Does Crop Insurance Promote Nutrition and Good Health Among Women and Children in the Agrarian Households of India?

Reshmi Sengupta and Debasis Rooj

1 Introduction

The persisting challenge of undernutrition in India remains a major hindrance in achieving Sustainable Development Goals (SDG) directly related to hunger, food, nutrition security (FNS), and good health. Notwithstanding wide acknowledgment on the scale of the challenges and a large body of the literature on the determinants of nutritional and health outcomes, gaps remain in understanding and explaining the pathways through which these outcomes are shaped in poor and rural communities. Moreover, the role and effectiveness of social safety nets in agriculture to improve the livelihood of the rural population remains to be assessed in specific contexts of vulnerabilities.

The agricultural sector in India is vital in providing food security and employment opportunities to the country's 1.3 billion population. According to the Periodic Labour Force Survey (2017–18), 55% of rural males and 73.2% of rural females are engaged in agricultural activities. In addition, the Reserve Bank of India (RBI) database on the Indian economy shows that agriculture accounts for nearly 13% of the country's Gross Value Added (GVA) for the year 2018–19 (at constant prices). Given the importance of the agricultural sector, the Government of India is continuously taking several initiatives to support the farmers and provide food security through different agricultural policies and programmes, such as farm loan waivers, crop insurance (CI), input subsidy, maximum support price, and public distribution system, among others.

R. Sengupta (✉) · D. Rooj
Associate Professor, Department of Economics, FLAME University, Pune, Maharashtra, India
e-mail: reshmi.sengupta@flame.edu.in

D. Rooj
e-mail: debasis.rooj@flame.edu.in

S. M. Dev et al. (eds.), *Achieving Zero Hunger in India*, India Studies in Business and Economics, https://doi.org/10.1007/978-981-99-4413-2_8

One of the major challenges in Indian agriculture is inadequate irrigation support and its heavy dependence on monsoon rains and heterogenous rainfall patterns. Variations in rainfall have increased over time due to climate change. There is enough evidence that climatic shocks lead to crop failure and increase income and food insecurity, leading to sustained poverty, especially among rural farming households (Barnwal & Kotwani, 2013; Birthal et al., 2014). Natural disasters, uncertainties in yields due to poor quality seeds, pests, diseases, and inefficient farming practices also lead to crop failure. The majority of the farming community is poor. They have inadequate access to finance and agricultural resources, making them even more vulnerable to these uncertainties.

Crop insurance (CI) can play a critical role not only in mitigating the major crop production-related challenges a farming household may face during a particular cropping season but may also reduce the cost of risk-bearing and stabilize farmer's income over time (He et al., 2019; Nair, 2010). Weather-related shocks and stresses in agricultural production can affect small-scale and large-scale enterprises in rural areas (Davies et al., 2008). CI is an essential policy response to risk and vulnerability in the agriculture sector. The scheme's main objective is to protect farmers against the crop losses suffered from natural calamities, such as drought, flood, hailstorm, cyclones, pests, diseases, etc. It is available to all farmers—loanee and non-loanee—irrespective of the size of the holding. The basic concept of insurance is to spread the risk of loss over many years and across a broad population base. During years of suffering loss, farmers can collect a large insurance payout, thus protecting them from insolvency or livelihood insecurity (Patt et al., 2010). Insurance can play a more significant role in absorbing risks, especially in developing countries where climatic impacts are critical to agricultural production (Panda, 2013). The insurance guarantee against the loan allows high-risk and low-income farmers to obtain credit to invest in seeds and other inputs for higher-yielding crops (Leary et al., 2007). Insurance can also free up assets to ensure enhanced consumption of merit goods like health and education. After a risk is realized (ex post), insurance payments can help families maintain their economic assets, ensure long-term financial viability, and escape the inter-generational poverty trap. An appropriate amount of timely and hassle-free claim disbursement can alleviate farmers' distress and positively impact income generation, thereby enabling them to achieve avenues for human resource development. CI as a shock absorber can help the agricultural households in maintaining a threshold amount of consumption and thus ensure sustainable standard of living.

However, in India, a large section of the farmers' population lacks proper insurance services. Lack of access to adequate insurance services may lead to an inefficient use of resources or negative coping mechanisms during times of crisis, such as choosing low-risk or low-return crops and inadequate production methods. It may also affect the inter-temporal resource allocation, such as reducing food consumption or the use of healthcare services, or the withdrawal of children from school, which may eventually erode their future-earning capacity, aggravating their vulnerability and perpetuating the vicious cycle of poverty (FAO, 2015).

Therefore, we argue that crop insurance has a vital role in households' demand for health services, potentially protecting the woman and her newborn's health and the entire family's welfare. This idea can be supported by 'Health' being a fundamental commodity, and consumers undertake health production by combining several inputs, including healthcare services (Dowie, 1975). Crop failure reduces agricultural yields, which causes a reduction in real income for the rural farming population in India. This, in turn, can reduce investment in health-improving goods (Burgess et al., 2014). Further, a household without crop insurance will not get the necessary income protection. It may also compel women to work during adverse events of income loss. Eventually, discouraging these women from seeking essential healthcare (antenatal and postnatal care) during their pregnancy and childbirth, thereby adversely affecting their health.

Although there is a vast body of literature that focuses on the demand for CI and its impact on input use in the presence of asymmetric information in the CI market (Möhring et al., 2020; Smith & Goodwin, 1996), some other studies (Ahsan et al., 1982; Chambers & Quiggin, 2002; Hau, 2006; Van Ittersum, 2015) have used crop yield as a measure of food security. However, these studies do not focus their analysis on identifying the effect of CI on the welfare aspects (Cole et al., 2017).

Households in India can differ in their access to market-supplied healthcare services and their ability to produce health due to several socio-economic and demographic differentials. The same is true for crop insurance. A visual depiction of the district-wise distribution of the crop insurance adoption and health-seeking practices by the women of their reproductive age shows that in general, districts with a higher proportion of crop insurance are also the districts where women are seeking more healthcare, such as receiving antenatal care in their first trimester opting for institutional delivery and postnatal checkup (Figs. 1, 2, 3 and 4).

