Final report

Herself and her children

How worse off are they? Impact of COVID-19 in rural Bihar

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LIST OF ABBREVIATIONS

APMC   Agricultural Produce Marketing Committee

ASHA   Accredited Social Health Activists

BPL   Below Poverty Line

DBT   Direct Benefit Transfer

DS   Dietary Scores

FC   Forward Caste

FPI   Food Prince Index

HDDS   Household Dietary Diversity Score

HNS   Health & Nutrition Strategy

IGC   International Growth Centre

JTSP   JEEViKA Technical Support programme

LIC   Low Income countries

LMIC   Low Middle Income countries

MDD   Minimum Dietary Diversity

OBC   Other Backward Castes

OLS   Ordinary Least Square

PDS   Public Distribution System

PPS   Probability proportional to size sampling

SARS   Severe acute respiratory syndrome

WFP   World Food programme

WHO   World Health Organization

WTP   Willingness to Pay

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CHAPTER ONE
COVID-19: A PERFECT STORM

1.1 Background

On 24th March 2020, the Government of India had announced a national level lockdown to contain the transmission of COVID-19 in India. The lockdown continued till 31st May, after which sanctions were lifted in a phased manner. The study analyses the impact of this lockdown on dietary practices of women and their youngest child in rural Bihar. It also examines access of households to welfare measures of the Central and State governments, and estimates change in welfare levels of women and children.

On 31 December 2019, the World Health Organization (WHO) China Country Office was informed of the outbreak of pneumonia, whose cause was unknown, had been detected in Wuhan, in the Province of Hubei, China. A total of 44 cases were reported between 31[st]December 2019 and 3[rd]January 2020. On 7th January 2020, China reported that it had identified a new type of coronavirus (2019-nCov). Confirmed cases were registered in other parts of Hubei Province, and Shanghai, Beijing, and the Province of Guangdong. Between 13th and 20th January 2020, Thailand, Japan and Republic of Korea reported similar cases, indicating that the disease had spread outside China(World Health Organization, 2020a). WHO (2020b) subsequently observed that community transmission had started within China and that "Currently, cases infected in China have been exported to the US, Thailand, Japan, and Republic of Korea. It is expected that more cases will be exported to other countries and that further transmission may occur" (World Health Organization, 2020b, p. 1).By 13th March, the outbreak had spread to 114 countries with more than 118,000 cases and 4,291 deaths, leading WHO to declare it a pandemic(World Health Organization, 2020c).

COVID-19 is a group of viruses affecting human beings through zoonotic[1] transmission. This is the third instance of the emergence of a novel coronavirus—preceding ones being severe acute respiratory syndrome (SARS) in 2003(Zhong et al., 2003), and Middle East respiratory syndrome coronavirus (MERS-CoV) in 2012(Ramadan & Shaib, 2019). The major reason for concern with COVID-19 is its "repeated emergence and global scale of transmission,

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[1] An infectious disease caused by a pathogen that has jumped from a non-human animal (usually a vertebrate) to a human.

significant number of deaths, infection and mortality of care providers and healthcare workers (HCWs), and higher risk of death in vulnerable or susceptible groups" (Chatterjee et al., 2020, pp. 147–148). In the initial phase, in the absence of a licensed vaccine or effective therapeutics for COVID-19, quarantining and social distancing[2] was adopted as a strategy. Quite a few countries, including India (vide MHA Order No. 40-3/2020-D dated 24/3/2020), had even adopted the extreme step of a lockdown. Aid agencies, researchers, and policymakers expect that the impact of these measures will be substantially high in Low Income countries (LICs) and Low Middle Income countries (LMICs), and will be a threat to food security and nutrition.

1.2 COVID-19 and its impact on food security and nutrition

1.2.1 Experience of earlier crises

Shocks from earlier pandemics have been shown to have substantial adverse consequences on livelihoods, food and nutrition security. COVID-19, too, is expected to have similar impacts in LICs and LMICs, particularly in countries with relatively weak healthcare systems. Analysis of the consequences of the HIV/AIDS pandemic reveals that such massive health shocks can generate "adverse cycles of upstream risk and downstream effects, particularly for the ultra-poor" (Gillespie & Whiteside, 2020). Tackling such shocks is difficult as such pandemics may have different drivers in different settings (Frega et al., 2010). Populations affected by HIV/AIDS were found to have experienced high levels of food insecurity (Anema et al., 2009). It has been estimated that HIV/AIDS led to an increase of undernourished persons by 75 million between 2005 and 2007; the study also reported that the majority of food-insecure individuals resided in Asia and Africa(United Nations & Food Agriculture Organization, 2008). The main cause of food insecurity was declining income, due to loss of livelihoods and unemployment. The income effect leads to a substitution of nutrient-rich, non-staple foods like eggs, fruits, and vegetables to cheaper calorie sources like rice, maize, wheat, or cassava, in order to preserve their caloric intake (D. Headey & Ruel, 2020).

During the 1998 Indonesian financial crisis, for instance, when real wages fell by 33 percent and rice prices shot up by almost 200 percent, rice consumption continued to rise

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[2]"Social distancing is a non-pharmaceutical infection prevention and control intervention implemented to avoid/decrease contact between those who are infected with a disease-causing pathogen and those who are not, so as to stop or slow down the rate and extent of disease transmission in a community. This eventually leads to decrease in spread, morbidity and mortality due to the disease" (Ministry of Health & Family Welfare, 2020, p. 1).

during this period, while intake of egg, meat, and vegetable declined sharply. The change in diet led to a sharp rise in child anaemia by 16 percentage points, while children's mean weight-for-height declined by over one-third of a standard deviation(D. Headey & Ruel, 2020). Similarly, the 2008 global food price crisis pushed an estimated 130 to 155 million people into poverty, leading to a 50 percent increase in acute malnutrition in Bangladesh, Cambodia and Mauritania, and a significant rise in stunting in LICs and LMICs (Shekar & Okamura, 2020).

If pandemics lead to an increase in mortality among the elderly, pandemics may also lead to a decline in elderly caregivers, especially in poorer households or where family members are engaged in the informal sector. This may further raise the risk of children becoming malnourished(Gillespie & Whiteside, 2020).

1.2.2 Understanding the dynamics

Lockdowns to contain COVID-19 are expected to aggravate the global recessionary trends resulting in declining income, unemployment, poverty, and inequality. Estimates indicate that the number of people below the poverty line will increase by 140 million, of whom 42 million will be from South Asian countries (Laborde et al., 2020). This is expected to have a substantial income effect on consumption levels, and the composition of consumption baskets. Consumption is projected to decline by 3.7 percent in South Asia (Laborde et al., 2020). Studies are also predicting a declining demand for vegetables, fruits, and animal-sourced foods, which will affect the supply of essential micronutrients. It is the poorest households, who are estimated to spend 70 percent of their incomes on food items, are likely to be most susceptible to income shocks (Laborde et al., 2020). The number of people in LMICs facing acute food insecurity is expected to double to 265 million by the end of 2020(World Food Programme, 2020).

The demand side shocks will be aggravated by supply -side effects in the form of disruptions to the supply chain and logistics, particularly of highly perishable foods, through the closed country and state borders, restrictions on movement, shutting down of *mandis* and agricultural product markets, etc. (Swinnen, 2020). In India, for instance, the dairy sector is expected to be severely hit (Bhandari & Ravishankara, 2020). The supply-side shocks are expected to lead to inflation in food prices. In Addis Ababa, for instance, maize and rice

prices increased, particularly in urban areas;[3] moreover, the inflation persisted even after the unlocking of the economy (Adewopo et al., 2020).

In India, supply-side disruptions reversed the declining trend in food prices observed over the past few years. Although the Retail and Wholesale Food Prince Index (FPI) has risen by only three percent in the first quarter of 2020, this may hit households severely given the widespread declining wages and loss of employment. However, the modest increase in FPI hides the marked commodity-wise and regional variations in prices. Further, the gap between wholesale and retail prices has widened in the post-lockdown period. Narayananan and Saha reports that:

> "Average retail price increases are over 6% for several pulses, over 3.5% for most edible oils, 15% for potato, 28% for tomato in the 28 days post-lockdown compared to prices during the month preceding the lockdown. Chicken and mutton prices have increased dramatically over the past two weeks, even doubled in some cities. However, milk prices have been steady over this period" (Narayananan & Saha, 2020).

As wholesale markets, where farmers typically sell, have been closed in most of the smaller towns the price rise is sharper in such cities, compared to larger cities. On the other end of the supply chain, closures and logistics-related risks of trading have reduced prices received by farmers by almost half (Hirvonen et al., 2020).

As household and community dynamics change the gender balance the gender-based disadvantage faced by women is likely to be aggravated (Swinnen & McDermott, 2020). Factors like limited access to nutrient-rich diet, breakdown of nutrition services, increased gender-based violence, restrictions on mobility, and reduced workforce participation are expected to compromise the diet of women. Children will comprise another vulnerable section of the population, as they are unable to compete with adults for food (Scott et al., 2020). UNICEF reports that in the early months of the COVID-19 pandemic there was a 30 percent reduction in the coverage of essential nutrition services in LMICs (UNICEF, 2020).

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[3] Although urban households tend to be richer and better able to absorb price shocks, the high degree of inequality in urban areas, along with job loss and wage cuts, implies that the impact of inflation in food prices is likely to be greater in urban areas, compared to rural areas (Adewopo et al., 2020). Other studies have also argued that rural households are better able to adapt to the lockdown induced shocks vis-à-vis urban households (Avula et al., 2020).

The situation in South Asia is concerning (Table 1.1). This will also affect the nutritional status and health of children.

Table 1.1: Nutrition-related programmes affected by COVID-19 in South Asia

Nutritional programme	Increase / No change	Decrease
Nutritional support for pregnant and lactating women	40	44
Safe and nutritious diet for children aged 6-23 months	55	49
Vitamin A supplement (children aged 0-59 months)	34	46
Nutrition programme in schools	14	45*
Food subsidies	38	4

Note: Reported drop in nutrition program in schools by 75-100%: 36 percent.
Source: UNICEF (2020) Tackling the situation of children during COVID-19. Accessed from https://data.unicef.org/resources/rapid-situation-tracking-covid-19-socioeconomic-impacts-data-viz/ on 15 February 2021.

Along with the breakdown in health and nutrition intervention schemes, this is expected to lead to:

> "… a 14.3% increase in the prevalence of moderate or severe wasting among children younger than 5 years due to COVID-19-related predicted country-specific losses in GNI per capita. We estimate this would translate to an additional estimated 6.7 million children with wasting in 2020 compared with projections for 2020 without COVID-19; an estimated 57.6% of these children are in South Asia and an estimated 21.8% in sub-Saharan Africa" (Derek Headey et al., 2020).

Moreover,

> "The estimated increase in child wasting is only the tip of the iceberg. The COVID-19 pandemic is also expected to increase other forms of child malnutrition, including stunting, micronutrient deficiencies, and overweight. The global community's failure to act now will have devastating long-term consequences for children, human capital, and national economies" (Fore et al., 2020, p. 518).

A study published in Lancet Global Health estimates that there will be an increase of child and maternal deaths by 2.53-11.57 lakhs and 0.12-0.57 lakhs, respectively; it represents a 9.8 to 44.7 percent increase in under-five child deaths per month and an 8.3 to 38.6 percent increase in maternal deaths per month (Roberton et al., 2020).The number of people facing

acute food insecurity is projected to rise from 135 million in 2019 to 265 million in 2020—an increase of 130 million(World Food Programme, 2020). There are apprehensions, therefore, that COVID-19 will undo the massive investments, made in the past decade, to improve maternal and child health, and render attaining associated Sustainable Development Goals almost impossible within the deadline of 2030.

1.2.3 Empirical studies

Studies undertaken in various countries have generally reported a decline in consumption levels, along with a shift to low quality diet. A study of 2,680 respondents in Germany, Denmark, and Slovenia found that people tended to shop less frequently, and shifted from fresh food to items with long shelf lives (Janssen et al., 2021). In rural China, a study reported a loss of $100 billion in wage income, and poor households reducing expenditure on education, nutrition, and health (Rozelle et al., 2020). The majority of villagers were found to have reduced spending on food and adopted a strategy of buying more grains and staples in bulk at low cost instead of more expensive goods like meat and produce. With declining food expenditures, we observe diet changes already beginning to occur. A survey in Ethiopia found households to be less likely to report consuming fruits (declining from 81% to 60% of households), meat (65% to 54%) , and dairy (56% to 45%), suggesting that fears about declining nutrient density of diets are real (Hirvonen et al., 2020). In Zimbabwe, rising food prices were accompanied by a reduction in the supply of nutritious food consumption (Matsungo & Chopera, 2020). Another survey reports that, while overall food consumption was similar to pre-pandemic levels (even among households reporting a job loss), grain and staple consumption has risen on average, in both value and calorie terms, while vegetable consumption and the residual category "all other foods," (including oils), have fallen. Consumption of other micronutrient-dense foods, such as animal-sourced foods and fruits, has remained steady on average. As vegetables are high in micronutrients this is potentially concerning (de Brauw et al., 2020).

In India, food security was compromised even before the pandemic. A survey of five states in 2017 shows that the proportion of adult household members consuming a minimally diverse diet was as low as three-four percent in these states, with cereals, pulses, and other vegetables comprising the diet for the majority. Only three percent of the households were classified as being food secure, with the remaining 97 percent experiencing food insecurity in some form or the another (Raghunathan, 2020). Analysis of the data from the National Family Health

Surveys shows that the proportion of wasted children has increased from 19.5 (2005-06) to 21 percent (2015-16), while the proportion of underweight children has remained the same at 43 percent over the same period (Das & Mohanty, 2021). The Global Hunger Report found hunger levels in India to be serious; out of 107 countries, India's rank was 94 (von Grebmer et al., 2020). The pandemic is expected to further aggravate a situation that is already serious, and prevent the attainment of a malnutrition free India by 2022, as envisaged under the *Poshan Abhiyan* (Raghunathan, 2020).

There have been several studies of the impact of the lockdown in India, mostly based on telephonic surveys. They reveal a bleak financial outlook, with a large proportion of respondents reporting job loss, hunger, and liquidity problems. The Centre for Sustainable Environment, Azim Premji University conducted a survey of 5,000 workers over 12 major states (Centre for Sustainable Environment, 2020). The study reports that 66 percent of the workers had lost their jobs, of which the majority were migrants. Income declined by 64 percent, inducing a decline in consumption by 73 percent in rural areas (83 percent in urban areas). It was also estimated that 35 percent of rural households did not have money to buy even a week's essentials (64 percent in urban areas). In case of rural Bihar, the study (Centre for Sustainable Enviornment, 2020) found job loss among 46 percent of respondents, with a consumption decline among 69 percent of households. About 37 percent of households did not have resources to purchase essentials beyond a week. Coverage under welfare schemes was poor, with 21 percent reporting that they had not obtained rations, and 40 percent reporting that they did not benefit from any cash transfer.

The Dalberg study (Dalberg, 2020)—covering 18,000 Below Poverty Line (BPL) households in ten states— reported an average income loss of 61 percent of the regular income of an average BPL household. The study also reported that every fifth household had already run out of money and supplies. Government support had started to reach the households; about 64 percent of eligible households had received some relief, but it was inadequate to meet the requirements of these families.

A study by Gaon Connection and Lokniti-CSDS (Gaon Connection and Lokniti-CSDS, 2020)found that 68 percent of respondents faced considerable difficulty in meeting their food requirements. Coverage under social safety measures was poor—60, 63, and 42 percent

received benefits under *Kisan Samman Nidhi,* Public Distribution System, and cash transfer to *Jan Dhan* account, respectively.

A series of telephonic surveys in the National Capital Region of Delhi (NCAER, 2020a, 2020b, 2020c, 2021) found that half of the households reported a severe income decline, while about a third of rural households reported a shortage, particularly in vegetables, fruits, grain, cereals, and milk. About 47 percent received rations and 29 percent received cash transfer to *Jan Dhan* accounts; this increased to 62 percent and 67 after the lockdown.

Another study by Population Council in Bihar and Uttar Pradesh (Acharya, 2020)found that the decline in household income affected food intake; consumption levels fell in 45-59 percent of households, and 32-48 percent faced a food shortage in the last 30 days. The mean DS was three, with consumption levels of fruits, vegetables, and meat being compromised. Only 25-33 percent of households received Take Home Rations.

Analysis of the Consumer Pyramid data collected by the Centre for Monitoring Indian Economy found that out of the 5779 households surveyed in 27 states, 84 percent reported a loss in income, with the second and third quintile of the income distribution being affected most (Chicago Boothand Rustandy Centre for Social Sector Innovation, 2020). In Bihar, this figure is over 90 percent. Rural households were also affected severely. It was found that a large proportion of households, particularly the urban poor, would not be able to survive any longer without assistance. The study of 47,000 low- income households spread over 15 states found that about 75 percent reported a loss in wages or jobs; 40 percent had fallen into debt. Coverage under Public Distribution System (PDS) (90 percent) and cash transfer schemes (86 percent) was high.

