

Food Expenditure and Household Welfare in India: MGNREGA Program Outcomes

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ABSTRACT

The Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA), enacted in 2005, is the largest public works program in the world. It provides employment to over 130 million Indians every year. Although this act increased rural household wages since its implementation, it is important to understand its effect on household welfare. I used monthly food expenditure and nutritional value data for over 400,000 households in Uttar Pradesh, India between 2006 and 2009 to understand how welfare had changed before and after the implementation of MGNREGA. I divided these households into three groups based on when the policy was implemented in their district (Phase I, Phase II, Phase III). Next, I analyzed the per capita food expenditure and nutritional adequacy ratio and aggregated them based on districts, and then Phases. Using Phase I households as my Treatment Group and Phase III households as my Control Group, I conducted a difference-in-difference (DID) estimation to understand the effect of MGNREGA on welfare. In 2006, household food expenditure in all Phases was approximately the same but by 2009, Phase III households spent about 35 percent more than Phase I households. The nutritional adequacy ratio decreased for all three Phases over time. MGNREGA had, on average, a positive effect on fat, energy, iron, beta-carotene and riboflavin intake in households but a negative effect on protein, calcium, thiamin, and ascorbic acid. MGNREGA had no effect on the average in niacin intake. These results could be largely due to food price and inflation, agricultural and non-agricultural wages, and allocation of districts into Phases. A better understanding of why these fluctuations occurred would provide justification on the effectiveness of MGNREGA on household welfare.

KEYWORDS

Uttar Pradesh, Food Consumption, Food Expenditure, Nutritional Adequacy Ratio, Difference-in-Difference Estimation.

INTRODUCTION

Public works programs are a subset of social protection programs that provide cash or food-based payments. These labor-intensive initiatives are generally used in low and middle-income countries to achieve the dual purposes of providing a safety net for the poor and improving infrastructure to promote long-term growth (Holmes and Jones 2011). Countries have used these programs to mitigate increases in unemployment due to macroeconomic shocks (Argentina and Latvia), drought-related poverty (Ethiopia), and chronic poverty (Rwanda), as well as to meet the challenges of HIV/AIDS by linking employment to social services (Bose 2015). One such public works program is the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) implemented by the Central Government of India in 2005. With its legal framework and rights-based approach, MGNREGA aims to enhance the livelihood security of Indians by providing at least one hundred days of guaranteed employment every financial year to every household where adults members are willing to do unskilled manual work (MGNREGA). The Act was implemented in three phases since 2006 and has provided 4.48 billion days of employment over a three-year period. Approximately five billion USD has been spent on wages, indicating the large size of the program intended to benefit the poor in India and the huge investment that has been made in it (Tiwari et al. 2011).

MGNREGA extends beyond poverty reduction, recognizing employment as a legal right. The scheme not only helps in increasing income of the poor, but also generates a much-needed productive infrastructure for poverty alleviation on a permanent basis (Ghosh 2013). The World Bank reports that about 40 percent of India's rural population survive on less than \$1.25 a day. According to the report 'The State of Social Safety Nets 2015', MGNREGA was ranked as the largest public works program in the world, providing a social security net for 15 percent of India's population, thus having an immense positive impact on the Indian population (MGNREGA 2006). Although the program has been highlighted by UNDP, problems regarding transparency, under-utilization of funds, inadequate awareness, discrimination, and challenges in creating useful assets still exist (Bose 2015). Thus, it is important to understand how this public works program has improved the lives of people it serves.

Since individuals derive welfare more from the actual consumption of goods and services than from their income, consumption is a good method to understand 'standard of living' (Bose

2015). Household surveys are a vital source of information to better understand economic and social indications of households (Morati and Natali 2012). Consumption usually includes food items, non-food items, housing expenditure and consumer durables. Additionally, the concept of consumption is much clearer than that of income, especially for self-employed households and those working in the informal sector (Morati and Natali 2012). This is especially pertinent in India, where agriculture is the largest source of livelihood. In 2016, it accounted for 23 percent of the country's GDP and employed 59 percent of the country's total workforce (FAO). In rural India, 70 percent of households still depend primarily on agriculture for their livelihood, with 82 percent of these agricultural workers being small farmers (FAO). Consumption is thus an effective yet time consuming measurement of welfare.