Therefore, in this study, we analyse the effect of crop insurance on women's health-seeking behaviour in their reproductive age (15–49 years) and children's nutritional outcomes. In particular, we examine whether crop insurance improves health-seeking practices such as antenatal care, intuitional delivery, and postnatal care. We argue that crop insurance protects the farmers during times of distress. Higher adoption of crop insurance also indicates a higher level of knowledge and creates a coping mechanism during financial distress. Furthermore, through a primary survey and analysis, we could also provide positive evidence of the government's income support programme on households', women's, and children's health-seeking behaviour and nutritional support. Thus we contribute to the literature by looking at the extended role of crop insurance and the government's income support programme in the welfare of rural households.

We contribute to the literature in several ways. First, we are the first to examine the role of crop insurance on health-seeking practices and nutritional outcomes of the vulnerable populations, pregnant women and children, in India. We use several measures of health-seeking practices, including prenatal and postnatal healthcare variables. We also use nutritional measures for children. We find that crop insurance has substantial implications for women's healthcare-seeking practices in their reproductive age. Therefore, this paper makes an essential contribution by using

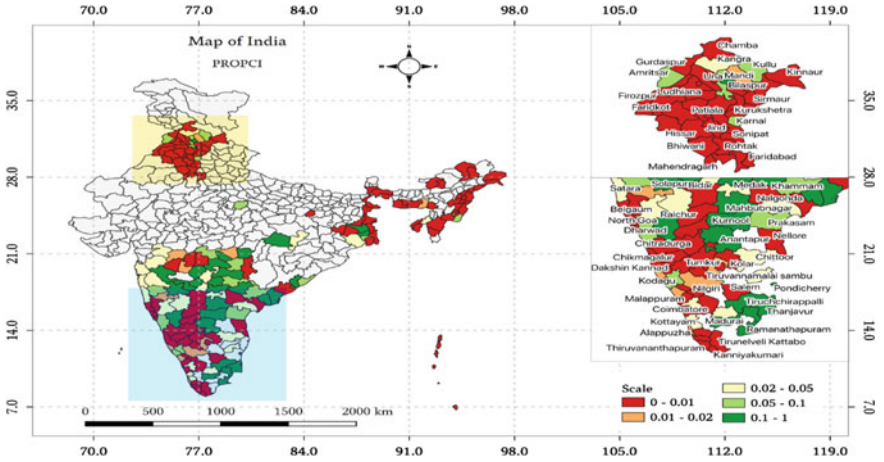

Fig. 1 District-wise distribution of crop insurance. *Source* Authors' own calculations; *Notes* The data on crop insurance is available from the NSSO 70th round (January–December 2013) survey on 'Situation Assessment Survey of Agricultural Households, January–December 2013'

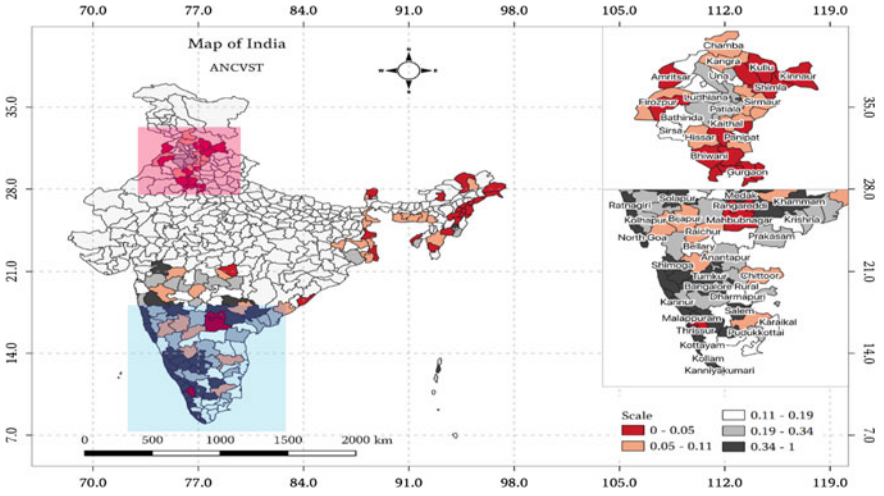

Fig. 2 District-wise distribution of ANC visits. *Source* Authors' own calculations; *Notes* The data on ANC visits is available from the DLHS-4 data set and are for the women in their reproductive age (15–49 years) who were pregnant and/or gave birth during the survey period

district-level data on crop insurance adoption paired with individual-level data on health outcomes to assess the role of crop insurance on the health-seeking behaviour of women in their reproductive age.

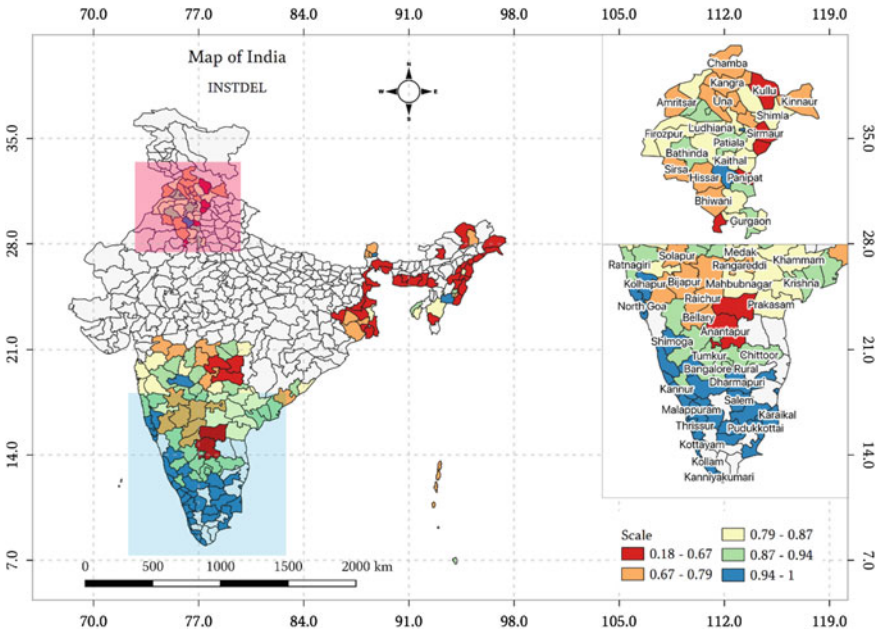

Fig. 3 District-wise distribution of institutional delivery. *Source* Authors' own calculations; *Notes* The data on ANC visits is available from the DLHS-4 data set and are for the women in their reproductive age (15–49 years) who were pregnant and/or gave birth during the survey period

In addition, we also conduct a primary survey to examine how the government's income support programme can impact the health-seeking practices of households, women, and children, and their food security.