A survey undertaken in May 2020 by ID Insight reports large drops in income and access to jobs, especially among non-farm households (ID Insight et al., 2020a). Although monetary transfers are inadequate to compensate for income loss, the coverage level is high. A subsequent survey revealed that rural unemployment is rising, although it is still below lockdown levels (ID Insight et al., 2020b). Farmers are adapting to changed circumstances by planning an increase in sowing area under the *kharif* season. The coverage of beneficiaries and access to entitlements is high, although food insecurity persists. It has also been reported

that farmers, particularly small holders, have been affected by high input costs and low output prices, leading to a fall in their income (ID Insight India, 2021).

1.2.4 Ensuring food security: Role of public safety nets

COVID-19 and its associated challenges led policy makers into unchartered territories- fraught with uncertainties. Forecasts of economic depression, food price inflation, large-scale unemployment, shrinking income, and increase in poverty imply that policymakers will have to gear up for a massive counter-cyclical and protective effort. The major challenges are, however, in the field of health and food security.

The PDS is an important vehicle to combat hunger, given its huge coverage of about two-third of the population and preventing duplication of benefits. In addition to the already provisioned regular supply of the same quantity of wheat and rice at a highly subsidised price of Rs 2 and Rs 3 per kg, the Government of India utilised the stocks available with the Food Corporation of India to provide an additional free bundle of five kg staple food (wheat and rice) per person per month for three months along with one kg of pulses. Since cereals and pulses comprise 80 percent of the staple food consumption of a household, they helped to mitigate the risks of hunger caused by income loss for a large section of the vulnerable population(Chand, 2020).

However, given that the most important impact of the pandemic on food security is through income declines that put food access at risk, cash transfer policies are particularly suited as intervention measures. It will also enable households to consume non-food commodities that are important to households. By June, most countries had introduced additional social protection measures in response to COVID-19. Substantial enhancements in cash transfers over a quarter became the most popular intervention strategy. In India, PDS entitlements were complemented by cash transfers of Rs1,500 paid in three monthly instalments through the *Jan Dhan Yojana*.[4]

In the agricultural sector, the Government of India undertook several supply -side measures to ensure adequate food supply and protect rural income. Agri-food production and marketing were treated as essential commodities, and exemption was granted to farmworkers and

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[4] In Bihar, of course, the state government provided a cash transfer of Rs.1000 to ration card holders.

transfer of agricultural machinery and farm produce. Simultaneously, a decision was taken to keep agricultural markets open. State governments relaxed Agricultural Produce Marketing Committee (APMC) rules and allowed farmers to sell their produce directly to private traders.

Given that children constitute a vulnerable section of the population, food intervention through schools potentially comprises an important form of intervention. In India, the Mid-day meal provides free lunch to approximately 100 million children, aged 6-14 years, across 1.3 million government primary and upper primary schools, for at least 200 days a year (Scott et al., 2020). The closure of schools affected the supply of nutrition- dense food to school-going children (HLPE, 2020).In response, several state governments have taken steps to adapt to the Mid-day meal scheme for children (Figure 2.1). The delivery mode of these meals has been modified; parents collect dry ration or cash at the school, home delivery (by cooks-cum-helpers, school staff, or other frontline workers) of rations, direct bank transfers, and distribution at fair price shops. In Bihar, eligible households were given cash transfers.

Figure 1.1: Modalities of benefit transfer under Mid-day meal scheme during COVID-19 pandemic
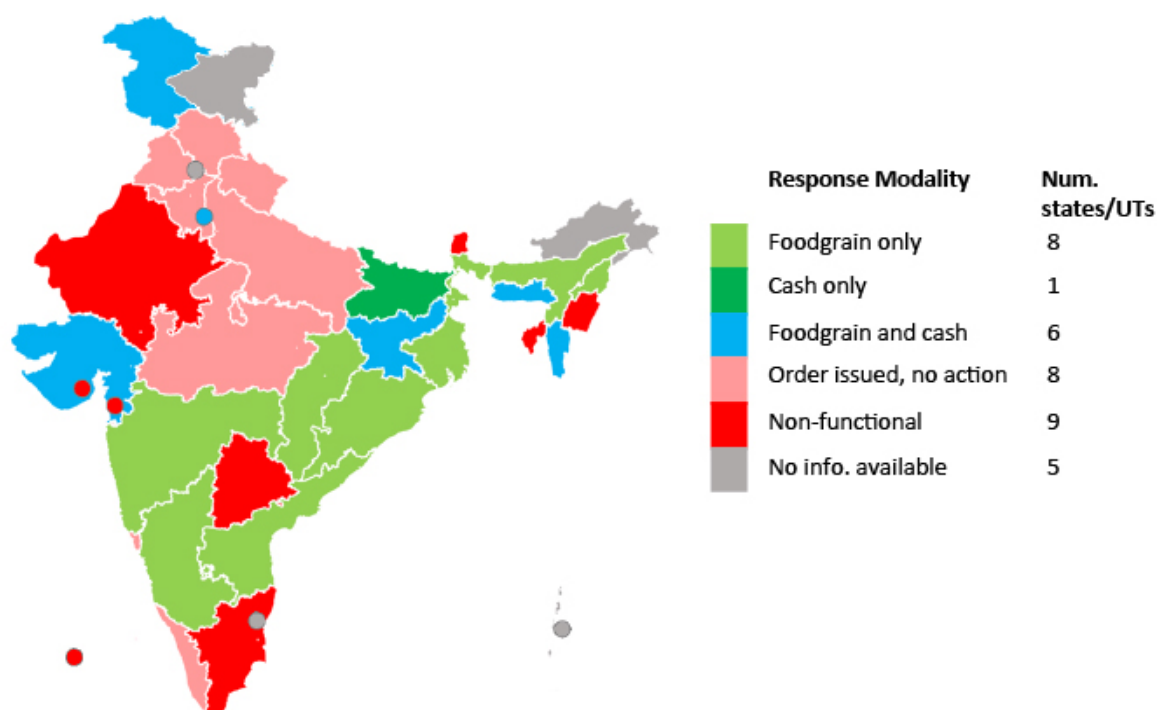
Source: *Scott et al., 2020.*

1.2.5 Who gets the benefits?

Anderson et al. has argued that, in India, pro-poor programmes are implemented through gram *panchayats,* "local elites are somehow able to capture majoritarian local institutions and run them in their own interests" (2015, p. 1781).This is possible through a system of

> "…buying of votes and hence power, by a cadre of political elite (patrons) in return-for the delivery of direct benefits to the non-elite (clients) whose support is essential for maintenance of power. Elite patrons control government but promote benefits to their clients in a quid pro quo arrangement that may see direct transfers to clients, but that will feature governance largely in the interests of the elite" (Anderson et al., 2015, p. 1781).

Such "discretionary provision of private or local public goods or privileges by government officials and political parties to particular groups of citizens, in exchange for their votes" (Pranab Bardhan & Mookherjee, 2000, p. 2) has been reported in several studies in India (P Bardhan & Mitra, 2014a; Pranab Bardhan et al., 2009; Dasgupta, 2017; Vora, 1996).

Studies have generally concluded that the Central and State governments have introduced social safety measures. Further, it has been documented that these measures have had adequate coverage in terms of the population served (Chicago Booth and Rustandy Centre for Social Sector Innovation, 2020). However, no study has examined the type of households that have secured such benefits. This is an important question given the leakages reported in the implementation of such schemes in normal times (Dreze & Khera, 2013, 2015), and during the lockdown (Khan, 2020a, 2020b; Press Trust of India, 2020; Singh, 2020).

1.3 Research objective

The above discussion shows that COVID-19 has created a perfect storm for global malnutrition. The crisis is expected to adversely affect the nutritional status of households—particularly vulnerable groups like women, children and the aged—through livelihood and income losses related to government-mandated shutdowns and de-globalization, freezing of food transfer schemes such as school feeding programs, supplementary nutrition programme implemented under Integrated Child Development Scheme, breakdown of food markets due to both demand shocks and supply constraints, and healthcare failures (as already -strained healthcare systems are forced to divert resources from routine immunization, and a range of nutritionally important functions—like antenatal care, micronutrient supplementation, and

prevention and treatment of childhood diarrhoea, and acute malnutrition—toward combating COVID-19) (D. Headey & Ruel, 2020). Although the Central and State governments have both announced several relief measures, media reports that implementation of such measures has been poor. Further, households with political links are often better able to access such programmes (Anderson et al., 2015; P Bardhan & Mitra, 2014b; Pranab Bardhan & Mookherjee, 2000; Dasgupta, 2017).

It is necessary, therefore, to undertake a study that will investigate the following issues:

(i)   Examine the extent to which COVID-19 affects dietary practices of women and children;

(ii) Assess whether households are able to access government programmes aiming to mitigate such adverse effects;

(iii) Examine whether political connections of household members increase the access of households to government schemes, thereby reducing welfare losses; and,

(iv) Quantify the change in the welfare of women and children based on a comparison of consumer surplus in the pre-lockdown and lockdown periods.

It is expected that regions with high levels of poverty, maternal mortality, and infant mortality, coupled with low coverage of public health and nutrition services, and poor health care delivery system will be most affected (HLPE, 2020). Special focus, therefore, will have to be paid to such states, like Uttar Pradesh and Bihar (Pandey, 2020). Our study focuses on Bihar for the following reasons:

(i)   Bihar is a resource-constrained state in India, having a high prevalence of malnutrition and anaemia among under-five children and mothers for several past decades (see Appendix A1.1). Maternal and child malnutrition has been the largest risk factor driving death and disability in Bihar since the 1990s (Indian Council of Medical Research et al., 2017).

(ii) The coverage of women and children under nutrition supplement programmes is very poor—only 30 percent of pregnant and lactating women and 40 percent of children are covered under supplementary food programme; such coverage rates are far below the national average (Avula et al., 2020). This already vulnerable group is likely to become even more vulnerable due to the shock of COVID-19 and the associated lockdown.

(iii)   Finally, state -level estimates of supply- side susceptibility using an index (based on indicators like cropped area, irrigated areas, cold storage density, supply procurement of cereals, the density of APMCs, and rural *haats*) indicate that Bihar is not well placed (value of 55, as compared to the national average of 59) (Saroj et al., 2020).

The now completed study analysed, inter alia, dietary practices of mothers and children aged below three years. We proposed to undertake telephonic interviews of 1,200 randomly selected respondents out of the 2,250 respondents for whom data had been collected between January and March 2020 in the earlier study. Additional information was collected on changes in financial status, change in dietary practices, access to Government support schemes, and political links of family members.

Given that COVID-19 is projected to remain for the next two years, recurring in repetitive waves(Leung et al., 2020), and that current relief measures have implementation and leakage related issues(Khan, 2020a, 2020b; Press Trust of India, 2020; Singh, 2020), this knowledge should be useful in designing bailout measures to ensure better targeting of relief measures directed to ensure food security, reduce leakages, and make such policies more inclusive. Further, the results of this study should also help to improve service delivery to vulnerable sections in general and in the context of disasters.

1.4 Survey design
The data used in this study was collected through a two-phased primary survey. The first phase was conducted between January to March 2020 and was part of a previous The International Growth Centre (IGC) funded study to examine the prevalence of maternal and child health practices (like contraception use, availing of antenatal and postnatal care services, institutional delivery, exclusive breastfeeding of children below six months, complementary feeding of children above six months, etc.) in rural Bihar, and test for the role of peer effects in motivating the adoption of such practices.

The second phase was conducted between October-November 2020 and covered a sub-sample of the respondents covered in the first phase through a telephonic survey. The two phases represent pre-lockdown and lockdown periods. Since data was collected about the

recent past in either case, there is minimal recall bias in our study. In the next section, we discuss the sampling strategy employed.

1.4.1 Sampling strategy in first phase

A multi-stage sampling design was adopted in the first phase of the survey. In the first stage, we selected 13 districts out of 38 districts of Bihar, where the JEEViKA Technical Support programme (JTSP) and Health & Nutrition Strategy programme (HNS) were in place during the last five years preceding the survey. In the second stage, these 13 districts were classified into three tercile groups based on a composite index of human development indicators, namely, percentages of non-SC/ST population, female literacy, and male non-agricultural labourers – using data from the 2011 census. At the third stage, two districts from each tercile group were selected randomly. The selected districts are Nalanda and Saharsha for the bottom tercile; Begusarai and Muzaffarpur from the middle tercile; and Purba Champaran and Katihar from the upper tercile (see Figure 1.1). Thus, a total of six districts were selected for the study (Table 1.2). Some important maternal and child indicators for these districts are given in Appendix Table A1.2.

After the selection of the study districts, i.e. at the fourth stage, four community development blocks were selected in each district based on the implementation of the JTSP and HNS programme. Two blocks were selected randomly where JTSP and HNS programme had been implemented during the last five years, while another two blocks were also selected randomly from the rest of the blocks. Thus, altogether 24 (=6×4) blocks were selected from the study districts.

Table 1.2: Selection of districts

Rank	District	FLIT[a]	FCPOP[b]	MALENONAG[c]	INDEX
1	Nawada	46.70	72.95	41.23	53.63
2	**Saharsa**	**39.20**	**82.21**	**42.75**	**54.72**
3	Gopalganj	53.99	84.84	29.39	56.07
4	Patna	51.04	79.95	43.91	58.30
5	**Nalanda**	**50.24**	**77.01**	**48.58**	**58.61**
6	Samastipur	50.63	81.02	46.99	59.55
7	**Muzaffarpur**	**52.27**	**83.52**	**44.09**	**59.96**

Rank	District	FLIT[a]	FCPOP[b]	MALENONAG[c]	INDEX
8	**Begusarai**	**52.68**	**84.50**	**42.85**	**60.01**
9	PashchimChamparan	42.46	78.25	60.18	60.29
10	Khagaria	48.30	84.73	49.30	60.78
11	**PurbaChamparan**	**43.41**	**86.70**	**55.30**	**61.80**
12	Purnia	39.28	83.57	63.93	62.26
13	**Katihar**	**41.59**	**85.51**	**63.51**	**63.54**

Notes
a. 100 * (Literate female / Female pop aged above 7 years)
b. 100 * (Population - SC & ST population) / population
c. 100 - Male Agricultural Main & Marginal workers as %age of Total Male Main workers

At the fifth stage, five villages from each block were selected by employing the probability proportional to size sampling (PPS) method. As the name suggests, in the PPS method, the likelihood of selecting large villages is higher, compared to relatively smaller villages. This ensures in capturing adequate socio-economic variations in the study samples and helps in the generalization of results from the study. A total of 120 villages (=6 districts ×4 blocks ×5 villages) were selected. At the last stage, 20 women comprising ten JEEViKA members and ten non-members were selected from each village. The recruitment criterion was that the respondent had at least one living child aged below three years, and was a permanent resident of the village. Thus, the total sample size of the study stands at 2400 (=6 districts ×4 blocks ×5 villages ×20 respondents). The final list of districts, blocks, and villages is given in Appendix Table A2.3. As some villages may 'vanish' over time – due to changes in the flow of the river, dwindling population, renaming, etc. – an additional village was identified for each block.

Figure 1.2: Map of Bihar showing survey districts
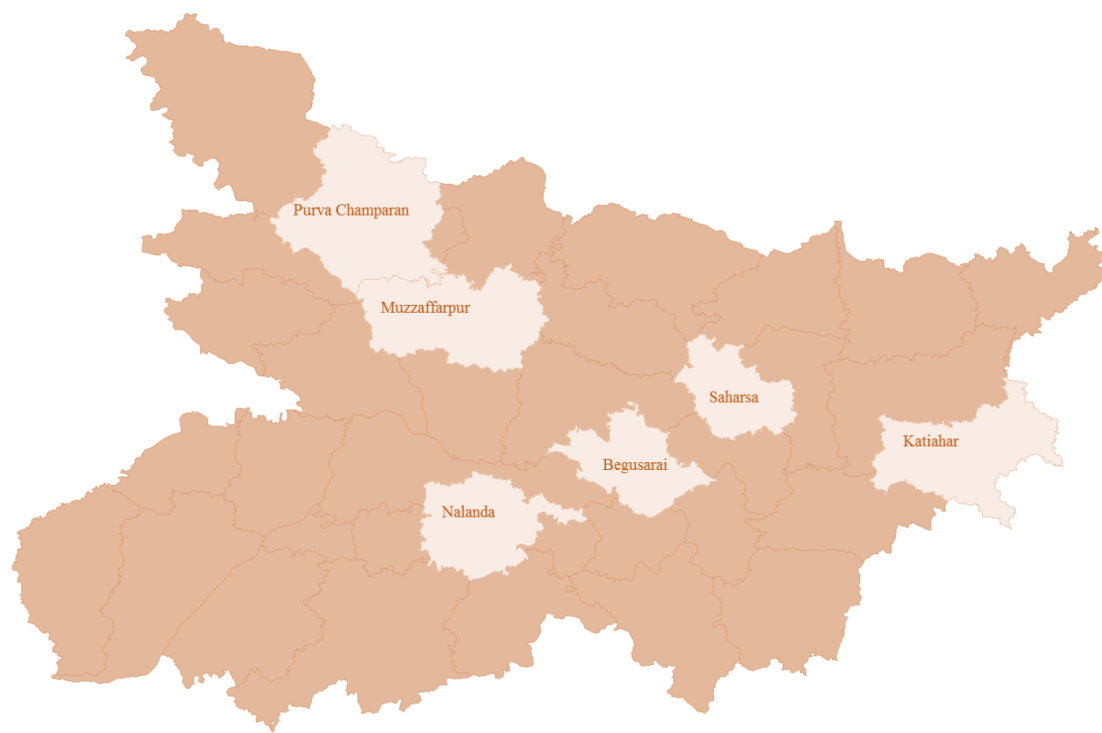
Data were collected by a trained group of Field Investigators using a structured questionnaire, eliciting information on individual characteristics of the respondent, and consumption of the respondent and children aged below three years. The questionnaires were pre-tested on 100 respondents at Vaishali village, in the Vaishali district on 23rd December 2019, followed by a feedback session.[5] In the third week of March, the outbreak of COVID-19 in India, followed by the announcement of a national level lockdown, forced us to abandon the data collection before it could be completed. At that point, data had been collected for 2250 respondents.

