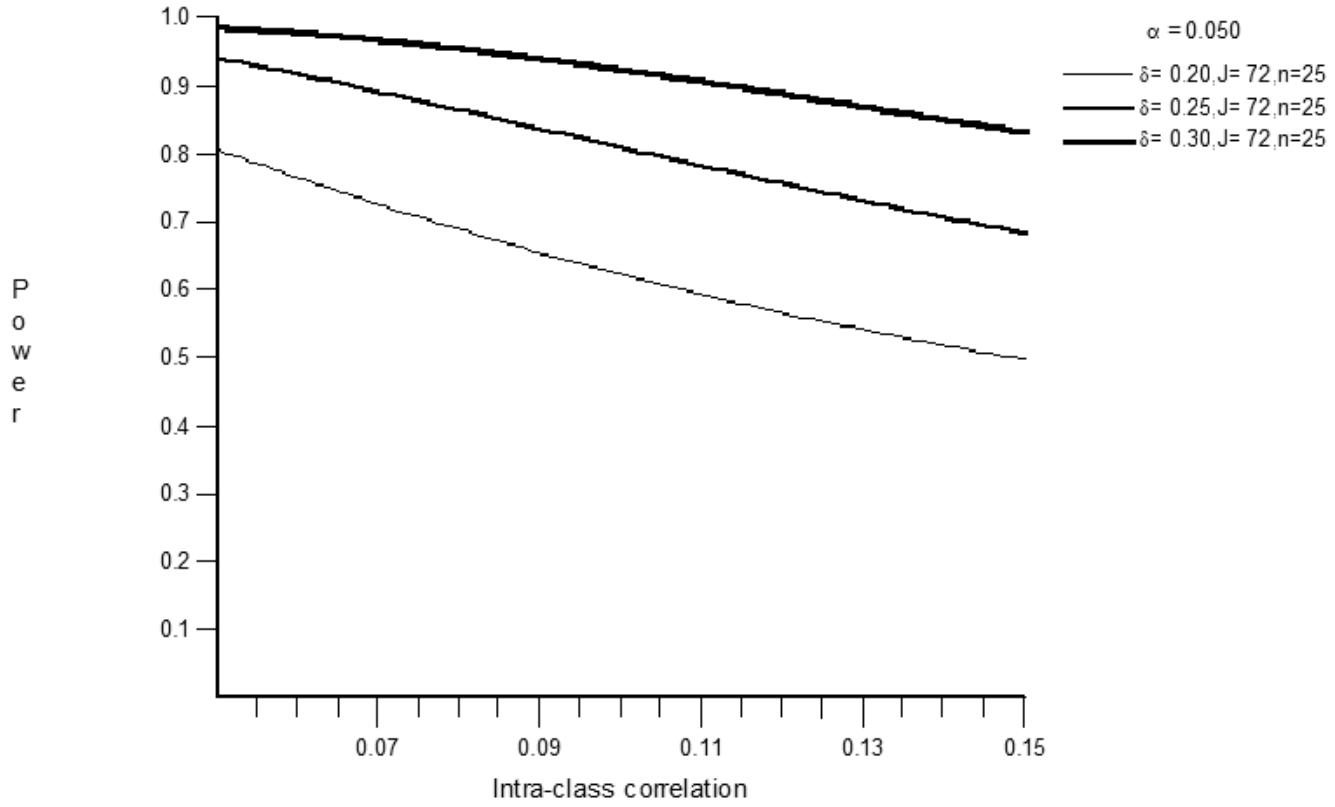

Figure A.3: Power versus Intra-class correlation

MOTHER'S QUIZ

1. **How many times do you feed your child in a day?**

   1……2……3……..4……..5…….

2. **How many times should growing children (age 3-6) be fed in a day?**

   1……2……3……..4……..5…….

3. **If there is paleness of complexion, which 3 food items will you give to increase iron?**

   1. Black gram 2. Carrot 3. Ghee 4. Milk 5. Pulses 6. Spinach

4. **Which 3 food items promote better eyesight?**

   1. Black gram 2. Carrot 3. Ghee 4. Milk 5. Green leafy vegetables 6. Mango

5. **Deficiency of protein causes shrivelling of body. Which 3 food items will you give from the following for increasing protein?**

   1. Carrot 2. Soya bean 3. Pulses 4. Ghee 5. Milk/Yoghurt 6. Mango

6. **For increasing calorie intake which 3 food items will you give to your child?**

   1. Rice 2. Jaggery 3. Carrot 4. Soya bean 5. Pulses 6. Wheat

7. **If your child is suffering from diarrhoea, which 3 food items should you give to your child?**

   1. ORS Water 2. Ghee 3. Lime Water 4. Mango 5. Water mixed with pulses and rice

8. **What symbol is visible on Government's packet of Iodised salt?**

   1. Laughing Sun 2. Laughing Flower 3. Laughing Moon 4. Laughing Child 5. Laughing Lion.

9. **Which 2 food items are good for strengthening your child's bones?**

   1. Carrot 2. Bajra 3. Milk 4. Green leafy vegetables 5. Mango

10. **Daliya and Maida (local preparations) both are made from Wheat. Which is more nutritious?**

    1. Dalia 2. Maida

Figure A.4: Translation of Mother's quiz

12 Acknowledgements

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