2 Data

We use both secondary and primary data analysis to ascertain the effect of crop insurance adoption on women's health-seeking behaviour during pregnancy and household and child nutritional statuses.

2.1 Secondary Data

To conduct the secondary data analysis, we combine data from NSSO (70th round) and District Level Household and Facility Survey (DLHS-4) to empirically analyse

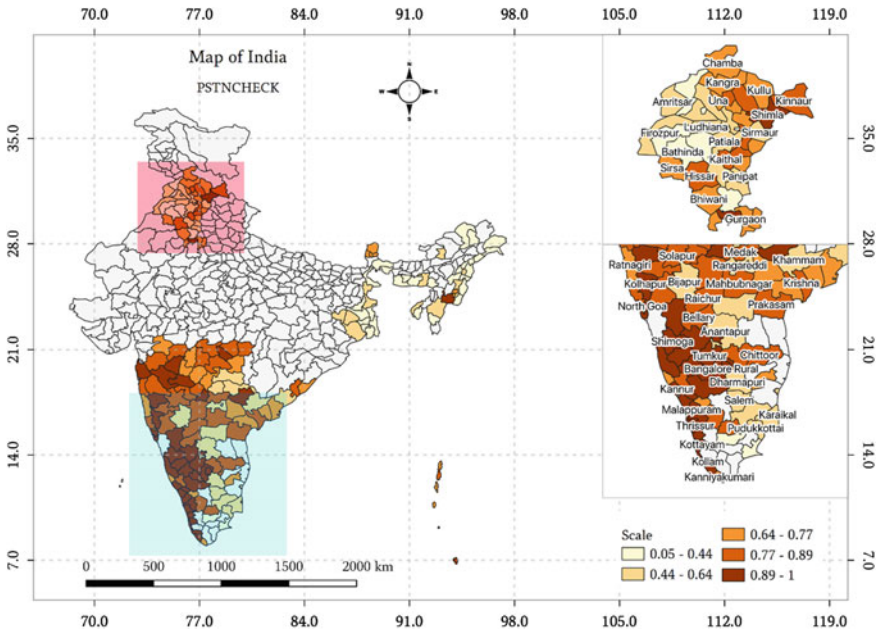

Fig. 4 District-wise distribution of postnatal checkup. *Source* Authors' own calculations; *Notes* The data on ANC visits is available from the DLHS-4 data set and are for the women in their reproductive age (15–49 years) who were pregnant and/or gave birth during the survey period

the effect of crop insurance on women's healthcare-seeking practices and child nutrition. The NSSO 70th round (January–December 2013) survey on 'Situation Assessment Survey of Agricultural Households, January–December 2013' has detailed information on households' financial assets. On the other hand, DLHS-4 was conducted during 2012–13.[1] However, since we are using two separate datasets from two different surveys, we cannot match information at the individual level. The only common identifier between the datasets is the match at the district level. We use crop insurance information from the NSSO data aggregated at the district level, and women healthcare use information and child nutritional status from DLHS-4 at the individual level. Finally, we merge the two datasets using district identifiers to obtain comprehensive data containing individuals matched across different districts giving us a complex multilevel structure.

[1] Both these databases have similar rural and urban samples with NSSO having 56% of samples from rural areas and 44% from urban areas. On the other hand, for DLHS there are 58 and 42, respectively.

2.1.1 Variables

Using DLHS-4 and NSSO 70th round of data, we define our variables for the secondary data analysis. The outcome variables of interest are women's health-seeking indicators, defined only for women in their reproductive age (15–49 years) who were pregnant and/or gave birth during the survey period. Child nutritional status is defined for children under 2 years old.

The outcome variables on women's health-seeking behaviours are defined based on whether pregnant women's sought prenatal care, institutional delivery, and postnatal care. We use various indicators of antenatal care, such as whether a woman sought antenatal care (ANC), whether ANC was received during the first or second trimester (ANCFTRIM, ANCSTRIM), whether the woman received at least 4 or 8 ANC (AT4ANC, AT8ANC) if a woman had received iron and folic acid supplements (IFA), whether taken tetanus toxoid injection and at least three injections (TT, AT3TTINJ), if the woman went for any treatment due to health problem during pregnancy (TRTHP), if the woman sought delivery in an institutional setting and a private healthcare facility (INSTDEL, PVTINST), and finally, whether the woman sought postnatal care in a private healthcare set-up (PNATALPVT). To measure the nutritional status of children weight-for-age z-score is used. A child is defined as being severely or moderately underweight (UNDERWT) if the weight-for-age z-score is below minus 2 (−2.0) standard deviations (SD) below the mean on the WHO Child Growth Standards, and as being severely underweight (SEVUNDERWT) if the weight-for-age z-score is below minus 3 (−3.0) standard deviations (SD) below the mean on the WHO Child Growth Standards. A detailed description of these outcome variables is presented in Table 1.

Crop insurance is the independent variable of interest in women's health-seeking behaviour analysis and child nutritional analysis. To define the primary independent variable, we consider whether rural households had crop insurance either because of crop insurance linked with an agricultural loan or crop insurance bought voluntarily. Therefore, we define CINS = 1 if a household has crop insurance and 0 if no crop insurance. Given the nature of our data, we converted crop insurance information into district-level constructs for our empirical analysis. We define PDCI as the proportion of households in a district having crop insurance during 2012–13.