1.4.2 Data collection in second phase

In the second phase of the survey, a list of all respondents was prepared. Respondents who had not provided us with their mobile numbers — either because they did not have any, or because they did not want to give us their contact number — were dropped from the list.

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[5] Before administering the questionnaires, investigators obtained verbal informed consent from the study participants by reading out a statement explaining why the study was being conducted and guaranteeing that the information provided by the participants would be kept confidential and used only for research purposes. Moreover, the voluntary nature of participation in the study was emphasized in the statement of informed consent.

Respondents with children below 3 months were also dropped. In view of travel restrictions, the remaining respondents were contacted over mobile and a telephonic survey was conducted,[6] eliciting information on consumption of the original respondent and her youngest child, the financial status of the household, and access to government relief measures during the lockdown period, and political links of family members. Since the respondents were acquainted with our survey team, lengthy introductions at the onset of the telephonic interview were avoided. This shortened duration of the interview, reducing refusal rates. It also eliminated recall bias as information on the pre-COVID-19 period has already been collected. We had planned to cover 1200 respondents, out of 1,652 respondents who satisfied the recruitment criterion (having children aged between 3 to 36 months at the time of the first survey), but ultimately managed to cover 1148 respondents. The response rate was 70 percent, which is satisfactory. The main reason for refusal was the failure to contact the original respondent as the mobile was not working, or was switched off. Refusal after contact was negligible (and below five percent). The profile of age, education, asset score, socio-religious identity, and husband's occupation of respondents who were selected in the second phase and who were not selected are given in Appendix Table A1.4. Selected respondents have higher asset scores; differences between the two groups with respect to other characteristics are marginal.

1.4.3 Sample characteristics

The sample profile is given in Appendix Tables A2.5 (for continuous variables), and A2.6 (for categorical variables). The mean and median age of respondents is 25 years, with marginal variations across districts. Years of education have a mean and median of 5.74 and 6.00 years, respectively. It varies from 4.5 years (Saharsa) to 6.5 (in Begusarai and Katiahar). The mean and median age of first marriage is quite low (17 years), without inter-district variations. The mean number of living children is 2.67, while the median is 2.00. Marginal inter-district variations are noted. Asset scores range from -0.26 (Saharsa) to 0.70 (Nalanda), with a mean of 0.10 and a median score of 0.08.

The district-wise distribution of categorical variables is given in Appendix Table A2.6. In Begusarai and Muzaffarpur the proportion of respondents without education is higher than in

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[6] The introduction of mobile phones has increased tele-density in India—it is 57.59 connections per 100 persons in rural areas (Telecom Regulatory Authority of India, 2020). Hence, telephonic survey is a viable survey method, even during COVID-19 (National Council of Applied Economic Research, 2020).

other districts; in Nalanda and Katiahar, on the other hand, the proportion of respondents with 11-17 years of education is higher vis-à-vis other districts. Overall, the highest proportion of respondents has 6-10 years of schooling, with 30 percent not having any education at all.

Other Backward Castes (OBCs) comprise the majority of the sample (58 percent); the proportion of Hindu Forward Caste (FC) respondents is high in Nalanda, Muzaffarpur, and Purva Champaran. Muslims comprise about 21 percent of the sample in Katiahar. We find that 15 percent of the sample are engaged in any income -earning activity; the proportion is highest in Purva Champaran (23 percent), and lowest in Begusarai (6 percent). Family size is quite large, with about 86 percent of respondents residing in families with 6-10 members. Male children comprise a slightly higher proportion of the sample (53 percent); the percentage of male children is about the same in all districts.

1.5 Methodology
1.5.1 Consumption indicators
The outcome variables studied relate to the consumption of specific food groups. The following food groups were considered for both the mother and child:

(i)   Cereals and potatoes;

(ii)   Pulses and nuts;

(iii)   Eggs;

(iv)   Fish and meat;

(v)   Milk and dairy products;

(vi)   Fruits that are yellow or orange inside;

(vii)   Dark green and leafy vegetables; and,

(viii)   Other fruits and vegetables.

Information was collected on the number of times the child had been given the specific food group. The recall period for the child was the day preceding the survey in the first phase; in the second period, it was an average day during the lockdown. This was recoded in binary form, with zero and one being recoded as zero, and two and above being coded as one. In addition, a binary indicator for Minimum Dietary Diversity was estimated (USAID et al., 2010); its value was one if the child had partaken of items from at least four food groups, and zero otherwise.

The mother was asked whether she consumed items from each food group daily, weekly, infrequently, or never. Responses were recoded as zero (if response was infrequently, or never), and one (if response was daily, or weekly). The recall period for the mother was weekly because the diet of adults is known to vary with exogenous causes like the presence of guests, family occasions, etc. Using this information, a Minimum Dietary Diversity was estimated if she consumed items from at least four food groups (FAO and FHI 360, 2016). These indicators were estimated for both mother and child in both pre-lockdown and lockdown periods. Another indicator of consumption used is the number of food groups consumed by the mother and child, respectively. It is referred to as Dietary Score (Swindale & Bilinsky, 2006).

1.5.2 Dietary practices

Using the above information, we created a transition matrix ($P_{k \times k}$). The matrix indicates the association between pre-lockdown and lockdown consumption levels. An element, p_{jk}, in this matrix indicates the probability that the lockdown consumption falls in the ith category, given that pre-lockdown consumption was in the jth category. The diagonal indicates stability in consumption levels, while above (under) diagonal cells indicate improvement (deterioration) in consumption levels after lockdown. Using the matrix, we estimated four measures to estimate whether consumption levels have remained stable, or changed over the study period.

The measures are:

      Shorrocks-Prais Index (Shorrocks, 1978):

        $\frac{K\text{-Trace(P)}}{K\text{-}1}$, when K is the dimension of the symmetric matrix P

      Bartholomew Index (Bartholomew, 1973): $\frac{\sum_i \sum_j p_{ij} \, | \, i\text{-}j|}{k(K\text{-}1)}$

      Eigenvalue-based index (Sommers & Conlisk, 1979):

        1 - $|\lambda_2|$, when λ_2 is the second largest eigenvalue

      Determinant-based Index (Shorrocks, 1978): 1 - $|P|$

The indices are estimated using the user-written package "igmobil" in Stata I/C version 15 (Savegnago, 2016).

Univariate statistical tests of means were used to test whether Dietary Score (DS) and percentage of respondents complying with Minimum Dietary Diversity (MDD) have changed over the study period, for different sub-samples. Specifically, we examined variations in

these indicators over the education of respondents, socio-religious identity, and asset holding classes. Such analysis was followed by an econometric exercise that sought to identify variables determining recoded versions of these two indicators. In the case of DS, for instance, the regression was run on:

$$\Delta DS = DS_{t+1} - DS_t + 8$$

when DS is the Dietary Score of an individual, t represents the pre-lockdown period, and t+1 represents the lockdown period. The number eight is added to ensure that ΔDS did not have negative values. It was done so that we could estimate both Ordinary Least Square (OLS) and count models. Although both models were estimated, OLS models gave better results, and we reported it.

In the case of MDD, we created four categories:

(i)   Did not comply with MDD norms in either period;

(ii)   Deteriorated: Complied with MDD norms before lockdown, but not subsequently;

(iii)   Improved: Complied with MDD norms only in lockdown phase; and,

(iv)   Complied with MDD norms in both periods.

Since it is difficult to ordinally rank these categories, we estimated a multinomial model. The assumption of Independence of Irrelevant Alternatives has to be satisfied by multinomial logit models; instead of testing whether this assumption is satisfied or not, we estimated the multinomial probit model.

Given the clustered nature of our data, heteroscedasticity may occur, leading to overestimation and underestimation of z-statistics. We, therefore, clustered the data at the village level to obtain robust standard errors. The following possible determinants were considered:

(i)   Consumption of mothers: Age, education, and socio-religious identity of the respondent, husband's occupation, whether respondent worked, household size, asset score, whether the husband was migrant, land ownership, ownership of the milch animal, possession of ration card, and contacts with *pradhan* or ruling political party.

(ii)   Consumption of children: Age, and gender of the child, education and socio-religious identity of the mother, father's occupation, whether mother worked, household size, asset score, whether the father was migrant, possession of ration card, and contacts with *pradhan* or ruling political party.

1.5.3 Access to Government schemes

In addition, we also obtained information on whether the respondent had access to government schemes. Access to the following schemes was examined:

a) Public Distribution System:

   (i)   Whether received cash transfer of Rs.1000 against ration card: Coded as No (0) or Yes (1);

   (ii) Whether received free rations of 5 kg rice and 1 kg pulses per person per month: Coded as No (0) or Yes (1);

   (iii) Number of months' respondent's family received 5 kg rice and 1 kg pulses;

b) *Pradhan Mantri Ujjwala* scheme:

   (i)   Whether received subsidised LPG cylinder: Coded as No (0) or Yes (1);

   (ii) How many times respondent's family received LPG cylinder: Coded as No (0) or Yes (1);

c) *Jan Dhan* account:

   (i)   Whether received any transfer into *Jan Dhan* account; Coded as No (0) or Yes (1);

   (ii) How much money was received in *Jan Dhan* account: Coded as 0 (Did not receive), 1 (Received Rs. 1, 000) and 2 (received Rs. 1,000, or more).

d) Mid-day meal scheme: Whether any children from family received cooked or uncooked food under the Mid-day meal scheme.

After descriptive analysis, based on tabular and graphical analysis, we estimated probit models (if the dependent variable is binary), and ordered probit models (if the dependent variable has several ordered categories). A village- level clustering strategy was employed when estimating these models. Explanatory variables included the socio-religious identity of respondent, husband's occupation, asset score, whether family belongs to the same caste as *pradhan*, and contacts with *pradhan* or ruling political party.

1.5.4 Welfare change

We have also estimated the welfare change of mothers and children using the Willingness to Pay (WTP) approach (Fig. 1.2). Under this approach, the actual payment (OEDC) and maximum WTP (OAB) are first estimated. The difference (EAD) is the consumer surplus. It is estimated for the pre-lockdown and lockdown periods, and the difference in the consumer surplus between the two periods is the welfare change.
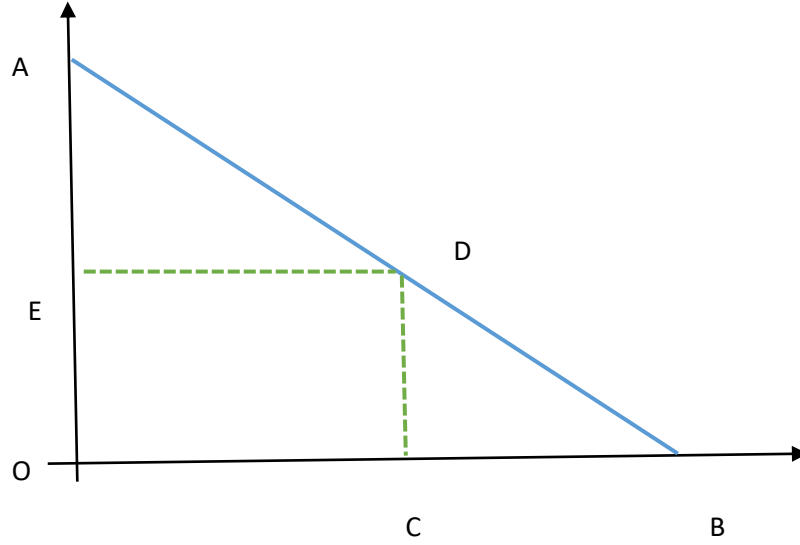
Figure 1.3 Willingness to pay and welfare

Empirically, the WTP was estimated using a probit model (Lopez-Feldman, 2016). This model regresses whether a person is willing to pay or not (= 0 if the actor is not willing to pay, = 1 if the actor is willing to pay) upon bid levels and the socio-economic characteristics of the respondents.

$$Y_i = \alpha + \beta BID_i + \chi Xi$$

when

      Y = 0 if the actor is not willing to pay, = 1 if the actor is willing to pay;

      BID is the amount requested from the actor; and,

      X is a vector of control variables.

The mean WTP is given by $\dfrac{\alpha + \chi \overline{X}_i}{\beta}$.

As our survey was undertaken over the telephone, a detailed Contingent Valuation type survey could not be undertaken. Nor was it feasible to obtain prices of different commodity items — even if the housebound women, who were our respondents, had the information. Instead, we obtained information on the time taken to collect rations from the PDS shops before and during the lockdown. These opportunity costs are taken to be a proxy of the actual price paid by respondents. The dependent variable was whether pulses were consumed or not. The control variables were whether the husband is a migrant (for mother), and age of the

child, years of schooling of mother and whether the father is a migrant (for children).[7] The welfare change was estimated for the entire sample, as well as sub-samples based on asset tercile classes. We had originally planned to estimate welfare change for cereals also; however, as cereal consumption was universal, we estimated welfare change using only pulse consumption.

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[7] In the first stage the probit model for mothers was estimated on BID, socio-religious identity, asset score, household size, whether respondent works, occupation of husband, and whether he is a migrant; in case of children, education of mother, age and gender of child, and number of living children was added. The variables whose coefficients were insignificantly different from zero were dropped. WTP was estimated for the reduced models. Stata codes were taken from Lopez-Feldman (2016).

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APPENDIX

Table A1.1: Selected maternal and child health indicators for Bihar and India

Indicators	Bihar						India			
	NFHS-3		NFHS-4		NFHS-5		NFHS-3		NFHS-4	
	Rural	Total	Rural	Total	Rural	Total	Rural	Total	Rural	Total
Infant Mortality Rate			50.0	48.0	47.3	46.8			46.0	41.0
Under-five Mortality Rate			60.0	58.0	57.4	56.4			56.0	50.0
Children under age 3 years breastfeed with an hour of birth	3.8	4.0	34.1	34.9	30.5	31.1	21.5	23.4	41.1	41.6
Children under age 6 months exclusively breastfed	27.3	27.9	54.1	53.4	59.4	58.9	48.3	46.3	55.9	54.9
Children age 6-8 months receiving solid or semi-solid food and breastmilk	58.3	57.3	29.5	30.8	39.0	39.0	53.8	55.8	39.9	42.7
Breastfeeding children age 6-23 months receiving an adquate diet			7.1	7.3	11.2	10.8			8.2	8.7
Non-Breastfeeding Children 6-23 months receiving an adequate diet			9.0	9.2	11.1	11.5			12.7	14.3
Total children age 6-23 months receiving an adequate diet			7.4	7.5	11.2	10.9			8.8	9.6
Children under 5 years who are stunted	51.3	50.1	49.3	48.3	43.9	42.9	47.2	44.9	41.2	38.4
Children under 5 years who are wasted	32.9	32.6	20.8	20.8	23.1	22.9	24.1	22.9	21.5	21.0
Children under 5 years who are severely wasted			6.9	7.0	9.0	8.8			7.4	7.5
Children under 5 years who are underweight	56.3	54.9	44.6	43.9	41.8	41.0	43.7	40.4	38.3	35.8
Women whose Body Mass Index is below normal (BMI <18.5 kg/sq.m)	45.9	43.0	31.8	30.4	26.9	25.6	38.8	33.0	26.7	22.9
Women who are overweight or obese (BMI >= 25.0 kg/sq.m)	3.5	5.3	11.7	11.7	14.2	15.9	8.6	14.8	15.0	20.6
Children age 6-59 months who are anaemic	89.0	87.4	64.0	63.5	69.7	69.4	80.9	78.9	59.5	58.6

Non-pregnant woman age 15-49 years who are anaemic			60.7	60.4	63.1	63.6			54.4	53.2
Pregnant woman age 15-49 years who are anaemic	59.4	60.2	58.0	58.3	63.9	63.1	59.0	57.9	52.2	50.4
All women age 15-49 years who are anaemic			60.5	60.3	63.1	63.5			54.3	53.1

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Table A1.2: Selected maternal and child health indicators for the surveyed districts