In India, the National Sample Survey Organization (NSSO) collects consumption data. Since there are approximately 5.8 million households surveyed every year, I decided to focus my study on Uttar Pradesh, the most populous state of India (NSSO 2016). The MGNREGA policy is said to have greatly impacted Uttar Pradesh because about 68.5 percent of its land and 65 percent of its people are employed in the agricultural sector (PKSY 2004). Thus, I ask how welfare has changed in Uttar Pradesh, India as a consequence of the MGNREGA policy between 2006 and 2009. To answer this question, I investigate (i) how food expenditure has changed in households of districts with and without the policy over this time-period, (ii) how nutritional intake has changed in households of districts with and without the policy over this time-period, and (iii) if households meet the nutritional adequacy requirements in districts with and without the policy over this time-period. I hypothesized that (i) food expenditure increased at a higher rate in households of districts with the policy rather than without it in this time-period, (ii) nutritional intake also increased at a higher rate in households of districts with the policy rather than without it in this time-period, and (iii) households in districts with the policy met a higher number of nutritional adequacy requirements than households in districts without it in this time-period.

BACKGROUND

MGNREGA

MGNREGA is the world's largest welfare program and is run by the Government of India. It is funded by the Central Government but implemented on a local government level to ensure that work undertaken is relevant to the local community and there is no regional bias in access to funds (Bose 2015). This also promotes a new way of doing business through "a model of governance reform based on principles of transparency and grassroots democracy" (Ministry of Rural Development 2009).

The types of work undertaken by villages are flood control, rural connectivity, water conservation, drought proofing, irrigation, and land development (Ministry of Rural Development 2009). This fulfills MGNREGA's second objective of creating durable assets. All employment opportunities require unskilled, manual labor. As a result, MGNREGA is designed to attract the poor and deter the non-poor from participating in the program. (Besley and Coate 1992). Thus, even though the program does not formally target the poor, most workers are of below poverty line status.

Some key features of the program are equal pay between men and women, fortnightly payment of wages, one-third of the beneficiaries being women, a 60:40 wage to material ratio maintained for payment, and no contractors or machinery utilized for work (Holmes et al. 2011). These features encourage women to become more self-sufficient and consequently increase household income. The most distinguishing features of MGNREGA from other welfare schemes is that it goes beyond poverty alleviation and recognizes employment as a legal right and provides work on demand to wage-seekers. As a demand driven program, it acts as an insurance for poor households against unemployment. It also gives households the power to choose when they need work. This differs from supply driven programs where workers have little control over timing and availability of work. (SRES 2017) As a result, agricultural households have a means of maintaining their consumption patterns in between sowing and harvesting seasons.

According to the Act, the 200 most "backward", underdeveloped districts in India were the first to receive the program in its Phase I rollout in 2006. By 2007-08, the next 130 backward districts (Phase II) were added, and the remaining 295 districts (Phase III) were notified starting from April

2008. Since 2008, the program has covered the entire country except districts that have a 100 percent urban population (Holmes et al. 2011).

Study Site: Uttar Pradesh

Uttar Pradesh is home to about 166 million people, making it the most populous state in India. It is also one of the poorest states despite having rich potential in terms of human and natural assets. (Census of India 2011). With agriculture as its primary form of livelihood, Uttar Pradesh is one of the leading producers of sugarcane, wheat and rice in India. After the Green Revolution in the 1960's, the economic growth in most sectors of Uttar Pradesh was greater than the rest of India. However, since trade liberalization in 1991, the state has been slow to seize opportunities. In the early 2000's an estimated 8 percent of the world's poor resided in Uttar Pradesh alone (Mahapatra et al. 2008). Thus, it faces challenges in reducing poverty, and improving the social security and well-being of its people. In order to face these challenges, the state needs to increase economic opportunities, empower the poor, and ensure that there is an effective social safety net (Kozel and Parker 2003).