Following the literature (Woldemicael & Tenkorang, 2010; Bhuiya et al., 2018), we include several women, household, and district-level indicators in analysing women's healthcare use. For instance, we include women's age in years (MAGE), women's level of education (below primary, primary, middle years of schooling, secondary, higher secondary, college education, and above. Illiterate being the reference group), women's employment status (EMP), birth order (1, 2, and 3 or more). Further, we include whether the women received financial assistance through Janani Suraksha Yojana (JSY). A variable (DIAGCHRONIC) captured whether any household member sought a diagnosis for a chronic illness. This variable will help us understand the health-seeking practices of the household. Next, we include the religion of the household head (Hindu and Muslim) and caste (scheduled tribes, scheduled caste, and other backward classes). We capture the economic status of the household

Table 1 Variable definitions and descriptive statistics (secondary data) outcome variables

Outcome variables	Definitions	Mean	SD
Women (15–49 years of age)			
ANC	=1 if a woman received any antenatal care, else 0	0.838	0.368
ANCFITRIM	=1 if a woman received ANC during the first trimester, else 0	0.593	0.491
ANCSTRIM	=1 if a woman received ANC during the second trimester, else 0	0.125	0.331
AT4ANC	=1 if a woman received at least 4 ANC visits, else 0	0.504	0.5
AT8ANC	=1 if a woman received at least 8 ANC visits, else 0	0.149	0.356
IFA	=1 if a woman received IFA bottle or tablet, else 0	0.651	0.477
TT	=1 if received TT injection, else 0	0.799	0.4
AT3TTINJ	=1 if received at least 3 TT injections, else 0	0.173	0.378
TRTDP	=1 if any treatment for health problem during last pregnancy, else 0	0.214	0.41
INSTDEL	=1 if institutional delivery, else 0	0.791	0.407
PVTINST	=1 if delivery in private institution, else 0	0.281	0.45
PNATALPVT	=1 if a woman sought post-natal care in a private institution, 0 otherwise	0.22	0.414
No. of observations		35,226	
Children (0–2 years of age)			
UNDERWT	If the weight-for-age z-score is below minus 2 (−2.0) standard deviations (SD) below the mean on the WHO Child Growth Standards	0.181	0.385
SEVUNDERWT	If the weight-for-age z-score is below minus 3 (−3.0) standard deviations (SD) below the mean on the WHO Child Growth Standards	0.054	0.228
No. of observations		12,470	

Source Authors' own definitions and calculations; *Notes* All the outcome variables are obtained from the DLHS-4 data set for women in their reproductive age (15–49 years) who were pregnant and/or gave birth during the survey period and for children in the age group of 0–2 years

through several indicators. We include below-poverty line (BPL) cards as a proxy for below or above-poverty-line households.

Further, we include ownership of pucca house (PUCCA), use of LPG and electricity as a cooking fuel (FUEL), having electricity (ELEC), and ownership of land (OWNSLAND) as other measures of the economic status of the households. Finally, we also include a variable that captures the wealth index, divided into quintiles, computed based on different asset information from the DLHS-4 survey. Households were categorized from the poorest to the wealthiest groups based on the quintiles, where quintile five represents the wealthiest group (HHWEALTHQ). Moreover, we include FAMSZ as an indicator of the size of the household and the husband's level of education (below primary and primary, middle years of schooling, secondary, higher secondary, college education, and above) as additional control variables in our analysis.

We also include several district-level indicators as well. For instance, PROPHFAR indicates the district-wise proportion of villages with distance to health facility being far away. Moreover, we define a variable DISTBANK: the number of bank branches to capture the financial access.[2]

In the child nutritional status analysis, we use child and household-related covariates from the DLHS-4 CAB data, such as child age in months (CAGE), child gender (CFEMALE), highest education of household members (HHHIGHESTEDU), the religion of household head (HINDU, MUSLIM), and size of the household (FAMSZ). We define a few household living condition indicators following WHO standards; as improved drinking water (IMPWATER); improved sanitation (IMPSANI), modern fuels (FUEL), including LPG, electricity, and biogas; whether the household owns a pucca house (PUCCA), whether the household has improved and clean sources of lightning (ELEC), such as electricity and solar; whether owns the house (OWNER), whether holds land (OWNSLAND); and household wealth status in quintiles (HHWEALTHQ). Finally, we add district-level information on the number of bank branches (DISTBANK). Table 2 provides a detailed description of all the variables used in both analyses.

The data for NSSO covered 634 districts from all the states in India. However, DLHS-4 was conducted in 275 districts. After combining these two databases, restricting our sample to the rural population, and deleting missing values on key indicators, our final women data sample consists of 35,226 observations from 198 districts. The child data sample consists of 12,470 observations from 197 districts.

2.2 Primary Data

We also conducted a pilot study in two districts of Bihar, Rohtas (199 households) and Nawada (201 households). The choice of the districts is based on specific criteria. We

[2] This data is obtained from RBI website and we consider the district level branches for the month of December 2012.

Table 2 Variable definitions and descriptive statistics (secondary data) independent variables