Indicators	Begusarai		Katihar		Muzzaffarpur		Nalanda		Purba Champaran		Saharsa	
	NFHS-4	NFHS-5	NFHS-4	NFHS-5	NFHS-4	NFHS-5	NFHS-4	NFHS-5	NFHS-4	NFHS-5	NFHS-4	NFHS-5
Children under age 3 years breastfeed with an hour of birth	29.8	42.0	44.2	25.8	36.7	29.7	47.1	22.4	40.5	33.7	26.0	38.0
Children under age 6 months exclusively breastfed	27.3	50.8	62.4	36.1	78.9	71.9	36.7	67.2	51.7	72.0	59.9	49.4
Children age 6-8 months receiving solid or semi-solid food and breastmilk	27.9	-	25.6	53.1	33.1	-	29.9	40.9	42.3	40.5	14.9	48.1
Breastfeeding children age 6-23 months receiving an adquate diet	4.2	5.5	8.3	13.6	8.5	16.3	6.0	7.5	8.6	14.9	2.9	11.8
Total children age 6-23 months receiving an adequate diet	4.8	4.6	7.9	13.8	7.8	17.2	7.1	9.6	9.3	15.4	2.9	10.3
Children under 5 years who are stunted	44.9	37.8	49.2	43.9	47.9	42.6	54.1	42.6	47.2	49.1	43.9	47.8
Children under 5 years who are wasted	18.4	21.0	20.7	23.5	17.5	19.9	24.3	27.8	18.0	16.8	24.0	20.5
Children under 5 years who are severely wasted	5.8	8.8	6.1	8.7	5.6	8.1	6.9	12.1	4.8	5.7	10.5	8.3
Children under 5 years who are underweight	39.1	35.6	45.1	48.1	42.3	34.7	50.2	46.7	40.8	37.9	44.4	42.7
Women whose Body Mass Index is below normal (BMI <18.5 kg/sq.m)	31.0	26.0	32.4	26.4	33.0	25.2	30.7	23.8	28.9	23.4	34.6	31.0
Women who are overweight or obese (BMI >= 25.0 kg/sq.m)	9.9	17.6	8.0	13.1	10.5	16.5	10.2	16.0	10.1	16.3	7.7	12.8
Children age 6-59 months who are anaemic	62.7	74.5	31.6	65.6	58.5	64.6	59.0	80.3	65.7	61.0	68.4	69.3
Non-pregnant woman age 15-49 years who are anaemic	60.1	63.2	64.3	68.9	52.2	58.7	62.6	71.5	54.9	57.1	60.6	65.7
Pregnant woman age 15-49 years who are anaemic	51.0	58.7	57.8	61.0	55.7	61.7	51.2	61.7	52.8	61.1	58.2	61.8
All women age 15-49 years who are anaemic	59.3	62.9	63.8	68.4	52.4	58.9	61.6	71.0	54.7	57.3	60.4	65.3

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Table A1.3: List of districts, blocks and villages surveyed in first phase

District	Block	Villages to be covered					Extra village
Nalanda	Biharsarif	Pachauri	Biskurwa	Mohiuddinpur	Tetranwan	Meghi Nongawan	Hargawan
	Chandi	Sartha	Birnawan	Utra	Mubarakpur	Chandi	Araut
	Katrisarai	MairaBarith	Katri	Saidi	Katauna (Part in Giriak)	Dewaspura	Patria
	Silao	Surajpur	Mahuri	Bindidih	Dharampura	Kamal Bigha	Narharbigha
Muzaffarpur	Musahri	Khabraurf Kiratpur Gurdas	Chak Ahmad	Barhanpura	Manika Harkishun	Modhopur	Jamalabad
	Baruraj (Motipur)	Pakri	Rampur urf Bishunpur Kesho	Birji	Bariarpururf Bazidpur	PagahiaRaiti	Senduari Gaj Singh
	Gaighat	Ladaura	Baraila	Maheshwara	Kanta Pirauchha Tengrahan	Lachhman Nagar	Boaridih
	Minapur	Khemaipatti	Minapur	Dubaha Rani Khairaurf Benua	Gosaipur	MajlisMadhourfChhapra	Harsher
Saharsa	Sour Bazar	Baijnathpur	Tiri	Chanaur	Dhamsena	Suhath	Kanp
	Sattar Katiya	Bara	Patori	Pachgachhia	Ukahi	BaghiurfBhaluasukhasan	Agwanpur
	Salkhua	Kabira	Mamarkha (Mobarakpur)	Utesra	Kotwalia	SamharKhurd	Gaurdah
	Sonbarsa	Agma	Paita	Khasurha	Bhaura	MahuapattiUttarwari	Manguar
Begusarai	Barauni	Singdaha	Sahuri	Zamira	Bishunpur Chand	Narayanpur	Gangasagar
	Naokothi	Chhatauna	Begampur	Pahsara	Bahadurpur	Samsa	Hasanpur
	Sahebpur Kamal	Sanha	Sabdalpur	Raghunathpur Barari	Shahpur Kamal	Pachmir	Phulmalik
	Begusarai	Bandwar	Ajhaur	Kaith	Lakho	Pachmma	Dhobauli
Darbhamparan (Mo	Tetaria	Balbhadarpur	Narha Panapur	Bahuara Gopi Sinh	Mohammadpur Sagar	Tajpur	Kadma

District	Block	Villages to be covered					Extra village
	Ghorasahan	Ghorasahanurf Kotwa	Jamunia Kawaia	Bagahi Bhelwa	Laukhan	Singhrahiya	Nonaura
	Mehsi	Rajepur	Harpurnag	Tajpur Bara	Kothia Hariram	Jhitkahia	Kash Pakri
	Kalyanpur	Kaleyanpur	Barharwa Mahanad	Rajpur	Gawandri	Dilawarpur	Hajipur
Katihar	Hasangunj	Jagarnathpur	Ramnagar Bansi	Kalsar	Dherwa	Balua Muradpur (Part in Kursela)	Rampur Maula Nagar
	Sameli	Mothoria	Dumar	Bakia	Chandpur		Chakla
	Falka	Chatar	Sohtha	Gobindpur	Bharsia	Amol	Baretha
	Amdabad	Karimullahpur	Ahmadabad	Gobindpur	Bhawanipur	Par Diara	Dumaria

Note: *The village of Barhanpura could not be located and had to be replaced by Jamalabad in Musahri block of Muzaffarpur district*

Table A1.4: Profile of first phase respondents satisfying recruitment criterion:

Selected & not selected in second phase

Socio-economic characteristic	Not selected	Selected	Total
Education of respondent			
No education	37.04	30.31	32.46
1-5 years	17.78	18.73	18.42
6-10 years	35.19	35.71	35.55
11-17 years	10	15.24	13.57
Chi2	**1.57 (0.67)**		
Mean	4.94	5.74	
t-statistic	**3.22 (0.00)**		
Age of respondent			
17-20 years	10.37	10.8	10.66
21-25 years	45	44.77	44.85
26-30 years	35.74	33.8	34.42
31-35 years	8.89	10.63	10.07
Chi2	**12.77 (0.01)**		
Mean	**25.51**	**25.55**	
t-statistic	**0.18 (0.86)**		
Occupation of husband			
Primary	20.56	16.9	18.07
Other rural occupations	60	64.63	63.15
Salaried class	19.44	18.47	18.78
Chi2	**4.15 (0.13)**		
Low	28.89	30.31	29.86
Medium	40.74	30.75	33.95
High	30.37	38.94	36.2
Chi2	**18.50 (0.00)**		
Mean	**0.03**	**0.10**	
t-statistic	**1.44 (0.15)**		
Socio-religious groups			
H-SC&ST	7.78	6.79	7.11
H-OBC	52.78	58.36	56.58
H-FC	33.33	26.39	28.61
Muslim	6.11	8.45	7.7
Chi2	**11.31 (0.01)**		

Note: Figures in parentheses are probability values.

A1.5: Mean, median and standard deviation of select variables

Variables	Districts	Mean	Median	Standard deviation	N
Age	Saharsa	25.18	25.00	3.99	150
	Nalanda	25.47	25.00	3.82	200
	Muzaffarpur	25.77	25.00	5.18	182
	Begusarai	25.55	25.00	4.18	173
	Purba Champaran	26.14	25.00	4.76	215
	Katihar	25.15	25.00	3.78	228
	Total	25.55	25.00	4.32	1418
Years of schooling	Saharsa	4.48	3.50	4.89	150
	Nalanda	5.51	5.00	5.12	200
	Muzaffarpur	5.95	7.00	4.58	182
	Begusarai	6.54	7.00	4.53	173
	Purba Champaran	5.26	5.00	4.70	215
	Katihar	6.46	8.00	4.75	228
	Total	5.74	6.00	4.81	1418
Age at first marriage	Saharsa	17.17	17.00	2.19	150
	Nalanda	17.43	17.00	2.14	200
	Muzaffarpur	17.27	17.00	2.15	182
	Begusarai	17.03	17.00	1.70	173
	Purba Champaran	17.11	17.00	2.28	215
	Katihar	17.39	18.00	1.61	228
	Total	17.24	17.00	2.02	1418

Variables	Districts	Mean	Median	Standard deviation	N
Total no. of living children	Saharsa	2.88	3.00	1.47	150
	Nalanda	2.52	2.00	1.25	200
	Muzaffarpur	2.65	2.00	1.42	182
	Begusarai	2.68	3.00	1.55	173
	Purba Champaran	2.87	3.00	1.50	215
	Katihar	2.50	2.00	1.38	228
	Total	2.67	2.00	1.43	1418
Asset index scores	Saharsa	-0.26	-0.35	0.81	150
	Nalanda	0.70	0.73	0.85	200
	Muzaffarpur	-0.06	-0.15	0.87	182
	Begusarai	0.26	0.34	0.69	173
	Purba Champaran	0.01	-0.12	0.85	215
	Katihar	-0.12	-0.35	0.89	228
	Total	0.10	0.08	0.89	1418

Table A1.6: Sample characteristics

Variables	Saharsa	Nalanda	Muzaffarpur	Begusarai	Purba Champaran	Katihar	Total
Years of schooling							
No schooling	49.33	30.50	25.27	21.39	31.63	27.19	30.31
1-5 years of education	10.67	23.00	21.98	19.65	22.79	13.16	18.73
6-10 years of education	29.33	29.50	38.46	43.35	31.16	41.67	35.71
11-17 years of education	10.67	17.00	14.29	15.61	14.42	17.98	15.24
Socio-religious identity							
H-SC&ST	4.67	18.00	3.85	9.25	2.79	2.63	6.79
H-OBC	70.67	46.00	54.40	61.85	57.21	62.72	58.36
H-FC	19.33	36.00	31.32	24.28	33.02	14.04	26.39
Muslim	5.33	0.00	10.44	4.62	6.98	20.61	8.45
Engaged in paid work							
No	79.33	78.50	92.86	93.64	77.21	89.04	85.02
Yes	20.67	21.50	7.14	6.36	22.79	10.96	14.98
SHG membership							
Non-member	50.00	52.00	45.60	48.55	50.23	46.05	48.69
SHG member	50.00	48.00	54.40	51.45	49.77	53.95	51.31
Husband's occupation							
Primary	20.00	27.64	14.92	19.65	8.45	27.75	19.86
Others	72.67	48.74	60.22	60.69	71.36	58.15	61.59
Wage &salaried	7.33	23.62	24.86	19.65	20.19	14.10	18.55

Variables	Saharsa	Nalanda	Muzaffarpur	Begusarai	Purba Champaran	Katihar	Total
Asset index tercile score							
Low	39.33	11.50	39.01	16.76	31.16	43.42	30.31
Medium	39.33	21.50	26.37	35.26	35.81	28.51	30.75
High	21.33	67.00	34.62	47.98	33.02	28.07	38.94
Gender of child							
Female	46.67	48.00	47.80	44.51	46.51	51.32	47.65
Male	53.33	52.00	52.20	55.49	53.49	48.68	52.35
Household size							
3-4 members	12.00	8.50	12.09	17.92	9.77	18.42	13.15
6-10 members	87.33	91.00	87.91	81.50	89.30	81.14	86.32
11-20 members	0.67	0.50	0.00	0.58	0.93	0.44	0.52

CHAPTER TWO

IMPACT ON COVID-19 ON WOMEN AND CHILDREN

IN RURAL BIHAR

2.1 Introduction

We commence our analysis by examining whether there has been any change in the proportion of respondents attaining Minimum Dietary Diversity (MDD), and the Dietary Scores (DS) of both mothers and the youngest child (aged between 6-36 months at the time of the first survey) using mobility indices. It is followed by a food group-wise analysis for both mothers and children. In the next step, we analyse the variations in DS and MDD across socio-economic correlates, followed by an econometric analysis to identify determinants of changes in consumption before and during the lockdown. The third part of the analysis comprises constitutes an analysis of access to social security measures announced by the Government of India, and the Bihar government. The analysis will also examine the role of political contacts in accessing such measures. In the final section of our analysis, we will estimate welfare change of the mother and child.

2.2 Dietary changes

Mobility indices estimated for MDD and DS of mothers and children indicate that the lockdown has had a substantial impact on consumption (Table 2.1). The proportion of respondents experiencing changes in consumption — whether captured using the number of food groups consumed or compliance with MDD — is high.

Table 2.1 Mobility indices for Dietary Score and Minimum Dietary Diversity

Mobility Indices	Mother		Child	
	Dietary Score	Minimum Dietary Diversity	Dietary Score	Minimum Dietary Diversity
Shorrocks-Prais index	0.98 (.02)	0.97 (.02)	1.02 (.02)	0.94 (.03)
Bartholomew index	0.38 (.02)	0.48 (.01)	0.41 (.01)	0.47 (.02)
Second largest eigenvalue	0.85 (.05)	0.00 (.00)	0.98 (.03)	0.94 (.03)
Determinant index	1.00 (.00)	0.97 (.02)	1.00 (0.00)	0.94 (.03)

Note: Bootstrapped standard errors are reported in parentheses.

However, transitions away from a stable state—low (high) consumption in both period—may be either an improvement, or deterioration. A comparison of DSs of mothers — the number of food items consumed — reveals that the basket of food items consumed by mothers contracted (from 5.65 to 5.20); the t-statistic (7.12) indicates that the difference of 8 percent is statistically significant at one percent level. Moreover, we can see the number of food groups has declined for nearly half the sample (49 percent). While 17 percent of mothers consume the same number of food groups, 34 percent are consuming items from more food groups.

In the case of children, on the other hand, mean DS increased over the period of study from 2.89 to 3.15; the difference of about 11 percent is statistically significant at one percent level (t = 4.75). Figure 2.1 also reveals that, while DS has remained the same for 19 percent of children, 45 percent of the children consume more food groups than in the pre-lockdown phase. We should, however, note three points. Firstly, the "improvement" may simply be due to the children growing older and allowed to consume more food. Secondly, about a third of children consume fewer food groups than in the pre-lockdown period. This is a large proportion. It is important to identify the characteristics of these groups. Thirdly, even with an improvement in dietary score, the proportion of children attaining MDD remains low.

Figure 2.1: Change in Dietary Score for mothers and children – percentage
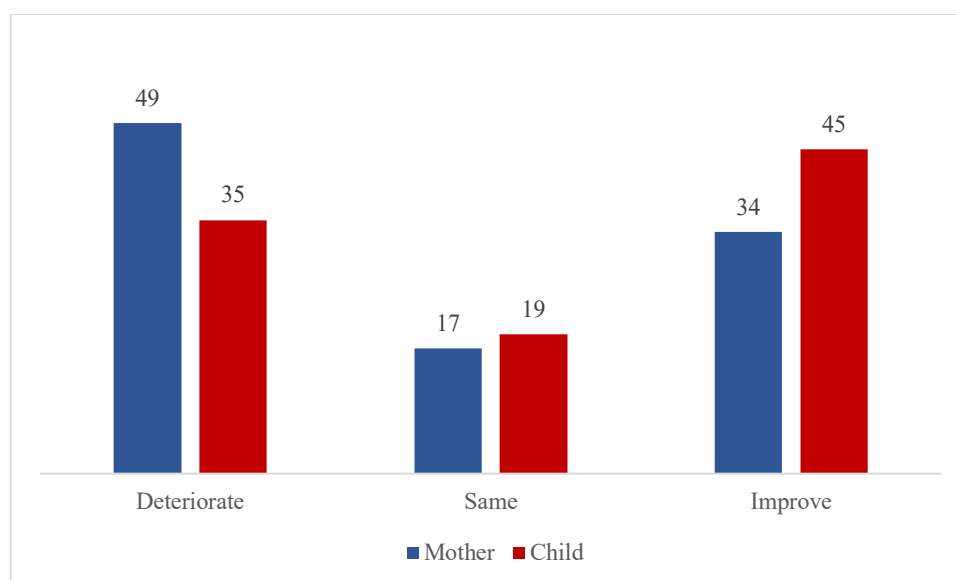
Our analysis also reveals that while 93.90 percent of mothers had attained MDD before lockdown, these figures declined to 83.45 percent during lockdown. The difference of 11 percent is statistically significant (t = 8.01). In Figure 2.2, the changes with respect to MDD of

mothers and children is reported. While the majority of mothers are able to comply with MDD norms, about 15 percent experience deterioration (viz. they had complied with MDD norms in the pre-lockdown period, but have failed to do so subsequently). Only about five percent of mothers have improved with respect to complying with MDD norms. In the case of children, compliance with MDD is low. It has, however, increased marginally — while 33 percent of children had attained MDD before lockdown, during the lockdown it increased marginally to 34 percent (t = 0.73). Moreover, about 46 percent do not achieve the recommended level of MDD in either of the two periods. Only 13 percent of children attain MDD in both periods. The proportion of children whose MDD has improved is 22 percent; it is marginally higher than the proportion whose dietary status with respect to complying with MDD norms deteriorates (20 percent). Overall, therefore, the situation with respect to MDD has deteriorated slightly for mothers and has remained persistently poor for children.