The MGNREGA program was designed to improve the lives of poor people by combating these very challenges. In Uttar Pradesh, there were 22 districts notified in Phase I, 17 districts in Phase II, and 32 districts in Phase III (MGREGA). In 2011, 7.3 million households demanded work and MGNREGA allotted work to 99.9% of them. (MGNREGA database)

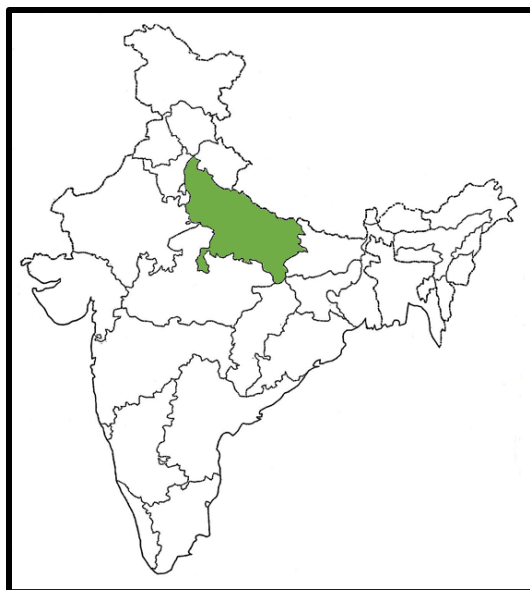


Figure 1: Location of Uttar Pradesh in India

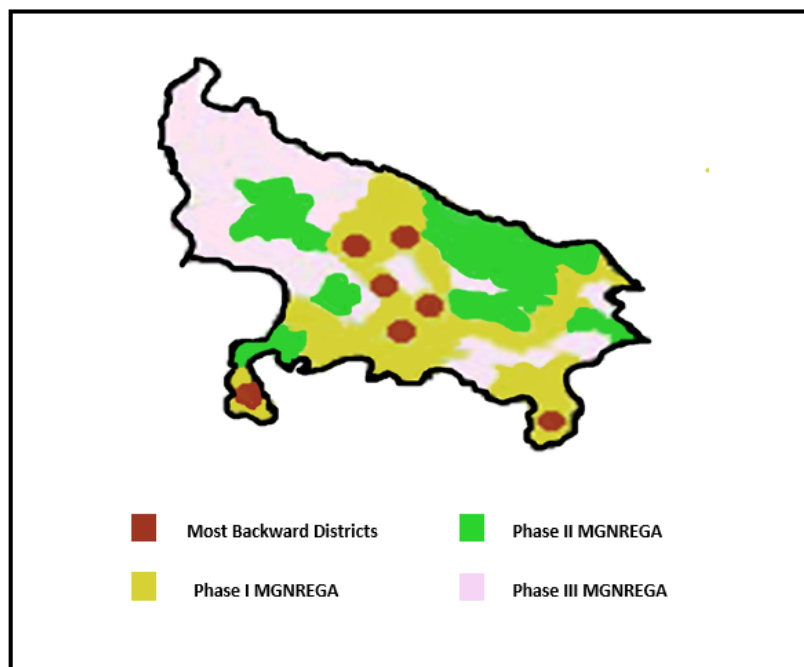


Figure 2: Backward Districts and Phases of MGNREGA Implementation

Food Price and Inflation

Food prices have been volatile around the world over the last few decades but rose considerably in early 2006. By 2008, these prices increased by 60 percent as compared to 2006 (Kozel and Parker 2003). Those most affected by it were developing countries, especially the low-income groups. These groups spend a large proportion of their income, up to four-fifths, on food (Hertel et al., 2004). India experience one of the highest rates of food inflation among developing countries during the late 2000's. There are three main periods in the food price trend. First, Indian inflation in food prices increased from 2005 to 2007. Second, inflation in food prices in India declined in 2007-2008. Third, global prices declined in the end of 2008, but prices in India increased (Dev 2009).

METHODOLOGY

MGNREGA Phases

With every phase that was added by MGNREGA, the time taken to implement the program in these additional districts increased. This increased the likelihood that effective employment creation would be weak in the beginning months of Phase II and Phase III notification (Imbert and Papp 2014). Thus, I took into consideration that with each Phase that was introduced, it took a longer period of time to implement the program in all districts in that Phase. As a result, I assume that the program was successfully implemented in Phase I districts by 2006, implemented in Phase II districts by 2008, and partially implemented in Phase III districts by 2009.