Variables	Definition	Mean	Std.
PDCI	District level proportion of crop insurance	0.04	0.08
Women (15–49 years of age)			
AGE	Women's age in years (15–49 years)	26.61	5.07
MPRIMEDUC	=1 if women had below primary and primary education, else 0	0.18	0.38
MMIDEDUC	=1 if women completed middle school education, else 0	0.19	0.39
MSECEDUC	=1 if women completed secondary education, else 0	0.20	0.40
MHSECEDUC	=1 if women completed higher secondary education, else 0	0.12	0.32
MCOLPEDUC	=1 if women completed college education or above, else 0	0.07	0.26
BO	Birth Order (0–12)	2.12	1.24
EMP	=1 if women is currently employed, else 0	0.19	0.39
JSY	=1 if received financial assistance under JSY, else 0	0.21	0.41
DIAGCHRONIC	=1 if any household member sought diagnosis for chronic illnesses, else 0	0.23	0.42
HINDU	=1 if the religion of the household head is Hindu, else 0	0.70	0.46
MUSLIM	=1 if religion of the household head is Muslim, else 0	0.06	0.23
SC	=1 if household head belongs to SC, else 0	0.28	0.45
ST	=1 if household head belongs to ST, else 0	0.21	0.41
OBC	=1 if household head belongs to OBS, else 0	0.34	0.47
BPL	=1 if the household is Below Poverty Line, else 0	0.39	0.49
PUCCA	=1 if the household has a pucca house, else 0	0.35	0.46
FUEL	=1 if the household uses LPG and Electricity as cooking fuel, else 0	0.25	0.43
ELEC	=1 if the household has electricity, else 0	0.99	0.11
OWNSLAND	=1 if the household owns land, else 0	0.49	0.50
HWEALTHQ	Household wealth quintile, 1 = poorest, and 5 = wealthiest	3.18	1.36
FAMSZ	Family Size	6.26	2.47
HPRIMEDUC	=1 if husband had below primary and primary education, else 0	0.17	0.37
HMIDEDUC	=1 if husband completed middle school education, else 0	0.19	0.393
HSECEDUC	=1 if husband completed secondary education, else 0	0.21	0.41
HHSECEDUC	=1 if husband completed higher secondary education, else 0	0.14	0.35
HCOLPEDUC	=1 if husband completed college education or above, else 0	0.09	0.29
PROPHFFAR	The proportion of health institutions far away from home	0.04	0.09
DISTBANK	District proportion of bank branches	180.9	190

(continued)

Table 2 (continued)

Variables	Definition	Mean	Std.
No. of observations		35,226	
Children (0–2 years of age)			
CAGE	Child age in months	17.24	7.134
CFEMALE	=1 if gender of the child is female, 0 otherwise	0.48	0.49
HHHIGHESTEDU	Highest education of household members	3.96	1.43
IMPWATER	=1 if improved drinking water, else 0	0.89	0.31
IMPSANI	=1 if improved sanitation, 0 otherwise	0.48	0.49
OWNER	=1 if the household owns the house, else 0	0.94	0.24
No. of observations		12,470	

Source Authors' own definitions and calculations; *Notes* CAGE—Min: 0 and Max: 24 months; HHHIGHESTEDU—Min: 1 and Max: 6;

aimed to collect data from different regions of Bihar to get variations in crop insurance adoptions. Hence, we selected Nawada and Rohtas. Nawada is a drought-prone area of Bihar, while Rohtas is one of the fertile districts of the State. Crop insurance uptake is likely to vary between drought-prone and fertile regions of the States, ensuring variations in the sample. To generate a random sample, two blocks were selected randomly from each district, Nawada, and Akbarpur for Nawada district; and Sasaram and Shivsgar for Rohtas. Finally, from each block, five villages were randomly selected. On average, twenty households were selected from each village for a face-to-face interview. However, due to sparse information on crop insurance (such as Pradhan Mantri Fasal Bima Yojna and Bihar Rajya Fasal Sahayta Yojana) in Bihar, we had to rely on another agricultural scheme, Pradhan Mantri Krishi Samman Nidhi (PMKSN), which has a relatively higher penetration. Of the 400 households, only 37 reported having crop insurance, while 373 households were aware of PMKSN, and 224 benefitted from it. PMKSN is a cash benefit programme where the government provides minimum income support (Rs. 6000 per year) to small and marginal farmers. We divide the households as PMKSN beneficiaries and non-beneficiary samples. The duration of primary data collection was between October 20 and October 29, 2021. The Institute of Human Development, New Delhi, helped us refine the questionnaire through several rounds of discussion, conducting the field survey, and tabulating the raw data.

Using the raw data, we define variables for our analysis. The final sample of all individuals consists of 2,429 observations. In the primary survey, we also collected information on women aged 15–49 years who were pregnant or gave birth in the last 5 years. We selected women's last pregnancy to capture health-seeking behaviour during pregnancy. Hence, the women's file consists of 394 observations. Finally, we also use child health-related information from the young children's (child aged 0–5 years) health roster. The child file has 554 observations.

2.2.1 Variables

The primary data consists of a vast number of variables. To capture the effect of PMKSN on different household-level health and food and nutrition security parameters, we define a variable, SEEKHC, which captures whether any member of the household sought treatment during the last 12 months from the survey; if sought treatment, whether opted for immediate treatment, IMMTRT, and treatment in private (PVTHC) versus public (PUBHC) healthcare facility. Also, we identified whether treatment was sought for an adult male, female, or children (both male and female). Furthermore, we use some indicators of food and nutrition security, such as whether the household had at least three meals per day (ADQMEALSGEQ3); household got enough quantity and variety of food (ENOUGH); whether the household was worried about food shortages in the last 1 year (WORRIED); and whether any adult member of the household was required to reduce or skip their meals, and the frequency of skipping meals (SKIPPED, FREQSKIPPED).

From the women file, we define women's healthcare seeking variables as ANC equals to one is the woman sought antenatal care during her last pregnancy; the number of ANC visits (NANC), whether sought ANC during the first trimester (ANCFTRIM) or second trimester (ANCSTRIM); whether the woman received at least three tetanus toxoid injections and at least 100 iron and folic acid tablets during her last pregnancy (TTINJAT3 and IFAAT100). We also define variables for safe delivery as to whether the woman opted for institutional delivery (INSTDEL) and delivery in public or private set-up (PUBDEL or PVTDEL). We also used a variable to capture whether a woman went for an immediate (within 24 h) postnatal checkup after delivery (WIMMPOSTNATAL).

From the child file, we define child health-seeking and nutrition variables as to whether the child got immediate (within 24 h) care after birth (IMMPOSTNATAL); or opted for any immunization (IMMUNIZATION); whether received full immunization (FULL_IMMUNIZATION); and was given breast milk at least within 2 h of birth (IMMBREASTFEEDING). A detailed description of all the variables is provided in Table 3.

3 Empirical Analysis

In this section, we present the results from our empirical analysis to identify the effect of crop insurance on women's health-seeking behaviour and children's nutrition from the secondary data; and the impact of PMKSN on household's health-seeking behaviour, and food and nutritional security; pregnant women's healthcare seeking behaviour; and children's health care and nutrition.