Figure 2.2: Change in attainment of Minimum Dietary Diversity for mothers – percentage
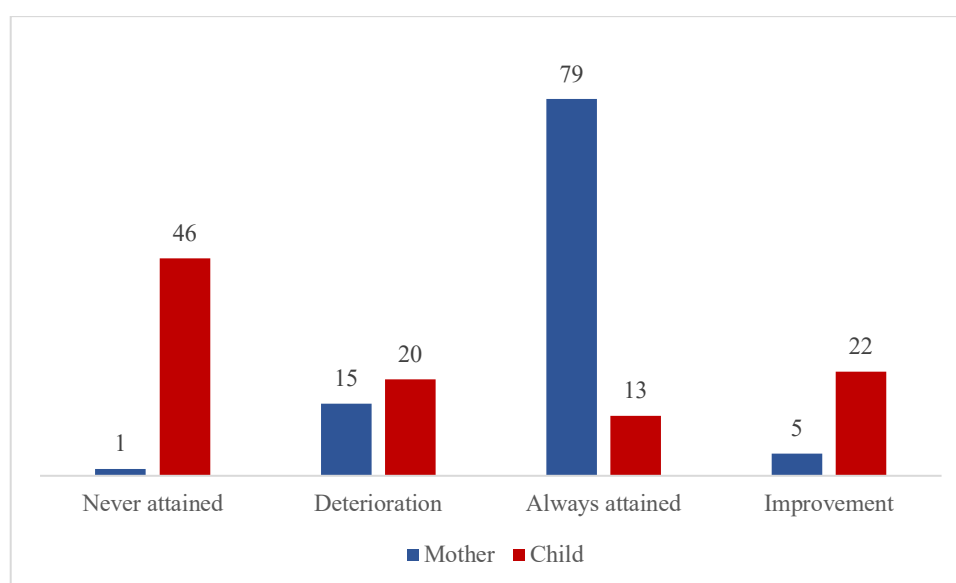
2.2.1 Investigating deterioration for mothers

The next steps will be directed to examining the nature of the deterioration in nutritional status of mothers. The analysis will start by examining the variation in DS and MDD across socio-economic correlates like asset level, education level, and socio-religious groups. It helps to identify which group has been most affected by the lockdown. In the next step, we examine changes in consumption of specific food groups. This will provide information on why dietary

diversity has declined. The third step comprises of an econometric analysis of possible determinants of the decline in DS and MDD.

2.2.2 MDD and DS across socio-economic correlates

The decline in average DS and proportion of mothers complying with MDD before and during lockdown is statistically significant across all asset classes (Table 2.2). In the case of DS, the decline is high in the top and bottom tercile group; the middle tercile class experiences a relatively lesser decline. In the case of MDD, however, it is the bottom two tercile groups that are affected more than the top tercile group.

Table 2.2: Changes in Dietary Score and Minimum Dietary Diversity for mothers across asset groups

Asset groups	Pre-lockdown	Lockdown	Difference (%)	t-statistic
Dietary score				
Low	5.53	5.08	-8.16	4.00
Medium	5.57	5.18	-6.92	3.25
High	5.81	5.30	-8.82	5.04
Minimum Dietary Diversity				
Low	94.83	83.05	-12.42	5.04
Medium	92.35	81.02	-12.27	4.49
High	94.41	85.68	-9.25	4.40

The decline in both indicators (DS and MDD) is statistically significant for all education levels (Table 2.3). The magnitude of the decline, however, is less in the case of those with at least 11 years of education.

Table 2.3: Changes in Dietary Score and Minimum Dietary Diversity for mothers across education levels

Education level	Pre-lockdown	Lockdown	Difference (%)	t-statistic
Dietary score				
No education	5.49	5.07	-7.64	3.73
1-5 years	5.62	5.02	-10.60	3.94
6-10 years	5.72	5.27	-7.76	4.13

Education level	Pre-lockdown	Lockdown	Difference (%)	t-statistic
11-17 years	5.86	5.48	-6.44	2.33
Minimum Dietary Diversity				
No education	92.82	81.32	-12.39	4.58
1-5 years	93.85	80.47	-14.26	4.27
6-10 years	94.14	85.37	-9.32	4.19
11-17 years	95.43	86.86	-8.98	2.85

Table 2.4 reveals that H-OBCs and H-FCs were substantially affected by the lockdown, and suffered statistically significant declines in both DS and MDD. Socially disadvantaged groups (H-SC&ST and Muslims) were not affected significantly by the lockdown.

Table 2.4: Changes in Dietary Score and Minimum Dietary Diversity for mothers across socio-religious groups

Socio-religious groups	Pre-lockdown	Lockdown	Difference (%)	t- statistic
Dietary score				
H-SC&ST	5.42	5.47	0.95	-0.23
H-OBC	5.61	5.10	-9.00	6.01
H-FC	5.72	5.19	-9.34	4.35
Muslims	5.91	5.64	-4.54	1.18
Minimum Dietary Diversity				
H-SC&ST	96.15	91.03	-5.33	1.31
H-OBC	94.03	82.09	-12.70	6.85
H-FC	94.06	83.17	-11.58	4.28
Muslims	90.72	87.63	-3.41	0.69

2.2.3 Changes in food basket of mothers

Analysis of change in consumption of specific food groups (Table 2.5) reveals that consumption of cereals and potatoes is universal in both periods. The proportion of mothers consuming this food group increases marginally by 0.17 percent, though the increase is not statistically significant even at the 10 percent level. The consumption of pulses is also very high, and increases by about two percent; however, the increase is statistically significant at one percent level. We also find that consumption of orange and yellow fruits has gone up

significantly in the lockdown period by about 50 percent. However, it is fairly low in both periods.

Consumption of all other food groups has drastically lessened; further, the reduction is statistically significant in all cases. Owing to cultural norms, consumption of non-vegetarian items like fish and meat, and eggs were relatively low in Bihar even in the pre-lockdown period. Lockdown reduced this proportion even more (by 30 percent and 12 percent, respectively). Consumption of dark green and leafy vegetables and other fruits and vegetables (23 and 14 percent, respectively) have also experienced significant declines. The decline for milk and dairy products is statistically significant, but the magnitude of the decline is only five percent.

Table 2.5: Proportion of mothers consuming specific food groups in pre and lockdown period

Food items	Pre-lockdown	Lockdown	Percentage change	t-test
Cereals and potatoes	98.87	99.04	0.17	0.41
Pulses & nuts	95.73	97.47	1.82	2.30
Fish and meat	58.01	40.84	-29.60	-8.30
Egg	41.90	36.76	-12.27	-2.52
Milk & dairy products	74.91	70.91	-5.34	-2.16
Yellow / orange fruits	22.74	34.15	50.18	6.11
Dark green, leafy vegetables	88.07	67.68	-23.15	-12.13
Any other fruits or vegetables	84.84	72.65	-14.37	-7.22

Now the large stocks of cereals and pulses acquired by the Food Corporation of India[1] enabled the Government of India to use the Public Distribution System (PDS) as a social security net, and cushion possible declines in consumption of cereals and pulses. We find that consumption of pulses increased by about two percent among families with ration cards (Table 2.6); moreover, the difference was statistically significant at five percent level (t = 2.32). In the case of families without ration cards, consumption of pulses remained the same. Change in consumption of cereals remained the same among both ration card holding and families without

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[1] As per its report dated 11.06.2020, FCI had 270.89 LMT rice and 540.80 LMT wheat (https://pib.gov.in/PressReleasePage.aspx?PRID=1631110).

ration cards. It indicates that the PDS system did play a part in moderating the negative effect of the lockdown on the consumption of pulses.

Table 2.6: Change in percentage of households consuming cereals & potatoes, and pulses & nuts for households with and without ration cards

Food group	Ration card	Pre-lockdown	Lockdown	Difference (%)	t-statistic
Cereals and potatoes	No	99.13	99.42	0.29	0.44
	Yes	98.76	98.88	0.12	0.23
Pulses and nuts	No	95.35	96.80	1.52	0.98
	Yes	95.90	97.76	1.94	2.13

There also seems to be a substitution of dark green and leafy vegetables, and other fruits and vegetables by orange and yellow fruits. Part of this change is due to the different seasons in which the surveys were undertaken. During January-March, availability of seasonal dark green and leafy vegetables like *palak sag* (spinach greens), *sarson ki sag* (mustard greens), *sag chana* (chickpeas greens), *muli sag* (radish greens), *khesari sag* (pea greens), *bandha gobi* (cabbages), etc. ensures that their consumption is high; in summer, their consumption declines in summer months with their non-availability. On the other hand, orange and yellow fruits like papaya, and mangoes are available in summer. Consumption of potatoes also increases during the summer months.

Table 2.7: Proportion of mothers consuming fruits and vegetables by land holding in pre- and lockdown period

Food group	Stage	Landless	1-9 katha	10-19 katha	20 katha & above
Dark green and leafy vegetables	Pre-lockdown	87.56	86.64	91.84	89.71
	Lockdown	68.27	63.79	65.31	72.00
	Change (%)	-22.02	-26.37	-28.89	-19.75
Other fruits and vegetables	Pre-lockdown	83.67	85.34	84.69	88.57
	Lockdown	72.47	69.40	71.43	78.29
	Change (%)	-13.38	-18.69	-15.66	-11.61

Ownership of land is also an important factor underlying the changes in dietary practices. About 56 percent of respondents are landless. For the remaining 44 percent of respondents, an inverse relationship between landholding and reduction in consumption of other fruits and

vegetables may be observed (Table 2.7). In families with land holdings between 1-9 *kathas*, the decline is about 19 percent; the decline is only 12 percent among families owning 20 *kathas* of land or more. So, to some extent, land holding is able to cushion families from the adverse effects of the pandemic and lockdown.

Similarly, about 40 percent of households reported owning milch animals (cows and buffaloes). Ownership of milch animals can also protect owners and their family members from shocks such as lockdowns. The change in consumption of milk and dairy items was categorised into four groups — never consumed, always consumed, consumed only in pre-lockdown period (but not in lockdown period), and consumed only in lockdown period (but not in pre-lockdown period). Taking 'always consumed' as the base outcome, a (clustered) multinomial probit was estimated with the change in consumption of this food group being regressed upon ownership of milch animals (=1 if the household owns a milch animal, zero otherwise), asset scores, education, and socio-religious identity. The coefficient of the milch dummy is -0.35 (z= -3.73, prob. = 0.00) in the model for "deteriorated consumption" against "always consumed". The negative sign of the coefficient indicates that the probability of a household reducing consumption of milk and dairy items will decline if the household owns a milch animal, vis-à-vis households consuming this food group in both pre-and lockdown periods.

 Political contacts may also play a role in help a household to access government schemes and reducing the impact of the shock. To test this hypothesis, we have estimated the difference in DS over the period of study ($\Delta DS = DS_{t+1} - DS_t$). The mean value of ΔDS is compared between sub-samples defined as follows:

 (i)   Whether respondent and *pradhan* is of the same caste;

 (ii)   Whether respondents' family members have any contacts with the *pradhan*; and

 (iii)   Whether respondents' family members have any political contacts.

Table 2.8 Political contacts and change in Dietary Score

Group	No	Yes	t-statistics
Same caste	-0.40	-0.56	-1.22
Contact with *pradhan*	-0.52	-0.31	-1.67**
Political contact	-0.49	-0.12	-2.00**

*Note: ** denotes 0.05 > Probability > 0.01*

Although caste does not seem to have any impact (probably because sub-caste is more important than caste), contacts with the *pradhan* or political party in power cushions the mother's consumption (Table 2.8).

2.2.4 Econometric analysis for mothers

In the last step of our analysis of mothers' dietary practices, we undertook an econometric analysis incorporating variables like age and education level of respondent, household size, asset holdings, socio-religious score, whether respondent works, whether the husband is a migrant, occupation of husband, landholding, possession of ration card, and contacts with political party or *pradhan*. Two models were estimated — for DS and MDD, respectively. In case of DS, an Ordinary Least Square (OLS) model was estimated (clustering villages to produce robust standard errors). In the case of MDD, a multinomial probit was estimated; however, only the deterioration panel (with "MDD in both period" as the base outcome") was reported. Results are reported in Table 2.9.

Table 2.9: Summary results of regression models

Variables	Dietary score			Minimum Dietary Diversity		
	β	z	Prob	β	z	Prob
Age of respondent	-0.04	-2.42	0.02	0.03	1.68	0.09
Education (No education)						
1-5 years	-0.27	-1.41	0.16	0.04	0.22	0.83
6-10 years	-0.19	-1.08	0.28	-0.07	-0.43	0.67
11-17 years	-0.04	-0.18	0.86	-0.13	-0.51	0.61
Socio-religious group (H-OBC)						
H-SC&ST	0.82	4.01	0.00			
H-FC	0.03	0.19	0.85			
Muslim	0.20	0.85	0.40			
Asset score	-0.09	-1.01	0.31	-0.11	-1.25	0.21
Household size	-0.02	-0.91	0.37	0.00	-0.17	0.86
Whether respondent works	-0.04	-0.19	0.85	0.03	0.19	0.85
Whether husband is a migrant	-0.07	-0.52	0.61	0.22	1.77	0.08
Occupation of partner (Primary)						

Variables	Dietary score			Minimum Dietary Diversity		
	β	z	Prob	β	z	Prob
Others	0.15	0.93	0.36	0.35	1.96	0.05
Wage & salaried	0.02	0.11	0.91	0.16	0.92	0.36
Land owned	0.00	-0.50	0.62	0.00	0.09	0.93
Possess ration card	0.43	3.12	0.00	-0.37	-2.79	0.01
Contact with						
pradhan/party	0.10	0.65	0.52	-0.55	-3.18	0.00
Intercept	6.40	10.90	0.00	-2.07	-3.51	0.00
N	1143			1143		
χ^2	2.45			106.13		

Note: Result for MDD reported for "Deterioration", with "MDD in both periods" as the base outcome. Inclusion of socio-religious identity created convergence problems, and had to be excluded.

Older respondents are more likely to consume fewer food groups than in the pre-lockdown period; they are also more likely to fail to comply with MDD norms. H-SC&STs are more likely to have a higher dietary score in the lockdown phase. Respondents whose husbands are migrants, or are working in the non-primary sector (Others category) are more likely to suffer deterioration with respect to compliance with MDD norms. Contacts with the ruling political party, or with the village *pradhan*, reduces the probability of a person who had previously complied with MDD norms, failing to so in the lockdown period. Possession of a ration card also appears to be an important factor cushioning households from a decline in DS or failing to comply with MDD norms.

2.3 Dietary practices of children
2.3.1 Variations across household characteristics
The mean DS is low for children of both genders. Mean DS is marginally higher among girls, compared to the mean for boys. It is observed in both pre-lockdown and lockdown periods, but in neither period is the gender difference in DS statistically significant. DS has increased for both boys and girls over the period of our study. The increase is about 11 percent for both. DS increases for children for all sub-samples formed based on asset holdings of families, education level of mothers, and socio-religious identity (Table 2.10).

Table 2.10: Variations in Dietary Score of children across socio-economic correlates

Correlate	Pre-lockdown	Lockdown	Difference (%)	t-statistic
Gender of child				
Male	2.85	3.16	11.12	-3.40
Female	2.90	3.23	11.20	-3.31
Asset				
Low	2.90	3.47	19.91	-4.60
Medium	2.95	3.17	7.36	-1.79
High	2.79	2.99	6.99	-1.86
Education of mother				
No Education	3.06	3.52	14.83	-3.68
1-5 years	2.79	3.02	8.14	-1.63
6-10 years	2.88	3.08	7.10	-1.75
11-17 years	2.58	3.01	16.76	-2.49
Socio-religious group				
H-SC&ST	2.55	3.25	27.11	-2.72
H-OBC	2.88	3.11	8.28	-2.68
H-FC	2.87	3.30	15.18	-3.28
Muslim	3.13	3.36	7.52	-1.09

In the pre-lockdown period, the percentage of children who have adhered to the MDD norm is low—32 among boys, and 34 among girls (Figure 2.11). However, this is not a statistically significant difference. In the lockdown phase, there is an increase in the percentage of boys attaining MDD by three percent points. In the case of girls, however, there is a marginal decrease. The temporal change is insignificant in both cases.

Table 2.11: Variations in percentage of children complying with Minimum Dietary Diversity across socio-economic correlates

Correlate	Pre-Lockdown	Lockdown	Difference (%)	t-statistic
Gender of child				
Male	31.66	34.87	10.13	0.07
Female	33.86	33.63	-0.67	-1.07

Correlate	Pre-Lockdown	Lockdown	Difference (%)	t-statistic
Asset				
Low	31.40	44.03	40.22	-3.18
Medium	37.19	33.33	-10.38	0.96
High	30.22	27.20	-10.00	0.90
Education of mother				
No Education	38.91	45.39	16.67	-1.59
1-5 years	27.57	28.11	1.96	-0.12
6-10 years	33.13	30.96	-6.54	0.59
11-17 years	25.53	26.95	5.56	-0.27
Socio-religious group				
H-SC&ST	18.46	33.85	83.33	-2.01
H-OBC	33.33	30.77	-7.69	0.91
H-FC	31.30	39.84	27.27	-1.98
Muslim	43.53	41.18	-5.41	0.31

The percentage of children complying with MDD increases over the period of our study for most sub-samples. The exceptions are children from families with medium and high asset holdings, children whose mothers have 6-10 years of schooling, and children from H-OBC and Muslim families.