Indicators of Welfare

As MGNREGA has been successfully implemented across India for some years, it is appropriate to reflect on the aspects of the scheme that can be considered a success, the indicators used to illustrate success and how success is defined and measured in analyses (Drèze and Oldiges 2011). In this study, I used household welfare to measure the success of the program. Standard economic theory assumes that a household's objective is to maximize its utility given certain

constraints. Utility represents the household's welfare. Since welfare is unobservable, it is important to find observable indicators (Holmes et al. 2011). I used household food expenditure and per capita nutritional adequacy ratio as welfare indicators.

Every household must spend a proportion of their income on food because it is necessary for survival. As a household's welfare improves, it can spend more on food consumption, be it to increase the quantity or to improve the quality of food consumed. To observe these differences, I studied the change in household expenditure on food items from 2006 to 2009. Furthermore, I looked at the nutritional value associated with each food item to analyze if a change in food expenditure behavior led to a change in nutrition that the household receives. Lastly, I looked at whether the nutritional intake of an individual in a household met the daily recommended nutritional requirements.

DATA SOURCES

National Sample Survey Organization

The National Sample Survey Office (NSSO), a subsidiary organization of the Ministry of Statistics and Programme Implementation in India, was established in 1950. It is responsible for conducting large scale sample surveys on a national level. These surveys are classified into four broad categories: (i) household surveys on socio-economic subjects (ii) surveys on land holding, livestock and agriculture (iii) establishment and enterprise surveys (iv) village surveys (NSSO 2001). Under the first category, NSSO collects primary data through household surveys and creates a database to understand the impact of various problems in the country on different population groups in various socio-economic areas. These surveys are conducted through household interviews - using random sampling, and they collect information on employment rates, consumer expenditure, literacy levels, health, nutrition, family welfare, etc. (NSSO 2001). For the purpose of my research, I used the NSSO household consumer expenditure and nutritional value datasets for the state of Uttar Pradesh. The datasets contained information on 71 districts and 447,016 households in Uttar Pradesh.

Household Consumer Expenditure Dataset

The Household consumer expenditure dataset measures the expenditure incurred by a household during a 30-day period, known as the reference period (NSSO 2016). This dataset contains information about household characteristics, demographics, monthly expenditure on food and non-food items, and expenditure on education and medical services. For my study, I used the household characteristics and household expenditure on food item datasets. With the household characteristics dataset, I wanted to gain a better understanding of the number of members in each household and the district that they resided in. With the household expenditure on food items dataset, I wanted to understand the different items that a household consumed in the reference period. Items consumed included rice, wheat, cereals, pulses, milk and milk products, oils, meat, vegetables, fruits, etc. Consumption of an item was measured in terms of quantity, i.e. *how much quantity of an item was consumed by the household in the last 30 days* or value, i.e. *what was the worth of the items consumed by the household in the last 30 days*.

Nutritional Intake Dataset

The nutritional intake dataset provided detailed information on the nutritional value of each item from the NSSO household expenditure dataset. This consisted of information about the fat, energy, protein, calcium, etc. content of one unit of every food item. The units were measured in number, kilogram, liter and gram.

Mahatma Gandhi National Rural Employment Guarantee

Since MGNREGA was implemented across India in three phases, the MGNREGA website reports the year in which districts in every state received the program. Using the MGNREGA database, I found the specific districts in Uttar Pradesh that were part of Phase I, II, and III implementation. I then combined this information the NSSO dataset, which contained district-level identifiers, with the data I obtained from the MGNREGA website. Thus, I was able to analyze the household consumer expenditure dataset based on which phase the household in Uttar Pradesh was a part of.

National Institute of Nutrition

The National Institute of Nutrition (NIN) is an Indian public health, nutrition and translational research institute located in Hyderabad, India. The NIN provides estimates of nutrients to be consumed daily to ensure the nutritional and health requirements of all individuals in a given population are fulfilled. This is known as Recommended Daily Allowance (RDA). This depends on the bioavailability, i.e. the nutrients absorbed and utilized by the body (NIN 2011). The RDA's are suggested for groups like children, adolescents, adult men and adult women. For my study, I take an average of the requirements of these groups to give me a mean RDA for an individual.