Table 3 Variable definitions and descriptive statistics (primary data) household and individual characteristics

Variable	Variable definition	Mean	SD
GENCASTE	=1 if household belongs to the general caste, 0 otherwise	0.31	0.46
HHPOOR	=1 if a household has Antodaya, Priority Household, or BPL card, 0 otherwise	0.57	0.50
MARGINAL	=1 if household holds < 2.5 acres of land, 0 otherwise	0.81	0.39
SMALL	=1 if household holds 2.5 to < 5 acres of land, 0 otherwise	0.07	0.26
MEDIUM	=1 if household holds ≥ 5 acres of land, 0 otherwise	0.12	0.32
FAMSZ	Number of household members	6.86	2.48
HI	=1 if the household is covered by health insurance, 0 otherwise	0.05	0.23
PUBHI	=1 if the household is covered by public health insurance, 0 otherwise	0.02	0.13
PVTHI	=1 if the household is covered by private health insurance, 0 otherwise	0.01	0.10
KITCHEN	=1 if the household has a separate kitchen or cooking area, else 0	0.54	0.50
TOILET	=1 if the household has flush toilet, including septic tank, else 0	0.47	0.50
FUEL	=1 if the source of energy mainly used is LPG, 0 otherwise	0.30	0.46
CONSEXP	Average monthly household consumption expenditure on food and non-food items	8916.96	9976.69
LNCONSEXP	Log of CONSEXP	8.90	0.53
BANKAC	=1 if any member of the household has a bank account, else 0	0.95	0.21
AWAGRIPOLICY	=1 if the household is aware of public schemes in agriculture, else 0	0.99	0.12
BFAGRIPOLICY	=1 if a household has benefitted from any public schemes in agriculture, else 0	0.66	0.47

(continued)

Table 3 (continued)

Variable	Variable definition	Mean	SD
AWPMKSN	=1 if a household is aware of Pradhan Mantri Kisan Samman Nidhi (PMKSN) in agriculture, else 0	0.94	0.24
BFPMKSN	=1 if household has benefitted from PMKSN, else 0	0.58	0.49
AWMATPOLICY	=1 if a household is aware of maternity benefit schemes, else 0	0.89	0.31
BFMATPOLICY	=1 if household has benefitted from any maternity benefit schemes, else 0	0.47	0.50
CROPAREA	Area of crop production in acres (in last 1 year)	1.32	1.20
CROPPROD	Total crop production in quintals (in last 1 year)	14.62	14.06
OWNCONSUMP	Percentage of crop produced for household's consumption (in last 1 year)	68.09	33.88
CROPLOSS	=1 if the household has experienced any crop loss during the last cropping season, 0 otherwise	0.39	0.49
CINS	=1 if the crop was insured, 0 otherwise	0.10	0.29
AGEYRS	Age of individuals in year	23.89	19.78
FEMALE	=1 if an individual is female, 0 if male	0.49	0.50
MARRIED	=1 if an individual is married, 0 otherwise	0.52	0.50
EDU	=1 if an individual has completed some schooling (below primary to graduation or higher), 0 otherwise	0.58	0.49
EMP	=1 if an individual is employed, else 0	0.26	0.44
SELFEMP	=1 if an individual is self-employed, else 0	0.15	0.36
CASUALEMP	=1 if an individual is employed in casual employment, else 0	0.04	0.20
SALARIEDEMP	=1 if an individual is employed as a salaried employer, else 0	0.06	0.24

(continued)

Table 3 (continued)

Variable	Variable definition	Mean	SD
SCH	=1 if a 3–14-year-old child is attending school, 0 otherwise	0.84	0.37
SEEKHC	=1 if any member in the household sought health care in the last 12 months, 0 otherwise	0.80	0.40
IMMTRT	=1 if the household member sought immediate care (i.e. within 24 h of symptoms), else 0	0.45	0.50
PVTHC	=1 if the member sought care in a private healthcare facility, 0 otherwise	0.61	0.49
PUBHC	=1 if the member sought care in a public healthcare facility, 0 otherwise	0.17	0.38
TRTADULTMALE	=1 if an adult male member sought treatment, else 0	0.17	0.37
TRTADULTFEMALE	=1 if an adult female member sought treatment, else 0	0.38	0.49
TRTCHILDMALE	=1 if an child male member sought treatment, else 0	0.10	0.30
TRTCHILDFEMALE	=1 if an child female member sought treatment, else 0	0.18	0.39
ADQMEALSGEQ3	=1 if the household had adequate meals (at least 3) per day, else 0	0.66	0.47
FOODENOUGH	=1 if the household got enough quantity and variety of food in the past 1 year, else 0	0.26	0.44
WORRIED	=1 if household worried whether they would face food shortages, else 0	0.87	0.33
SKIPPED	=1 if any adult member in the household is ever required to reduce their food or skip meals, 0 otherwise	0.10	0.30
FREQSKIPPED	=if a household adult member skipped meal almost every month, else 0	0.01	0.12
No. of observations		2,429	

Source Author's own definitions and calculations; *Notes* FAMSZ—Min: 1 and Max: 17; CONSEXP—Min: 2050 and Max: 1,03,000; CROPAREA—Min: 0.03 acres and Max: 10 acres; CROPPROD—Min: 0.08 and Max: 98 quintals; AGEYRS—Min: 0 and Max: 99

3.1 Summary Statistics

Tables 1, 2, 3, 4, and 5 provide detailed descriptive statistics for all the outcomes and independent variables from secondary and primary data analysis. Table 1 shows that around 84% of the women received some antenatal care (ANC) during the survey period. While a majority of the women (close to 59%) received such care during the first trimester (ANFTRIM), almost 12.5% received ANC care during their second trimester (ANCSTRIM). Nearly 50% of women went for at least 4 ANC visits, and 15% went for 8 ANC visits. We also observe that around 65% of women took some iron and folic acid tablets (IFA). Close to 80% of women received tetanus toxoid injections during their pregnancy. However, only 17% received at least three TT injections (AT3TTINJ). In terms of safe delivery, around 80% of women had institutional delivery (INSTDEL), out of which close to 28% happened in private facilities (PVTINST). Finally, for postnatal care, close to 22% of women received postnatal care from a private healthcare facility (PNATALPVT). Child nutrition indicators in Table 1 show that nearly 18% of children are underweight, and 5% of children are severely malnourished.