2.3.2 Consumption of food groups

Analysis of consumption of specific food groups reveals that proportion of children consuming cereals and potatoes, pulses and nuts, and milk and dairy products is high in both periods (Table 2.12). Out of these three food groups, consumption of milk and dairy products has declined by 5 percent, while that of cereals and potatoes, and pulses and nuts have increased significantly by 4 percent and 32 percent, respectively. Consumption of non-vegetarian items, and yellow or orange fruits is very low in both periods. The percentage of children consuming dark green and leafy vegetables, and other fruits and vegetables is also low; their presence in consumption basket of children also needs to be increased substantially to ensure adequate supply of micro-nutrients and vitamins. However, the lockdown does not seem to have affected their intake significantly.

Table 2.12: Change in consumption of food groups by children

Food groups	Pre-lockdown	Lockdown	Difference	t-statistic
Cereals and potatoes	88.43	92.25	4.32	-2.81
Nuts and pulses	63.59	84.08	32.22	-10.40
Fish and meat	7.86	4.03	-48.73	3.52
Eggs	2.34	3.29	40.60	-1.25
Milk and dairy products	68.68	65.18	-5.10	1.62
Yellow/Orange fruits	3.18	7.11	123.58	-3.87
Dark green leafy vegetables	23.57	22.08	-6.32	0.77
Other fruits and vegetables	29.72	31.74	6.80	-0.95

2.3.3 Econometric analysis for children

In the final step of our analysis of changes in dietary practices of children, we have undertaken an econometric analysis of determinants of DS and MDD. Table 2.13 presents the results of the OLS regression model of DS regressed upon variables hypothesised to influence DS; the model is clustered at the village level, producing robust standard errors. Coefficients of variables like the gender of child, whether the mother is employed, household size, whether the father is a migrant, occupation of father, and whether family possesses ration card are not different from zero at ten percent level.

Table 2.13: Results of OLS model for change in Dietary Score of children

Variables.	Coef.	t	P>t
Age of child (7-12 months)			
13-18 months	-0.62	-3.59	0.00
19-24 months	-0.97	-4.93	0.00
25-36 months	-1.07	-5.59	0.00
Gender of child	-0.03	-0.20	0.84
Mother's education (No education)			
1-5 years of education	-0.27	-1.46	0.15
6-10 years of education	-0.31	-1.77	0.08
11-17 years of education	0.03	0.12	0.91
Socio-religious identity (H-SC&ST)			
H-OBC	-0.66	-2.59	0.01

Variables.	Coef.	t	P>t
H-FC	-0.57	-2.37	0.02
Muslim	-0.74	-2.41	0.02
Asset	-0.23	-2.84	0.01
Household size	0.02	0.84	0.40
Working mother	-0.21	-0.93	0.36
Father is migrant	0.08	0.51	0.61
Occupation of Father (Primary)			
Others	-0.11	-0.65	0.52
Wage & salaried	0.31	1.38	0.17
Possesses ration card	0.14	0.89	0.38
Political contacts	0.65	1.97	0.05
Intercept	9.72	20.82	0.00
Number of observations	937.00		
$F_{(16, 112)}$	5.13		0.00
R^2	0.07		
Ramsay RESET statistic	0.13		0.95
Link test	0.06	0.40	0.69

Age of child is inversely related to the change in DS; older children consume fewer food groups in the lockdown stage. Children whose mothers have 6-10 years of education have lower DS in the second phase of the study, compared to children whose mothers are illiterate. In comparison to children from H-SC&ST families, children from other socio-religious groups have experienced a deterioration in DS over the period of our study. Somewhat surprisingly, children from families with higher asset holdings are found to have experienced deterioration in DS. The coefficient of whether families have political contacts is significantly different from zero at a ten percent level; it implies that having political links with the ruling party protects the children from consumption shocks.

Tests for misspecification and omitted variables reject the null hypotheses that the model is specified incorrectly, or that omission of variables is producing biased estimates of coefficients.

Table 2.14: Results of multinomial model for change in proportion of children complying with Minimum Dietary Diversity

Variables	Never attained MDD			Deterioration in MDD			Improvement in MDD		
	Coef	t	P>t	Coef	t	P>t	Coef	t	P>t
Age of child (7-12 months)									
13-18 months	-0.75	-3.12	0.00	0.00	0.01	0.99	-0.76	-2.80	0.01
19-24 months	-0.78	-3.01	0.00	0.13	0.43	0.67	-0.79	-3.20	0.00
25-36 months	-0.80	-3.52	0.00	0.00	0.01	0.99	-1.16	-4.72	0.00
Gender of child	-0.12	-0.89	0.38	-0.24	-1.51	0.13	-0.13	-0.92	0.36
Mother's education (No education)									
1-5 years of education	1.01	4.78	0.00	0.87	3.57	0.00	0.65	3.15	0.00
6-10 years of education	0.41	2.20	0.03	0.50	2.39	0.02	0.16	0.79	0.43
11-17 years of education	0.75	2.76	0.01	0.63	2.11	0.04	0.54	2.02	0.04
Socio-religious identity (H-SC&ST)									
H-OBC	-0.05	-0.10	0.92	0.73	1.87	0.06	-0.35	-0.94	0.35
H-FC	-0.12	-0.25	0.81	0.63	1.55	0.12	-0.21	-0.55	0.59
Muslim	-0.53	-0.97	0.33	0.61	1.39	0.16	-0.52	-1.30	0.19
Asset	0.27	2.65	0.01	0.31	2.86	0.00	0.05	0.53	0.60
Household size	-0.04	-1.41	0.16	-0.07	-1.97	0.05	-0.03	-0.97	0.33
Working mother	-0.08	-0.40	0.69	0.21	1.09	0.28	0.06	0.29	0.77

Variables	Never attained MDD			Deterioration in MDD			Improvement in MDD		
	Coef	t	P>t	Coef	t	P>t	Coef	t	P>t
Husband migrant	-0.04	-0.29	0.77	-0.01	-0.04	0.97	-0.13	-0.89	0.37
Occupation of husband (Primary)									
Others	-0.31	-1.28	0.20	-0.39	-1.73	0.08	-0.40	-1.55	0.12
Wage & salaried	-0.29	-1.02	0.31	-0.38	-1.41	0.16	-0.23	-0.78	0.43
Possesses ration card	-0.55	-3.06	0.00	-0.44	-2.15	0.03	-0.40	-2.12	0.03
Political contacts	-0.09	-0.43	0.67	0.09	0.38	0.70	0.59	2.43	0.02
Intercept	2.56	3.77	0.00	0.47	0.77	0.44	2.17	3.26	0.00
Number of observations	937								
F	302.38		0.00						
Link test	-0.19	-1.63	0.10	0.06	0.61	0.54	-0.05	-0.32	0.75
Count R^2 (adjusted)	0.02								

Note: Base outcome is "Attained MDD in both periods". Village level clustering is undertaken to produce robust standard errors.

Results of the multinomial probit model for MDD are reported in Table 2.14. The coefficients of the gender of the child, socio-religious identity, whether the mother works, and whether the father is a migrant worker are statistically insignificant at ten percent level. Children aged 7-12 months are less likely not to comply with MDD norms; it may because mothers are still relying on breastfeeding and not providing supplementary food to such children. Illiterate mothers are more likely to comply with MDD norms in both periods; it may reflect the stronger influence of Accredited Social Health Activists and other grass-root workers upon less educated women (Dutta, Husain, and Ghosh 2021; Ghosh and Keshri 2020). Children from H-SC&ST families are more likely to adhere to MDD norms in both periods. In larger families, children are less likely to experience deterioration concerning MDD norms in the lockdown phase. Possession of ration cards ensures that MDD norms will be complied with in both periods, while political contacts improve likelihood of attaining MDD in lockdown phase.

Now, in both the regression models, we find the age of the children to be a significant determinant of dietary practices. Further, we find that children aged 7-12 months are better off than older children (13-36 months); their DS improves during the lockdown, while a higher proportion complies with MDD norms. This may reflect the weaning of the children— as breastfeeding is reduced, it is substituted by complementary food items. In order to test this hypothesis, we have examined the changes in DS and MDD over different age groups (Table 2.15). The increase in the number of food groups consumed is highest among children in the age group 7-12 months, who are being weaned from breast milk; the increase in the proportion of children complying with MDD is also highest for this age group. In contrast, children aged 25-36 months experience a decline in both DS and MDD, while those aged 19-24 months are observed to experience a marginal increase in DS and a decline with respect to compliance with MDD norms. So the improvement in consumption, reflected in increases in both DS and MDD is partly due to children growing older, and having to be weaned away from breast milk.

Table 2.15: Variations in Dietary Score and Minimum Dietary Diversity across age groups

Age in first phase	Dietary score			Minimum Dietary Diversity		
	Pre-lockdown	Lockdown	Change (%)	Pre-lockdown	Lockdown	Change (%)
7-12 months	2.21	3.22	45.93	15.67	36.41	132.35

Age in first phase	Dietary score			Minimum Dietary Diversity		
	Pre-lockdown	Lockdown	Change (%)	Pre-lockdown	Lockdown	Change (%)
13-18 months	2.91	3.25	11.50	34.63	35.02	1.13
19-24 months	3.14	3.20	2.01	38.42	35.79	-6.85
25-36 months	3.18	3.12	-1.81	40.29	30.94	-23.21

2.4 Access to welfare measures

Our analysis reveals that access to welfare measures was quite high in rural Bihar (Figure 2.3). About 92 percent of respondents had received free rations of 5 kg rice and 1 kg pulses per person in at least one month, while 81 percent received money in their *Jan Dhan* accounts. About half of the eligible respondents were beneficiaries of the *Pradhan Mantri Ujjwala* scheme and Mid-day meal schemes. The lowest proportion of beneficiaries was observed for the Direct Benefit Transfer (DBT) of Rs.1000 to ration card holders announced by the Bihar government.

Figure 2.3: Access to welfare schemes
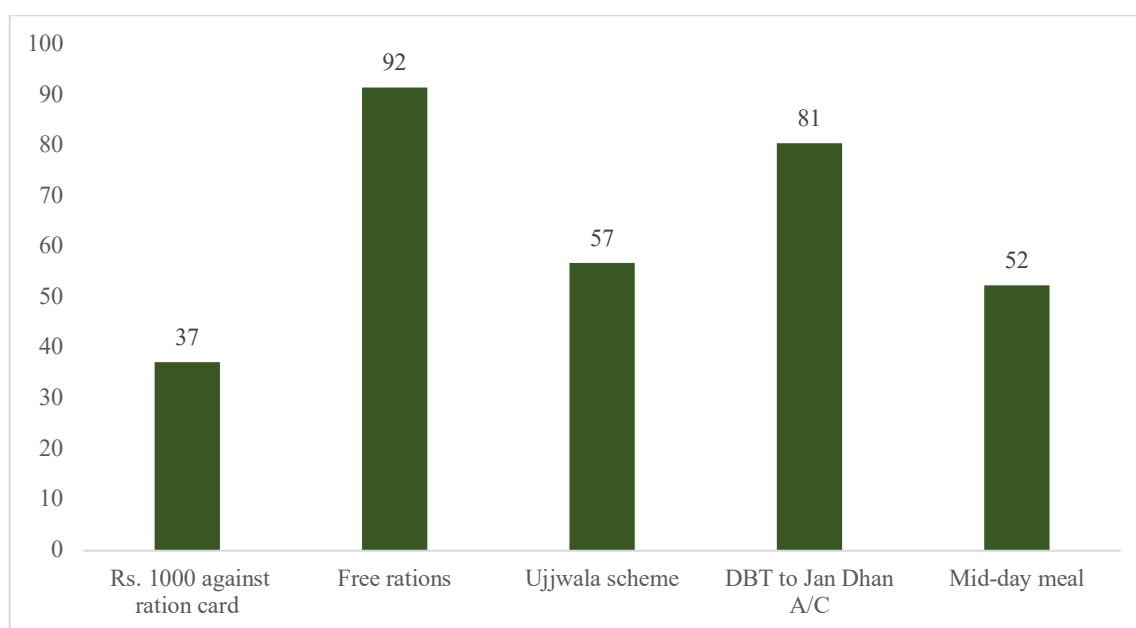
2.4.1 Access to welfare measures across correlates

The results of the analysis of proportion of beneficiaries out of eligible respondents across socio-economic correlates is presented in Table 2.16. No clear relationship between education of respondent and access to schemes is observed. This is also true for variations in access across

socio-religious groups. In general, the proportion of beneficiaries is highest among households with low asset scores, and is lowest among households with high asset scores. An exception is access to DBT against ration cards, where 40 percent of households in the middle tercile group are beneficiaries. No occupational group seems to have been exclusively targeted.

Table 2.16: Proportion of beneficiaries across socio-economic correlates

Correlates	Received Rs. 1000 against ration card	Received free rations	Received subsidised LPG cylinder	Received transfer to *Jan Dhan* account	Children benefitted from Mid-day meal scheme
Education					
No Schooling	38.4	93.17	60.34	82.61	48.23
1-5 years	36.31	90.91	59.29	80.19	54.49
6-10 years	39.18	90.37	54.12	78.77	57.61
11-17 years	31.3	91.3	52.94	80.26	47.37
Socio-religious identity					
H-SC&ST	44.23	84.62	43.75	79.49	34.38
H-OBC	36.32	92.34	59.63	81.87	53.5
H-FC	35.50	90.45	53.70	80.38	51.16
Muslim	41.98	93.75	57.78	72.55	63.75
Asset classes					
Low	38.80	93.63	64.33	83.84	58.39
Medium	40.49	91.50	60.67	82.14	52.84
High	33.11	89.66	47.93	75.85	47.38
Husband's occupation					
Primary	39.87	89.61	56.03	84.25	45.90
Others	35.71	92.04	58.46	79.46	55.24
Wage & Salaried	39.86	92.14	52.73	80.00	50.00

In general, respondents reported to have received the promised free rations of five kg rice and one kg pulses for about five months (mean: 4.42); they also reported receiving two subsidised cylinders under the *Ujjwala* scheme (mean: 1.54). It was also estimated that, on an average, respondents benefitted from about four out of the five schemes (mean was 3.68).

It is observed that number of subsidised cylinders received and number of schemes from which the family benefitted is lower among more educated families (Table 2.17).[2] Hindu-Scheduled Caste and Scheduled Tribe (H-SC&ST) families have benefitted less than other socio-religious groups. A negative relationship is observed between asset groups and number of subsidised cylinders received and number of schemes benefitted from.

Table 2.17: Variations in access to benefits across socio-economic correlates

Correlates	No. of months received 5 kg rice and 1 kg pulses	No. of subsidised cylinders received	Mean number of schemes that family benefitted from
Education			
No Schooling	4.16	1.23	3.66
1-5 years	4.35	1.27	3.72
6-10 years	4.19	1.10	3.75
11-17 years	4.32	1.07	3.53
Socio-religious identity			
H-SC&ST	3.59	0.91	3.27
H-OBC	4.19	1.23	3.71
H-FC	4.33	1.11	3.65
Muslim	4.59	1.16	3.88
Asset classes			
Low	4.13	1.31	3.94
Medium	4.41	1.26	3.64
High	4.16	0.99	3.43
Husband's occupation			
Primary	3.67	1.09	3.61
Others	4.33	1.19	3.67
Wage & Salaried	4.53	1.20	3.89

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[2] Actually, we had used education of respondent. But, in Bihar, hypogamy and isogamy is the norm. So a more educated woman implies that the husband, too, is likely to be more educated.

Beneficiaries of the DBT to *Jan Dhan* account received, on an average, Rs1,066. Almost half of the potential beneficiaries received more than Rs.1000, while only one out of five did not get any transfer. No substantial variation is observed across education level of respondents, socio-religious groups, or occupation of husband (Table 2.18). Affluent households (with high asset scores) seem to have benefitted comparatively less than poor families.

<p align="center">**Table 2.18: Variations in cash transfer across socio-economic correlates**</p>

Correlates	None	Below Rs.1000	Above Rs.1000
Education			
No Schooling	17.39	34.78	47.83
1-5 years	19.81	29.25	50.94
6-10 years	21.23	28.30	50.47
11-17 years	19.74	27.63	52.63
Socio-religious identity			
H-SC&ST	20.51	35.90	43.59
H-OBC	18.13	30.88	50.99
H-FC	19.62	34.81	45.57
Muslim	27.45	11.76	60.78
Asset classes			
Low	16.16	32.83	51.01
Medium	17.86	30.61	51.53
High	24.15	28.50	47.34
Husband's occupation			
Primary	15.75	33.86	50.39
Others	20.54	30.81	48.65
Wage & Salaried	20.00	26.00	54.00
Aggregate	**19.47**	**30.62**	**49.92**

2.4.2 Access to benefits and political contacts

Contacts with the local *pradhan*, or with political party in power in the village are found to be important factors underlying access of households to social welfare schemes (Table 2.19). Households who have contacts with the *pradhan* are better placed to avail to obtain benefits

from all five schemes. Households belonging to the same caste as that of the *pradhan* have a higher likelihood of accessing benefits from the schemes studied; the only exception is Mid-day meal programme. Contacts with the local party in power also helps in accessing safety net measures, particularly the *Ujjwala* scheme, cash transfer via *Jan Dhan*, and Mid-day meal scheme.