METHODS

NSSO Datasets

For my research, I used the 62nd and 66th round of NSSO household consumer expenditure datasets. The 62nd round is the seventeenth in the annual series of surveys of household consumer expenditure. It was conducted from July 2005 to June 2006. The 66th round is the twenty-first in the annual series of surveys of household consumer expenditure and was conducted from July 2009 to June 2010. Using the 62nd round of NSSO was useful because it was the year that the MGNREGA Phase I had completed its implementation. As a result, it was able to showcase household expenditure as people were first being exposed to the policy's effect. Although MGNREGA announced its Phase III expansion in 2008, there was poor implementation of the policy for this Phase, so I assume that the Phase III districts took a long period to completely implement the policy. Thus, I used the 66th round because I assumed that the implementation of this Phase III was not complete by 2009.

For my analysis of nutrition, I used the 61st round of nutritional intake because that was the dataset that was available to me.

MGNREGA Phases

I analyzed the MGNREGA policy from 2006 to 2009. I used the Phase I districts as my Treatment Group because households in this district had been exposed to the policy for all three years of analysis. I used Phase III districts as my Control Group because they had only been partially exposed to the policy by 2009.

The Phase I districts were part of my treatment group because over the three-year period, these districts in Uttar Pradesh had the most exposure to the MGNREGA policy. The districts in Phase II were an intermediate group of districts that I used to better understand the trend of food expenditure and nutritional intake values. Phase III districts were part of my control group because they had just been exposed to the MGNREGA policy when the data on these households were collected, as seen in Table 1.

Table 1: Phases of Implementation of MGNREGA

	2006	2009
Phase I	Implemented	Implemented
Phase II	Not Implemented	Implemented
Phase III	Not Implemented	Not Implemented

Total Expenditure on Food Items

For each household's total expenditure, I first looked at all the items that the household consumed in 30 days. I multiplied the price of each item with the quantity of the item consumed. Then, I added these individual values to get the total expenditure value (TEV). Next, I aggregated the TEV for all households in one district and calculated the mean TEV for that district. Finally, I combined all the mean TEV for all districts in one Phase and calculated the TEV value for that Phase.

I repeated these steps to get the mean total expenditure value for Phase I, II, and III for the time periods 2006 and 2009.

Then, I found the difference between the mean TEV in 2006 and 2009 for all three Phases. In order to calculate the difference-in-difference estimate of TEV between the Phase I (Treatment) and Phase III (Control) groups, I subtracted the Phase III TEV difference between 2006 and 2009 from the Phase I TEV difference between 2006 and 2009.

Nutritional Adequacy Ratio

For each household's nutritional intake values (NIV), I looked at all the items that the household consumed in 30 days. I multiplied the quantity of the item consumed with the nutritional value associated with that item. I took the sum of each nutrient across all items consumed for one household to understand the NIV of that household. This gave me the total amount of protein, fat, energy, etc. consumed by that household.

Then, I divided the NIV of each household by the number of members in that household which gave me the per capita NIV of that household. By dividing each per capita nutrient value by 30, I calculated the per capita NIV per day. Next, I divided the per capita NIV by the Recommended Daily Allowance, calculated by the National Institute of Nutrition, to give me the nutrient adequacy ratio (NAR) of each household per day. If this ratio was greater than one, the members of the household were getting an adequate amount of the nutrient. However, if the ratio was less than one, the members of the household were getting a less than adequate amount of that nutrient. Then, I aggregated the NAR values for all households in one district and calculated the mean NAR value for that district. Finally, I combined all the mean NAR values for all districts in one Phase and calculated the mean NAR value for that Phase.

Then, I found the difference between the mean NAR in 2006 and 2009 for all three Phases. In order to calculate the difference-in-difference estimate of NAR between the Phase I (Treatment) and Phase III (Control) groups, I subtracted the Phase III NAR difference between 2006 and 2009 from the Phase I NAR difference between 2006 and 2009, as seen in Figure 3.