Table 2 shows that around 4% of the households had crop insurance during the survey period. The average age of women in the sample is 26 years, nearly 18% of women completed below primary and primary education, and almost 7% college education, almost 19% of women had some form of employment, 21% received some form of maternity benefits (like JSY), nearly 40% of households had below poverty line cards, and 49% owned some form of land.

Tables 3, 4, and 5 report the summary statistics from the primary data. In Table 3, the individual sample shows nearly 31% belong to the general caste category, 57% are poor, have Antodaya, BPL, or PH card, 81% of households were marginal, 7% small, and 12% were medium farming households. Only 5% had only some form of health insurance. Nearly 94% were aware of PMKSN, while 58% benefitted. Almost 40% of households experienced crop loss, and 10% had crop insurance. The average age of individuals in the full sample is 24 years, with 49% of females and almost 58% of individuals have completed some schooling. Nearly 80% of individuals sought health care and 40% sought immediate health care. Sixty-six per cent of the household had adequate daily meals, 26% informed of having enough quantity and variety of food in the past year. However, 87% of households reported being worried about food shortages, and 10% of adults skipped meals.

The women sample in Table 4 shows that the average age of women is 27 years (Min 16–Max 48 years), with 72% of women having completed some form of schooling and 4% of women had some employment. Nearly 36% of women sought treatment for healthcare problems during their last pregnancy, and 52% received maternity benefits from some government schemes. Almost 88% of women received ANC, 50% of women sought ANC during their first trimester, 37% during their second trimester, and nearly 4% in their third trimester. Eleven per cent of women had at least three tetanus toxoid injections, and 21% had consumed at least 100 iron

Table 4 Variable definitions and descriptive statistics (primary data) women (15–49 years) characteristics

Variable	Variable definition	Mean	SD
WAGEYRS	Age in years on women	27.26	5.10
WMARRIED	=1 if the woman is married, 0 otherwise	0.98	0.14
WEDU	=1 if the woman has completed some schooling (below primary to graduation or higher), 0 otherwise	0.72	0.45
WEMP	=1 if the woman is employed, else 0	0.04	0.19
WSELFEMP	=1 if the woman is self-employed, else 0	0.02	0.15
WCASUALEMP	=1 if the woman is employed in casual employment, else 0	0.01	0.07
WSALARIEDEMP	=1 if the woman is employed as a salaried employer, else 0	0.01	0.10
TRTHP	=1 if the woman sought health care due to health problems during her last pregnancy, else 0	0.36	0.48
MATERNBENF	=1 if the woman received any maternity benefits during her last pregnancy, 0 otherwise	0.52	0.50
ANC	=1 if the woman received antenatal care (ANC) during her pregnancy, else 0	0.88	0.33
NANC	Number of antenatal visits	3.58	1.54
ANCFTRIM	=1 if ANC sought during the first trimester of pregnancy, else 0	0.50	0.50
ANCSTRIM	=1 if ANC sought during the second trimester of pregnancy, else 0	0.37	0.48
ANCTTRIM	=1 if ANC sought during the third trimester of pregnancy, else 0	0.04	0.20
TTINJAT3	=1 if the woman had taken at least three Tetanus Toxoid injections during her last pregnancy, else 0	0.11	0.31
IFAAT100	=1 if the woman had at least 100 iron and folic acid tablet during her last pregnancy, else 0	0.21	0.41
INSTDEL	=1 if the woman went for institutional delivery, 0 otherwise	0.92	0.28
PUBDEL	=1 if the woman went for institutional delivery in a public hospital, 0 otherwise	0.52	0.50

(continued)

Table 4 (continued)

Variable	Variable definition	Mean	SD
PVTDEL	=1 if the woman went for institutional delivery in a private hospital, 0 otherwise	0.39	0.49
NUTRISUP	=1 if the woman received any nutritional supplement from anganwadi centre during her last pregnancy, else 0	0.54	0.50
WIMMPOSTNATAL	=1 if the woman received post-natal care immediately (within 24 h) of child birth, 0 otherwise	0.45	0.50
No. of observations		394	

Source Author's own definitions and calculations; *Notes* WAGEYRS—Min: 16 and Max: 48; NANC—Min: 0 and Max: 16

Table 5 Variable definitions and descriptive statistics (primary data) children (0–5 years) characteristics

Variable	Variable definition	Mean	SD
CAGE	Age of a child in months	29.86	18.15
CFEMALE	=1 if the child is female, else 0	0.52	0.50
BOC	Birth order of the child	2.09	1.09
BWEIGHT	Birth weight of the child in Kgs	2.74	0.52
IMMPOSTNATAL	=1 if the child received immediate post-natal care (within 24 h of birth), else 0	0.71	0.45
IMMUNIZATION	=1 if the child received any immunization, 0 otherwise	0.99	0.11
FULL_IMMUNIZATION	=1 if the child received full immunization, else 0	0.83	0.37
IMMBREASTFEEDING	=1 if child was breastfed immediately (within 2 h) after birth, else 0	0.80	0.40
No. of observations		554	

Source Author's own definitions and calculations; *Notes* CAGE—Min: 0 and Max: 60; BOC: Min: 0 and Max: 6; BWEIGHT- Max: 5.20 kgs

and folic tablets. Ninety-two per cent had institutional delivery, with public 52% and private 39%. Almost 45% of women received some form of postnatal care.

Table 5 presents summary statistics for children in the age group of 0–5 years. The average age of children is 30 months. Fifty-two of the children are female. The average birth weight is 2.74 kgs. Seventy-one per cent of children received immediate postnatal care. Nearly 83% received full immunization. Almost 80% of children were breastfed immediately after birth.