**Table 2.19: Political contacts and access to programme**

Programmes	Whether caste same as that of *pradhan*		Whether contact with *pradhan*		Whether contact with party in power	
	No	Yes	No	Yes	No	Yes
Received Rs. 1000 against ration card	36.4	38.71	35.22	40.54	37.15	37.61
Received free rations	92.19	90.22	90.8	92.71	91.46	91.74
Received subsidised LPG cyclinder	55.73	59.34	50.83	67.65	55.01	68.63
Received transfer to *Jan Dhan* account	78.61	83.7	79.63	82.06	79.7	86.49
Children got cooked meals/dry rations under Mid-day meal scheme	58.13	41.61	46.92	65.12	49.64	74.29

While the *pradhan* is able to ensure that favoured households get access to welfare measures, he is less influential in determining the number of times that the family benefits. Thus, belonging to the same caste as that of the *pradhan*, or having contacts with him does not seem to have a bearing on the number of times the household received free rations, or subsidised Liquefied Petroleum Gas (LPG) cylinders (Table 2.20). Contact with the party in power, on the other hand, seems to help in this regard.

Table 2.20: Benefits and political contacts

Nature of contact	No. of months received 5 kg rice and 1 kg pulses	No. of times received subsidised LPG cylinder	Mean number of schemes that family benefitted from
Whether caste same as *pradhan*			
No	4.65	1.19	3.84
Yes	3.47	1.14	3.42
Whether contact with *pradhan*			
No	4.08	1.03	3.39
Yes	4.49	1.42	4.04
Whether contact with ruling party			
No	4.19	1.12	3.57
Yes	4.47	1.51	4.25

Contact with local party in power is also important in determining amount of cash transfer to *Jan Dhan* account (Figure 2.4).

Figure 2.4: Nature of contact and amount of cash transfers to *Jan Dhan* accounts
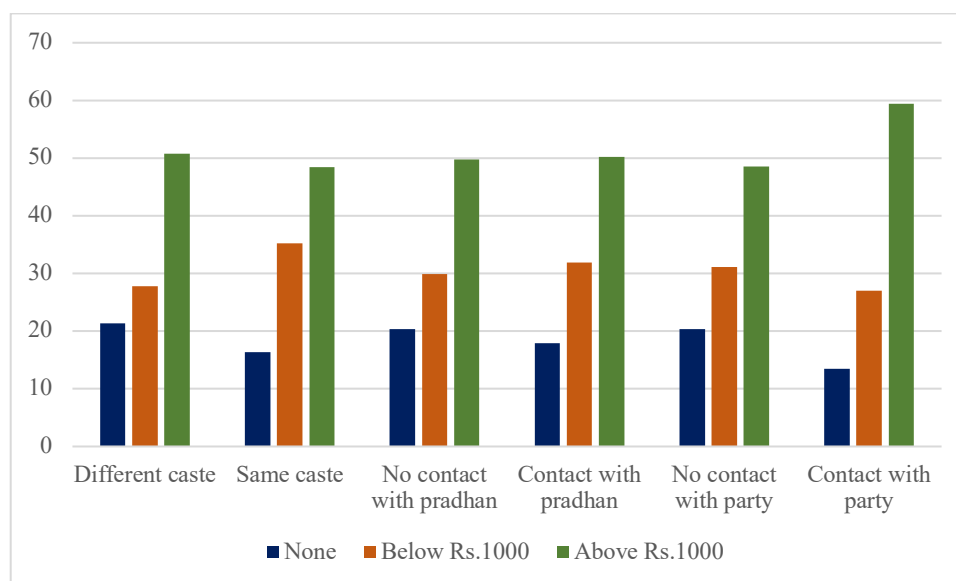
2.4.3 Econometric analysis

Results of the econometric analysis to identify determinants of access to social safety measures are given in Tables 2.21 and 2.22.

Contacts with the political party in power in village is an important determinant of both whether the household is able to a safety measure or not, and quantum of benefits secured. Such contacts

are important in acquiring subsidised LPG cylinders under the *Pradhan Mantri Ujjwala Yojana*, availing of food under the Mid-day meal scheme, and obtaining cash transfer under *Jan Dhan* account. Not surprisingly, therefore, such contacts play an important role in determining the number of social protection schemes the household is able to access.

We also find that poorer households (i.e. households with low asset scores) are more likely to obtain the cash transfer of Rs. 1000 against ration card, or secure at least one subsidised LPG cylinder. They are also more likely to acquire more gas subsidised cylinders, and access more safety measures, than affluent households.

H-SC&ST households are more likely to have obtained the cash transfer against ration cards; however, such households, along with Muslim families, are likely to procure lesser number of subsidised cylinders under the *Ujjwala* scheme.

Children from families engaged in non-agricultural activities are more likely to obtain rations under the Mid-day meal programme. Such families, along with families with wage and salary earners, are likely to get free rations a larger number of times, relative to households engaged in agricultural activities.

Table 2.21: Results of probit models

Variables	Cash transfer of Rs. 1000		Free rations		Subsidised LPG cylinder		Mid-day meal		Cash transfer to *Jan Dhan* account	
	b	z	b	z	b	z	b	z	b	z
Contact with party	-0.01	-0.07	-0.03	-0.12	0.32	1.82*	0.64	3.49***	0.24	1.22
Asset	-0.10	-1.80*	-0.13	-1.61	-0.24	-3.31***	-0.09	-1.57	-0.13	-1.55
Socio-religious group (H-OBC)										
H-SC&ST	0.28	1.75**	-0.31	-1.20	-0.19	-0.61	-0.35	-1.47	0.01	0.02
H-FC	-0.06	-0.47	-0.15	-0.92	-0.25	-1.72	-0.08	-0.58	-0.08	-0.49
Muslim	0.14	0.77	0.06	0.28	-0.14	-0.54	0.20	1.08	-0.33	-1.77
Occupation (Primary sector)										
Others	-0.12	-1.03	0.09	0.53	-0.01	-0.07	0.20	1.95**	-0.19	-1.28
Wage & salaried	-0.01	-0.06	0.17	0.73	-0.10	-0.60	0.13	1.03	-0.15	-0.84
Intercept	-0.26	-1.98**	1.37	7.86***	0.27	1.66	-0.12	-0.88	1.04	6.50***
N	786		784		563		927		597	
χ^2	7.34		6.3		16.7		23.55		9.44	
Pseudo R^2	0.01		0.02		0.03		0.03		0.01	

Note: ***, ** and * denotes Prob. < .01, .05 and 0.10, respectively.

Table 2.22: Results of ordered probit models

Variables	Free rations		Subsidised LPG cylinders		Amount received in *Jan Dhan* account		Number of schemes	
	b	z	b	z	b	z	b	z
Contact with party	0.22	2.05**	0.31	2.14**	0.25	1.72*	0.73	3.10***
Asset	0.01	0.23	-0.20	-3.08***	-0.06	-0.97	-0.19	-2.29**
Socio-religious group (H-OBC)								
H-SC&ST	-0.45	-1.54	-0.17	-0.58*	-0.09	-0.50	-0.16	-0.30
H-FC	0.09	0.73	-0.18	-1.36	-0.12	-0.90	-0.15	-0.88
Muslim	0.10	0.48	-0.12	-0.54**	0.04	0.18	0.28	0.95
Occupation (Primary sector)								
Others	0.35	3.10***	0.03	0.28	-0.10	-0.92	-0.03	-0.15
Wage & salaried	0.41	2.83**	0.08	0.52	0.02	0.15	0.31	1.44
Cut1	-1.32		-0.18		-0.93		-1.64	
Cut2	0.20		0.29		-0.06		-0.91	
Cut3			0.79				-0.25	
Cut4							0.81	
N	791		563		597		216	
χ^2	16.04		18.07		5.59		21.58	
Pseudo R^2	0.02		0.01		0.01		0.01	

*Note: ***, ** and * denotes Prob. < .01, .05 and 0.10, respectively.*

Contact with party or pradhan *was used as an explanatory variable, instead of contact with party, for the regression model of 'Amount received in* Jan Dhan *account'.*

2.5 Welfare changes

The final step of our analysis comprises measuring welfare changes. From Table 2.23, we can see that the lockdown has not reduced welfare of both the mothers and their children. Welfare levels of mothers has increased from 1800 to 2135 minutes (an increase of about 20 percent). The analysis of the welfare changes of households classified by their asset scores reveal that the middle group were the biggest gainers; the households belonging to the highest tercile groups, however, experienced a welfare loss. It may be because these households are less likely to have a ration card (66 percent of the households in the high asset group have ration cards, as compared to the sample average of 70 percent). The result underlines the cushioning effect of distribution of staples and pulses through the PDS during the lockdown.

In case of the youngest child, welfare is observed to increase substantially from 207 to 1411 minutes. While children in the middle tercile group are the biggest gainers, the children from poor households are found to have experienced a welfare loss.

We have converted the change in welfare to money terms using the Mahatma Gandhi National Rural Employment Guarantee programme wage rate of Rs.171 per day (for eight hours). In money terms, the welfare increase is not very impressive—Rs.126.30 (mothers) and Rs.429.10 (children). Families with low asset scores have gained the least (Rs.195.8 for mothers, and Rs.-68.80 for children). On the other hand, households in the middle asset tercile class have gained by Rs.3024.80 (mothers) and Rs.140.80 (child), while the welfare changes for those in the top asset tercile group are Rs.-2751 (mothers) and Rs.161.80 (child).

Table 2.23: Change in welfare measured using pulse consumption for mothers and youngest child

Group	Pre-WTP	Pre-CS	Post-WTP	Post-CS	Difference (%)	t-statistic	Probability
Mother	**1821.33**	**1779.91**	**2187.22**	**2134.54**	**19.92**	**-140.00**	**0.00**
Asset class							
Poor	245.10	203.68	806.04	753.36	269.88	-220.00	0.00
Medium	114.87	156.29	8594.25	8646.93	5432.49	340.00	0.00
Rich	13797.33	13838.76	6063.87	6116.55	-55.80	-310.00	0.00
Child (7-36 months)	**166.41**	**206.79**	**1358.79**	**1411.14**	**582.41**	**445.56**	**0.00**
Child (18-36 months)	**645.77**	**687.52**	**1539.47**	**1593.28**	**905.76**	**905.76**	**0.00**
Asset class							
Poor	540.00	580.37	334.84	387.19	-33.29	-71.47	0.00
Medium	83.67	124.04	467.03	519.38	318.71	146.26	0.00
Rich	247.98	288.36	794.96	742.61	157.53	-380.00	0.00

2.6 Financial situation during lockdown

Although the majority of the respondents (87 percent) reported that they were in comfortable conditions before the lockdown, 90 percent reported that their financial status had deteriorated during the lockdown (Fig. 2.5).

Figure 2.5: Financial situation during lockdown and outlook in coming year
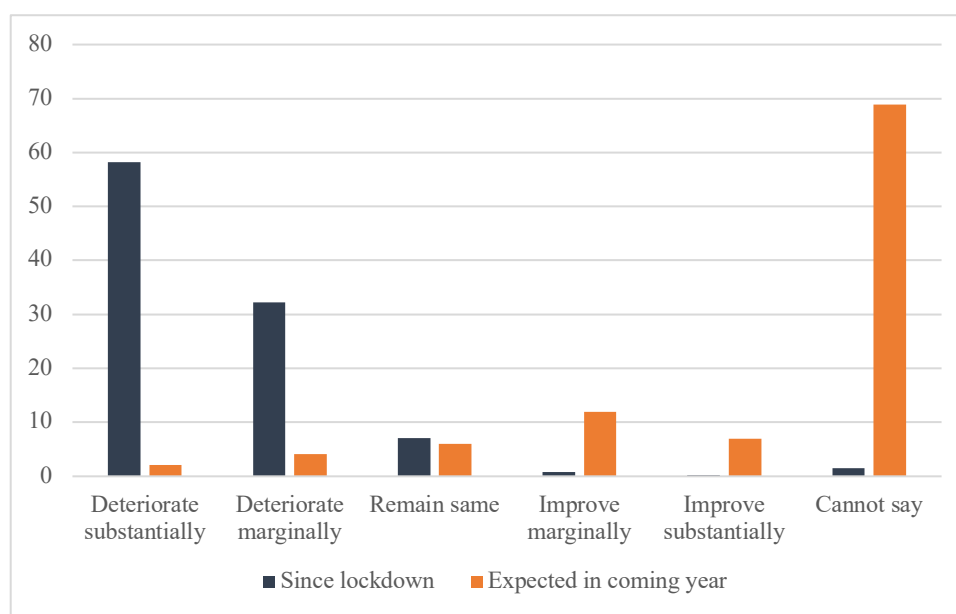
Surprisingly, when respondents were asked about their expected financial condition over the next year, 19 percent believed that their position would improve. The majority, however, were uncertain about their future prospects.

Table 2.24: Variations in financial situation and outlook over asset groups, occupation of husband and political contacts

	Low	Medium	High	Primary	Rural	Salaried	No contact	Contact
Financial situation since lockdown								
Deteriorate substantially	60.06	58.36	56.60	56.83	58.66	58.49	63.31	48.35
Deteriorate marginally	30.46	31.44	34.23	37.00	30.82	31.13	28.74	38.93
Remain same	8.05	7.37	6.26	5.73	7.53	7.55	5.17	10.94
Improve marginally	0.00	1.13	1.12	0.44	1.14	0.00	0.53	1.27
Improve substantially	0.00	0.00	0.45	0.00	0.28	0.00	0.26	0.00
Cannot say	1.44	1.70	1.34	0.00	1.56	2.83	1.99	0.51
Expectation about prospect in coming year								
Deteriorate substantially	1.72	1.42	2.91	1.32	2.41	1.89	2.52	1.27
Deteriorate marginally	2.87	3.97	5.15	5.29	3.27	5.66	4.90	2.54

Remain same	6.32	6.80	5.15	7.49	5.54	6.13	4.37	9.16
Improve marginally	12.07	13.03	10.96	12.78	11.65	11.79	6.89	21.63
Improve substantially	3.74	5.95	10.29	7.05	6.96	7.08	6.49	7.89
Cannot say	73.28	68.84	65.55	66.08	70.17	67.45	74.83	57.51

Analysis by asset group indicates that the deterioration in financial position was across asset and occupational groups (Table 2.24). A lower proportion of households with political contact, however, reported a decline in financial status; they also expected that their situation would improve over the next year.

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CHAPTER 3
HERSELF, AND HER CHILD:
HOW WORSE OFF ARE THEY?

3.1 Summary of findings

Measures to contain the transmission of COVID-19 were expected to have a major impact on food and nutrition security. The effects were anticipated to operate through the following channels (HLPE, 2020b):

(i)   Disruptions to food supply chains;

(ii)   Loss of income and livelihoods, and consequent widening of inequality;

(iii)   Break down of social protection programmes;

(iv)   Altered food environment; and,

(v)   Rising food prices.

At the start of the lockdowns in different countries, there were forecasts of unprecedented economic depression, deflation, large-scale unemployment, shrinking income, and an increase in poverty. Addressing the UN Security Council, David Beasley, head of the World Food Programme (WFP), warned that "We could be facing multiple famines of biblical proportions within a short few months" unless urgent action was taken to avoid the catastrophe (BBC, 2020). According to the WFP, the number of people in LMICs facing acute food insecurity would nearly double to 265 million by the end of 2020 (World Food Programme, 2020). Researchers opined that diet quality would be severely affected primarily through declining demand for vegetables, fruits, and animal-sourced foods. It would reduce the supply of essential micronutrients. Simultaneously, disruptions in value chains supplying perishable foods would aggravate the trend towards monotonous, nutrient-poor diets (D. Headey & Ruel, 2020). A Lancet study warned that children comprised a vulnerable section and faced the threat of increased malnutrition and wasting (Derek Headey et al., 2020). Indian studies confirmed such fears (Centre for Sustainable Enviornment, 2020; Centre for Sustainable Environment, 2020; Chicago Booth and Rustandy Centre for Social Sector Innovation, 2020; Gaon Connection and Lokniti-CSDS, 2020; ID Insight India, 2021; Kesar et al., 2020; NCAER, 2020a, 2020b, 2020c, 2021); they portrayed a bleak financial outlook, with massive unemployment and loss of livelihood leading to a dramatic reduction of household income. Food security was threatened, and most surveys reported that a large

proportion of households did not have the necessary resources to purchase essential items. Initially government social protection measures failed to reach vulnerable households, over time, however, such schemes — particularly the Public Distribution System — provided some relief.