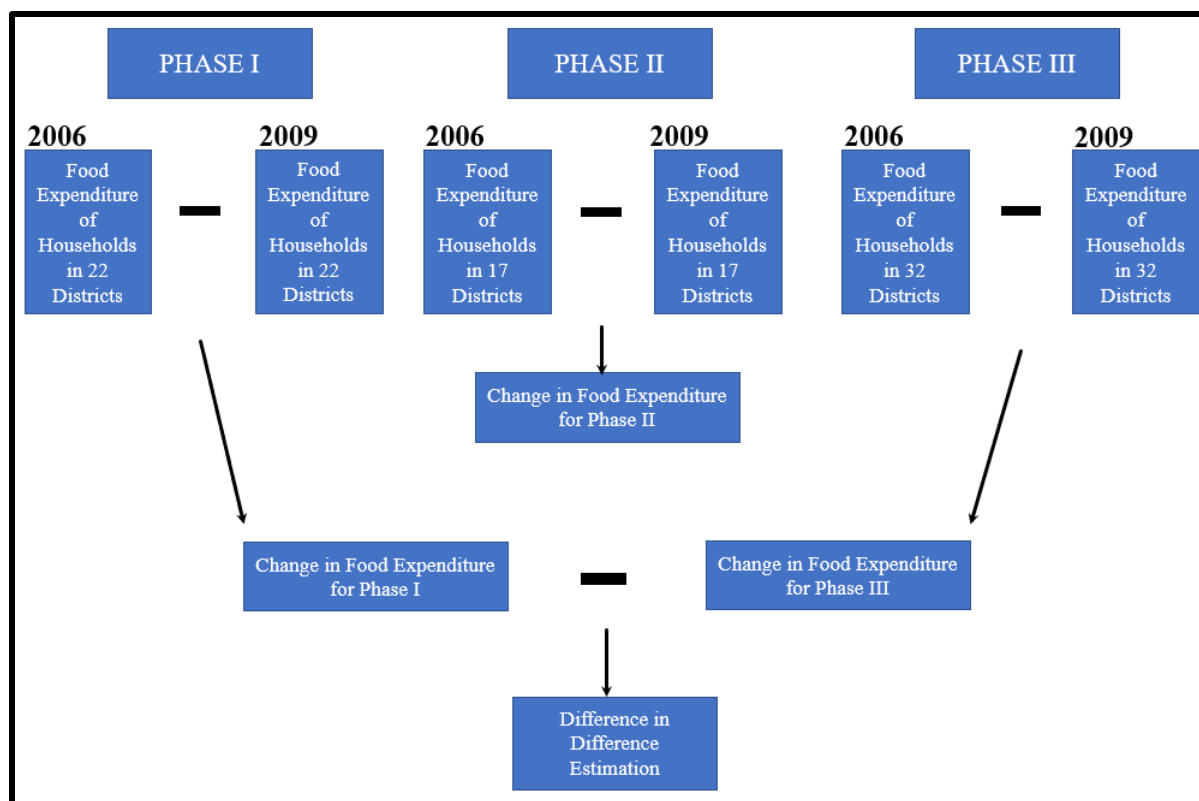


Figure 3: Chart of Difference-in-Difference Estimation

RESULTS

Total Expenditure on Food Items

I found that in 2006, households in all three phases spent approximately the same amount of on food. By 2009, Phase I households increased their expenditure by 30 percent, Phase II by 34 percent, and Phase III by 39 percent (Table 2). Moreover, in 2009, households in the Phase I (Treatment Group), were spending less on food than households in the Phase III (Control Group). I calculated the difference-in-difference estimation and observed that households in Control Group were on average spending 35% more on food consumption than households in Treatment Group.

Table 2: Total Expenditure Value in Phase I, II, III between 2006 & 2009

	2006	2009	Percentage Change
Phase I	4363.92	6206.95	30%
Phase II	4435.56	6704.89	34%
Phase III	4381.21	7214.00	39%

Nutritional Adequacy Ratio

Between 2006 and 2009, I observed a decrease in nutritional value intake for all nutrients in all three Phases. This is surprising because an increase in household expenditure (Table 1) could indicate an increase in nutritional intake.

On calculating the nutritional adequacy ratio (NAR) based on the recommended for Phase I, II, and III in 2006 and 2009, I noticed that households, on average, had an adequate amount of protein, fat, thiamine in their diet regardless of their Phase or time period (Table 2). Similarly, households, on average, did not have an adequate amount of energy, calcium, iron, betacarotene, and riboflavin in their diet. Additionally, households in all three Phases, on average, had an adequate amount of ascorbic acid in 2006 but an inadequate amount of it in 2009.