These studies provide the alarming picture of an economy about to plunge into economic chaos, and households facing famine like situation. It is possible, however, that such studies have painted an exaggerated picture of the reality. Most of the studies have not employed a scientific sampling design, using a non-random sample of households. For instance, the Azim Premji University study combines sub-samples collected using different (non-random) sampling strategies (Centre for Sustainable Environment, 2020, pp. 8–10). Similarly, the Dalberg study uses data from Below Poverty Line households only, without explaining how the respondents are selected (Dalberg, 2020); it is also true for the DVARA study (Agrawal & Ashraf, 2020). The SWAN survey covers stranded migrant workers who called up the SWAN helpline to seek relief (Adhikari et al., 2020). As a result, it is possible that the resultant sample is selective, so that results do not apply to the population at large. Secondly, the mode of the interview may affect the response, particularly if questions are complex (Tipping et al., 2010). Although the rise in mobile density implies that coverage is not a major issue with telephonic surveys, it is still less reliable than face to face interviews (Szolnoki & Hoffmann, 2013). This is because telephonic surveys may create measurement errors due to social desirability bias (Holbrook et al., 2003), especially if respondents want to finish off the interview quickly; other mechanisms leading to response bias in telephonic surveys include pressuring respondents to respond through verbal introductory statements to the survey and not offering a Don't Know option (Graeff, 2002).

Such biases may be aggravated by the leading nature of questions resulting in biased responses. An example of this danger is the question "For how long can your household continue without borrowing or getting any help in cash or kind from anyone?" (Chicago Booth and Rustandy Centre for Social Sector Innovation, 2020). It is also possible that households —especially during times of economic crisis— may choose responses in a manner that makes them potentially eligible for government welfare schemes.

These studies have provided a real time analysis of the impact of lockdown, thereby drawing the attention of policy makers to a potential crisis in the making. However, to obtain a more

accurate picture of the impact of COVID-19 and the associated lockdown, a more deliberate study based on a random population obtained through probability sampling is necessary. The current study has the advantage that it uses an existing database of dietary practices of a randomly selected population before the onset of the pandemic. This survey, undertaken between January to March 2020, serves as a baseline survey against which we can compare data from an end line survey. The duration of the gap between the two surveys implies that respondents will be unable to recall their initial response, and deliberately would not give a misleading picture of their current situation. In other words, if the bias is roughly the same in both periods ($\varepsilon_{t+1} \approx \varepsilon_t$), the difference [$\Delta C = (C_{t+1} - \varepsilon_{t+1}) - (C_t - \varepsilon_t)$] will be unbiased.

3.1.1 How worse were the mothers?

Our analysis reveals that the Mean Dietary Score (DS) of mothers has decreased from 5.65 to 5.20; simultaneously, the percentage of mothers complying with Minimum Dietary Diversity (MDD) norms has declined by about 11 percentage-points from 94 percent. Analysis by sub-groups reveal that both DS and MDD have declined most among households with low asset holdings, and among H-FCs (Hindu-Forward Castes) and H-OBCs (Hindu-Other Backward castes); compliance with MDD norms has also declined substantially among women with no education. Analysis by specific food groups reveals that increased consumption of cereals and pulses substituted for declining consumption of non-vegetarian items, dark green leafy vegetables, and other fruits and nuts. Ownership of land and milch animals were found to be important cushioning factors.

3.1.2 How worse were the children?

The baseline survey revealed that the nutritional status of children was low, with only one out of three complying with MDD norms. The average number of food groups consumed is also low (2.89). Both have improved marginally over the study period. Cereals, pulses and milk, and dairy products are the main items consumed by children. The increase in dietary intake, however, is possibly due to the children growing older and being weaning away from breast milk. Considering age group-wise changes in DS and MDD, we find that both have declined among children aged 25-36 months.

3.1.3 Access to safety nets

Access of households to social security schemes was high. About 92 percent of households obtained free rations, while 81 percent benefitted from cash transfer under the *Jan Dhan* scheme. About half of the eligible households received subsidised Liquefied Petroleum Gas (LPG) cylinders under the *Ujjwala Yojana*, and food items or cash transfers under the Mid-day meal scheme. On an average, respondents benefitted from four of the five schemes whose coverage was studied. The quantum of coverage under the schemes was also adequate; for instance, households received two subsidised LPG cylinders on an average, while free rations were obtained for about five months.

3.1.4 Welfare changes and future outlook

Using pulse consumption, and the time taken to draw rations, we estimated the welfare change of mothers and children. Both were found to have increased. Using Mahatma Gandhi National Rural Employment Guarantee programme (MNREGA) daily wages, the welfare change was converted to money terms. The welfare increase in money terms is not very impressive—Rs.126.30 (mothers) and Rs.429.10 (children). Families with low asset scores have gained the least.

Although 90 percent of households reported a decline in financial status, about one in five respondents were optimistic that their situation will improve over the next year. The majority of households, however, were uncertain.

3.1.5 Clientilism at work

Contacts with the local *Pradhan*, or with the local party in power played an important role in determining access to social safety measures. For instance, households with connections to the *Pradhan* were able to access 4.04 schemes on an average, in contrast to an average of 3.39 for other households. This is expected, given that state elections were expected in October-November. A lower proportion of households with political contacts reported a decline in financial fortunes, vis-à-vis families without such contacts; a higher proportion of respondents with political contacts, on the other hand, expected an improvement in financial status in the near future.

3.2 Discussion

Our study reveals that, although dietary diversity did worsen, a major catastrophe did not occur among the rural population in Bihar. The lockdown was found to have worsened the dietary practices of women of reproductive age. The consumption basket has changed with the substitution of cereals and potatoes, and nuts and pulses for non-vegetarian items, dark green leafy vegetables, and other fruits and vegetables. While this shift has health implications, it may reflect seasonal changes, as dark green leafy vegetables become scarce during the summer months.

In the case of children, lockdown seems to have had less of a shock. Particularly children 7-12 months report a significant improvement with respect to mean DS and compliance with MDD norms. This result may be partly explained by the substitution of breast milk by complementary food as there is a gap of several months between our survey and re-survey periods. We should also note that children require little food implying that they are not major competitors for food except in periods of famines. For example, during the first phase of the survey, we observed that children were often given a *chapatti* (unleavened flatbread), which they munched away contently for one-two hours. However, consumption of children aged 19-36 months, particularly 23-36 months, was found to have been adversely affected. This has the potential to increase the incidence of wasting for a short period. Secondly, both the mean DS and proportion of children complying with MDD norms at all age groups is very low, and needs to be improved substantially. Finally, the consumption of specific food groups like eggs, fish and meat, milk and dairy products, and dark green leafy vegetables have either declined or is negligible.

The change in dietary practices of mothers and the poor dietary quality of children have serious health consequences. The dietary practices followed by mothers and children during lockdown are likely to lead to a deficiency in micronutrients like iron, iodine, zinc, Vitamin A, Vitamin D, etc. Such deficiencies impair body growth and intellectual development, cause prenatal complications, and increase the risk of mortality and morbidity. They also increase chances of cardiovascular disease, diabetes, obesity, stroke, cancer, atherosclerosis, osteoporosis, macular degeneration, while weakening the immunity system. This has long term health consequences for morbidity and mortality, affects human capital formation by lowering learning outcomes and retention, and further affects long term growth and development. In the case of children surviving at below subsistence levels even on normal

days, even a minor shock (in the form of reduced intake of essential micronutrients) can tip a child into a 'clinically' deprived state (Pandey, 2020).

Despite some concerning findings, our study indicates that the overall effect of lockdown on dietary practices of women and children in rural Bihar, while serious, was not as disastrous as portrayed in similar studies (Agrawal & Ashraf, 2020; Centre for Sustainable Enviornment, 2020; Centre for Sustainable Environment, 2020; Chicago Booth and Rustandy Centre for Social Sector Innovation, 2020; Dalberg, 2020; Gaon Connection and Lokniti-CSDS, 2020; ID Insight India, 2021). The main reason is the ability of the state governments to use the PDS to successfully provide a buffer to falling consumption levels. Although, coverage of health and nutrition schemes is poor in Bihar (Avula et al., 2020), as in other countries, the PDS in Bihar rose to the occasion and was able to ensure a steady supply of staples to households. The fact that 2020 was Election year may have also played a role in motivating the Bihar government to ensure adequate coverage under the different social protection measures. As a result, the food basket may have narrowed significantly—with possible micronutrient deficiencies, and consequent long term health consequences—but famine and starvation-related deaths- have been averted, as feared. Secondly, agricultural activities showed remarkable resilience in most countries, including India (Chand, 2020), so that the shock on rural households was less than what was expected (Gupta & Kishore, 2020). Fears that the supply chain disruptions would have a major consumption shock (Gillespie & Whiteside, 2020; Raghunathan, 2020) did not materialise as the rural households were located at the source of production. For instance, our analysis reveals that possession of milch animals and land had some cushioning effect, reducing the adverse effect of lockdown on the consumption.

3.3 Challenges for policy makers

Ensuring food security is a major objective of policy making during pandemics (HLPE, 2020a); at the same time, given the higher chances of morbidity and mortality among people with poor nutritional status, food security is also a means to control the transmission of pandemics (Anema et al., 2009; United Nations, 2020).

It has been pointed out that food security rests on the three pillars of **availability** of food, providing **access** of the population to food supplies through adequate resources and markets, and **utilisation** of the available food (Pan American Health Organization, 2020). These

principles have been recognised, and embedded in early attempts to protect the food security of the general population and vulnerable section (DeWitte, 2018; Hatcher, 1977; Moote & Moote, 2004; Morton, 1938). For instance, pandemics, like the Black Death, created labour shortages, leading to a decline in cultivated land (Trevalyn, 1942). Export of food grains led to shortages, creating black markets, speculation, and inflation in food grain prices. In response, governments relied on massive import of food grains from surplus producing areas, and the distribution of food grains at subsidised rates through the market system (Post, 1976). Such measures met with varying degrees of success in different countries.

Subsequent experience with safeguarding food security during pandemics and natural disasters also provide useful lessons to policy makers. The core of social safety measures is that they have to be based on a combination of short and long term measures. Steps to guarantee availability, access and utilisation cannot be taken after the crisis has started, but has to be planned well ahead of possible emergencies (FAO and CELAC, 2020). The objectives of the short term relief plan should be:

  (i)   Making sure that coverage of nutritional support programmes targeting women and children are not disturbed;

 (ii)   Promoting healthy dietary practices;

(iii)   Making sure that school-based nutrition programmes are not affected;

(iv)   Introducing supplementary social protection measures to facilitate access of vulnerable sections to food and income;

 (v)   Establishing mechanisms to guarantee the supply of inputs and capital to the agricultural sector; and,

(vi)   Creating a transport and logistics system for the distribution of food and essential items.

The implementation of the short term relief measures requires close co-ordination between national, regional, and local governments, with the local governments being the key actor in implementing the relief measures (Pan American Health Organization, 2020).

In India, however, the lockdown was announced without giving adequate notice and planning. There was also considerable scope to improve the co-ordination between central and state governments:

> "In India's fight against the pandemic, the Centre-states relations have witnessed some frictions regarding vital decisions in its initial period. Political scuffle over key

issues like declaration of the nationwide lockdown without the consultation of the states, the irregular supply of essential medical equipment, the plight of the migrant workers and the tackling of the crisis by few opposition ruled states, came to the forefront" (Ghosh, 2020).

No attempt was made to identify vulnerable groups,[1] and plan measures beforehand to safeguard their access to livelihoods and food. The overlooking of migrant workers, for instance, led to a humanitarian crisis (Adhikari et al., 2020), besides spreading the pandemic to eastern and north-eastern states (Husain & Kothari, 2021). Similarly, the reforms in labour laws implemented in several states increased the economic vulnerability of urban workers, threatening their food security.

A major reason why a disaster of the magnitude predicted by international agencies could be avoided in India was the resilience of the agricultural sector (Chand, 2020; Gupta & Kishore, 2020). The bumper crops of the last few years piled up with Food Corporation of India were offloaded through the Public Distribution System successfully to meet the calorie needs of the population. However, such efforts met the demand for cereals and pulses only and aggravated a diet that was already imbalanced. Cash transfer schemes, in contrast, have the advantage that they enable consumers to choose an optimal commodity bundle. Although the transfer of cash to *Jan Dhan* accounts was high, only 50 percent of eligible beneficiaries received the promised Rs. 1,500. Other cash transfer schemes had a low coverage. Similarly, supplementary nutrition support schemes (like the Mid-day meal programme) faltered during the lockdown. Not surprisingly, our survey found both women and children to have an imbalanced diet; further, an increase in micronutrient deficiency among adult women was also observed.

Another key component of a long term relief plan is investing in agriculture to increase its resilience:

> "Increased investment in agricultural research and development would support enhanced food security. Advanced technologies need to be adopted globally in each region to deliver local food production capability that can provide secure sources of food in future pandemics. This will require public and private policies that support

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[1]Typically, vulnerable groups constitute households with irregular or limited income, families with low reserves of cash or food, families from groups that are socially disadvantaged because of either health-related stigma or because of caste, residents of isolated areas, aged individuals, and individuals with poor health(Pan American Health Organization, 2020).

regional investment in food production infrastructure and acceptance of new technologies" (Henry, 2020, p. 1096).

Although the government declared agri-food production and marketing as essential commodities— exempting restrictions on the movement of farm workers, farm machinery, and farm produce—and kept agricultural markets open (Chand, 2020), implementation of these decisions at the ground level was not smooth:

> "vendors of fresh produce as well as transporters have faced considerable difficulties in securing movement passes and permissions for their operations. Several (vendors) are unaware of the rules. Overzealous law enforcers have focussed on enforcing the lockdown, rather than maintaining food supply chains. There have also been worrying reports of social and religious discrimination in many cities – barring vendors belonging to certain minority communities from selling in some neighbourhoods, or barring entry of people from some ethnic background in certain supermarkets" (Narayananan & Saha, 2020).

Subsequently, in the last Union Budget for the financial year 2021-22, allocations to the Ministry of Agriculture were reduced from Rs. 14,276.24 million (Budget estimates for 2020-21) to Rs. 13,153.19 million.

Welfare measures, based on a combination of cash transfer and food provisioning through the Public Distribution System, were introduced. Our study, in consonance with other studies (Dalberg, 2020; ID Insight et al., 2020a, 2020b), shows that some of these measures had a good coverage. However, such measures were introduced *after* the crisis, and took time to take off; hence, their cushioning effect operated after a lag. It is not surprising, therefore, that early studies found households facing a bleak future or even an imminent disaster (Acharya, 2020; Centre for Sustainable Enviornment, 2020; Centre for Sustainable Environment, 2020; Gaon Connection and Lokniti-CSDS, 2020; NCAER, 2020a, 2020b). Apart from the short term food deficiency and economic crisis, our analysis identified specific challenges facing the policy makers.

Firstly, consumption of non-vegetarian diet is very low among both mothers and children, which potentially results in protein deficiency. Low consumption of non-vegetarian diet is observed in both the pre-lockdown and lockdown period, implying that it is a persistent feature of their diet. Secondly, among mothers, fluctuations in dietary diversity are observed,

which may partly reflect seasonal changes associated with the availability of food items. Proper substitution between food groups is necessary and should be addressed in, for instance, awareness programmes like the Health and Nutrition Strategy of JEEViKA. Thirdly, the dietary intake of children is very poor. Few food groups are consumed; further, consumption of eggs, and milk and dairy products is negligible. These issues will hinder India's progress towards meeting the nutritional challenges of the *Poshan Abhiyan* and attaining the Sustainable Development Goal of eliminating malnutrition by 2030.

Finally, while coverage under PDS, and *Jan Dhan* was satisfactory, coverage under the *Pradhan Mantri Ujjwala* scheme, Mid-day meal scheme, cash transfer to ration holders was not adequate, and needs to be improved. Moreover, coverage was affected by clientelism—households with political contacts were better able to access social safety measures. This question assumes significance given that 2020 was an election year in Bihar. In such situations, political parties have two alternatives. They can either choose to distribute the benefits of welfare programmes efficiently and equitably, thereby signalling their quality to voters; alternately, they can "use aid to buy relief and votes …. In developing countries, where institutions overseeing public spending tend to be weaker, incumbents face more favorable conditions to allocate strategically aid in order to increase the odds of staying in power" (Gallego, 2018, p. 73). In Bihar, unfortunately, the preference seems to be for the second alternative. This goes against the concept of social protection and inclusiveness, and attempts must be made to rise above narrow political gains and sectarianism.

3.4 Final words

Our study has some limitations. As the first phase survey was planned before COVID-19 had emerged in China we had not collected information on consumption levels so that we can calculate actual calorie intake. The second phase survey had to be designed to ensure consistency with the first phase, and the responses from the first phase were used. The difficulties in obtaining detailed information about consumption levels of different food groups was another reason for not collecting figures for consumption levels. As a result, we studied dietary practices, rather than consumption levels. Analysing the impact of lockdown on consumption levels, therefore, remains an important challenge before researchers. Secondly, our findings about the contraction of the consumption bundle may be partly explained in terms of the seasonal availability of food groups. This is, however, a hypothesis

based on discussion with residents of Bihar; it has to be investigated more thoroughly. Thirdly, if the hypothesis does turn out to be true, we need to examine the health consequences of the seasonal deficit in micronutrients.

Nonetheless, our study made an attempt to find out some of the potential correlates of changes in dietary practices during pandemic situations from a scientifically selected sample of the population from the resource-constrained state of Bihar. The study contributed to the literature on the effect of pandemics on the vulnerability of women and children in an underdeveloped region of a low and middle income country.

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