In 2006, Phase I (Treatment Group) households had a higher NAR for protein, energy, iron, thiamine, niacin, and ascorbic acid when compared to Phase III (Control Group) households. Although some of these values are negative, they are less negative than those of Phase III's. On the other hand, Phase III had higher values of fat, calcium, betacarotene, and riboflavin than Phase I. In 2009, this trend continued with the exception of Phase I households having a lower value of ascorbic acid than Phase III households.

The difference in NAR between 2006 and 2009 for the three Phases showed a much higher decrease in values for Phase II districts than for Phase I and Phase III. This was with the exception of betacarotene and riboflavin. To estimate the effect of MGNREGA on the nutritional adequacy rate of households, I computed the difference-in-difference estimate between Phase I and Phase III. These results showed me that MGNREGA had a positive effect on fat, energy, iron, betacarotene and riboflavin. This means that without the program, these estimates could have decreased more than they did in the calculation. However, MGNREGA had a negative effect on protein, calcium, thiamin, and ascorbic acid. An interesting observation was that MGNREGA played no role on the change in niacin because the DID value was 0.

I conducted t-tests on all the values calculated and found them be significant with a p-value of 0.001 at the 99 percent confidence level.

Table 2: Log Nutritional Adequacy Ratio in Phase I, II, II between 2006 & 2009

	protein	fat	energy	calcium	iron	b-carotene	thiamine	riboflavin	niacin	ascorbic
Phase I										
2006	0.106	0.119	-0.034	-0.170	-0.079	-0.799	0.209	-0.180	-0.024	0.190
2009	0.061	0.084	-0.074	-0.252	-0.142	-1.027	0.178	-0.207	-0.076	-0.120
diff	-0.045	-0.034	-0.041	-0.082	-0.064	-0.228	-0.032	-0.027	-0.052	-0.310
Phase II										
2006	0.132	0.184	-0.015	-0.154	-0.070	-0.843	0.221	-0.186	0.022	0.227
2009	0.051	0.083	-0.083	-0.256	-0.166	-1.014	0.158	-0.211	-0.084	-0.105
diff	-0.082	-0.101	-0.068	-0.102	-0.096	-0.172	-0.063	-0.025	-0.106	-0.332
Phase III										
2006	0.072	0.247	-0.051	-0.130	-0.094	-0.750	0.170	-0.164	-0.083	0.219
2009	0.031	0.159	-0.103	-0.185	-0.159	-0.992	0.139	-0.195	-0.135	-0.087
diff	-0.040	-0.088	-0.052	-0.055	-0.065	-0.242	-0.031	-0.031	-0.052	-0.306
DID	-0.004	0.054	0.011	-0.027	0.001	0.014	-0.001	0.004	0.000	-0.004

DISCUSSION

From 2006 to 2009, I found that food expenditure increased in households in Phase I, II, and III districts but nutritional intake decreased in all these households. Additionally, the Treatment Group did show some difference from the Control Group that could be accounted to MGNREGA. These results suggest that more research is needed on the relationship between MGNREGA on food prices and nutritional intake.

Food Prices and Inflation

There was extremely high food price volatility in India between 2006 and 2009. Regardless of MGNREGA's implementation, household food expenditure increased because of the rise in food prices. Thus, a boost in food expenditure did not mean an increase in quantity of food consumed. It is possible that households may have spent more on cheaper, higher calorie staples, and less on foods rich in protein and vitamins (Bhattacharya and Gupta 2017). However, from

Table 2, the nutritional adequacy ratio (NAR) of proteins and fats were positive, which meant that households were still consuming food rich in protein and fats. Moreover, the NAR for energy in kilocalories was negative through all households in both time-periods. The difference-in-difference estimate of NAR energy was 0.11 which suggested that MGNREGA had a positive effect on the consumption of food high in calories, as the value would have dropped even lower if the program was not implemented.

Agricultural versus Non-Agricultural Wages

With the increase in food prices, agricultural wages grew by an average annual rate of 17.3 percent between 2008-2009. In this period, agricultural wages were considerably higher than non-agricultural wages (Dev 2009) and this could be explained by the considerable increase in food expenditure in the Control Group (Phase III) districts in 2009. MGNREGA was not yet fully implemented. People in these households were still heavily dependent on agriculture for their livelihood and ended up having a higher income than those in Phase II and Phase III districts. Imbert and Papp find that although MGNREGA functioned to increase rural wages, the program raised wage income by 4.5 percent, suggesting that its impact was limited (Imbert and Papp 2015).

Micronutrient Deficiency

According to Bouis, there is a high prevalence of micronutrient deficiency in developing countries because extremely low intake of vitamins and mineral in diet. Thus, a small decrease in intake of vitamins and minerals will drive the prevalence rates significantly higher (Bouis 2008). From Table 2, calcium, iron, beta-carotene, riboflavin, niacin NAR values were negative in all three Phases, thus displaying a deficiency in micronutrients. Over time, these values decreased even further which is seen in the negative difference values. This is an indication of deteriorating public health and nutritional status of individuals. The DID values of iron, beta-carotene, and riboflavin could suggest that MGNREGA program had a positive effect on these micronutrients, but it does not explain why the DID values of the other micronutrients are negative.

MGNREGA Districts in Phase I, II, and III

As mentioned previously, MGNREGA Phase I was implemented in 2006, Phase II in 2008, and Phase III was partially implemented in 2009. According to the Act, Phase I was implemented in the 200 most backward rural districts in the country, followed by Phase II, and lastly Phase III. Thus, household welfare in the Treatment Group (Phase I) was much worse than welfare in the Control Group (Phase III). However, households in all three Phases had approximately the same average food expenditure values in 2006. This could display that within one year of the program implementation, households in the Treatment Group had a similar level of welfare to the Control Group. However, it could also indicate that the districts chosen for the Phase I implementation, were in fact not the most backward ones. A Planning Commission Report in 2014 ranked districts in India based on their backwardness. It is constructed using percentage of Scheduled Caste and Scheduled Tribe population, output per agricultural worker, and agricultural wages per day at the district level (Bose 2015). This graph showed that on average districts in Phase I were more backward than districts in Phase III. However, there is considerable overlap between the districts in Phase I and Phase III. This signifies that the Phase a district belonged to did not necessarily give a clear picture of a district's backwardness.

LIMITATIONS AND FUTURE DIRECTIONS

This study faced several limitations. First, when analyzing food consumption data, I only included food items that were measured in kilograms, grams and liters. By leaving out items that were measured by units other than these, like eggs in dozen, I left out items that could have potentially had an impact on my results. Then, while analyzing the nutritional value intake of individuals, I divided the household nutritional intake values by the number of people in the household. I did not investigate the composition of the household, i.e. adult male, infant, pregnant woman, etc. Additionally, I also took an average of the recommended daily allowance of the data to get an estimate for an individual without looking at how the allowances changed depending of the kind of individual. More detail into the individuals would have given me a better understanding of their nutritional requirements and make the nutritional adequacy ratio more precise.

I conducted household-level analysis of food expenditure and nutritional intake and then aggregated these values based on districts, and then aggregated these values based on the MGNREGA Phase the district belonged to. Since my sample size was so large, calculating the t-statistic and p-value was not enough to test the significance of the dataset. This is because the large sample size had the effect of skewing the results of the t-test. Next, to understand the effect of MGNREGA on household welfare, I used a difference-in-difference estimation approach. I assumed that the program was completely implemented in Treatment Group (Phase I) districts by 2006. However, there was no way to ensure that this happened. Similarly, by 2009, some districts in my Control Group had the program implemented in them. These assumptions impacted my results because I took a mean result of households depending on which Phase they were in. Thus, there is a possibility that households in my Treatment and Control Groups not following my assumptions affected my results. Furthermore, since districts in Uttar Pradesh are located close to each other, there was a high likelihood of spillover benefits in the data which impacted my results.

Further studies should create a more complex dataset that analyzes the changes in nutritional intake depending on individual. Additionally, a deeper study on the composition of food items consumed should be conducted to understand how consumption behavior changes depending on the changes in food prices. Lastly, more significance tests like an effect size type analysis needs to be conducted to understand how relevant the results calculated are.

BROADER IMPLICATIONS

MGNREGA is the largest public works program in the world, creating job opportunities for millions of households every year. Since it has been implemented to benefit rural population in the agricultural sector and this population spends a large proportion of its income of food consumption, it is important to understand how the program has affected food expenditure and nutritional intake behavior. This is the first step in counties moving past just feeding their population to ensure food security, justice, and sovereignty, and ultimately ensuring an increase in their population's welfare.

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