3.2 Empirical Strategy—Secondary Data

Due to the hierarchical structure of the sample, we use multilevel regression analysis to identify the effect of crop insurance adoption on healthcare-seeking practices by women of their reproductive age. In our data set, the common identification unit in the district. Therefore, we assume that individuals are nested within districts, and hence, we use a multilevel analysis for the empirical estimation. As the outcome variables of interest are binary, we use a multilevel logistic regression model.

The empirical model can be written as,

$$\text{Logit}\left[P\left(Y_{ij}=1|X_{ij},Z_j,u_j\right)\right]=\alpha+\beta_x X_{ij}+\beta_z Z_j+u_{j,}\quad u_j\sim N\left(0,\sigma^2\right)$$

where Y_{ij} is the binary outcome variable of interest. The individuals are indexed as $i=1,\ldots,n$ and districts are denoted by $j=1,\ldots,d$. The model includes vectors of individual-level covariates X_{ij} as well as district-level covariates Z_j. u_j are the random effects, which summarize the unobserved factors at the district level affecting individual outcomes. Therefore, the standard deviation σ measures between-district variations in response that are not accounted for by simple logistic regression.

The first step in the multilevel model analysis is to examine if our sample justifies using random effects at the district level. We present the results from the random intercept-only model in Table 6. There was a significant variation in healthcare-seeking behaviour across the districts. Based on the Intra-class correlation coefficients (ICC), we find that 30% of the total variation in ANC use is attributable to the differences across districts. Similarly, nearly 55% of the variance in the institutional delivery and 40% of the variance in the postnatal care in a private facility can be attributed to differences across districts. The ICC for other measures of health-seeking behaviours in our analysis is also relatively high, indicating the justification for using a multilevel model in our empirical research.

Next, we present the results from the final model by including both individual and district-level control variables. Both fixed and random effects are included. The primary variable of interest is the proportion of district-wise crop insurance (PDCI). Table 7 shows the odds ratios for PDCI from the multilevel logit analysis. After controlling for individual-level and district-level variables in the multilevel model, we observe that PDCI is significant for most health-seeking behaviour measures. We find that the estimated coefficient of PDCI is positive and statistically significant for ANC. The odds of choosing ANC increase by almost 87% with PDCI. The finding indicates that the likelihood of seeking ANC increases if the woman belongs to a district with higher crop insurance penetration. We also observe that although there is no evidence that higher crop insurance adoption increases the likelihood of ANC utilization in the first trimester of the pregnancy, however, it positively and significantly affects antenatal care in the second trimester (OR 2.33). Similarly, the estimated coefficients of both AT4ANC (OR: 5.08) and AT8ANC (OR: 5.47) are positive and statistically significant. Therefore, we find a higher probability of ANC visits with crop insurance adoption.

Table 6 Intraclass correlation coefficient for the random intercept model

Variables	ICC
ANC	0.303
ANCFTRIM	0.242
ANCSTRIM	0.103
ANCTTRIM	0.316
AT4ANC	0.428
AT8ANC	0.437
IFA	0.299
AT100IFA	0.222
TT	0.3675
AT3TTINJ	0.229
TRTHP	0.126
INSTDEL	0.545
PVTINST	0.263
PNATALPVT	0.395
No. of observations	35,226

Source Authors' own calculations

Furthermore, we find that the likelihood of having IFA and at least three TT injections significantly increase with PDCI. The odds ratios are 2.65 and 2.31, respectively. For safe delivery practices, our regression results suggest that the likelihood of institutional delivery (OR: 2.76) and delivery in a private health facility (OR: 1.09) increase with PDCI. Finally, we find that the estimated coefficient of PNATALPVT is also positive and statistically significant, indicating a higher tendency of seeking postnatal care from private healthcare facilities by women from districts with higher crop insurance adoption. The odds ratio of PNATALPVT is 2.92.

Therefore, the findings imply that after controlling for individual and district-level heterogeneities, including financial access, social security benefits, and distance to the health facility, women in districts with higher crop insurance adoption are likely to seek more health care during their pregnancy compared to women in other districts. Thus, our estimation results provide evidence that crop insurance adoption improves women's health-seeking behaviour in their reproductive age. Moreover, crop insurance also removes the barriers to accessing institutional delivery.[3]

The effect of PDCI on children being underweight and severely underweight, although positive, is not statistically significant (See Table 8). Hence, using the data, no conclusive results can be obtained on the effect of PDCI on children's nutritional status.

[3] Results on other control variables in the model are presented in Table 12 of the Appendix.

Table 7 Odds ratios from fixed-effect estimates of PDCI from the multilevel regression for women 15–49 years

Outcome variables	Independent variable: PDCI	Likelihood ratio test
ANC	1.872*** (3.659)	1981.18***
ANCFTRIM	1.987 (1.300)	2071.46***
ANCSTRIM	2.331* (1.087)	693.07***
AT4ANC	5.076* (4.944)	4422.35**
AT8ANC	5.469** (4.155)	2641.95***
IFA	2.650*** (0.922)	2952.82***
TT	1.818 (1.057)	1913.35***
AT3TT	2.311*** (1.594)	2480.84***
TRTHP	2.091 (1.474)	975.32***
INSDEL	2.759*** (3.479)	1628***
PVTINST	1.088** (1.942)	2172.32***
PNATPVT	2.919** (1.265)	1981.4***
No. of observations	35,226	

Source Authors' own calculations; *Notes* ***, **, and * denote significance at 1, 5, and 10%, respectively. Figures in parentheses are standard errors. The likelihood-ratio test compares the model with a one-level ordinary logistic regression

Table 8 Odds ratios from fixed-effect estimates of PDCI from the multilevel regression for children 0–5 years

Independent variable	UNDERWT	SEVUNDERWT
PDCI	2.006 (0.939)	1.873 (1.050)
Likelihood ratio test	521.08***	292.20***
Observations	12,470	12,470

Source Authors' own calculations; *Notes* ***, **, and * denote significance at 1, 5, and 10%, respectively. Figures in parentheses are standard errors. The likelihood-ratio test compares the model with a one-level ordinary logistic regression

3.3 Primary Data Analysis

Tables 9, 10, and 11 show the two-sample t-test results on the outcome variables of interest from the primary survey. The samples are divided between households who have been benefitted (PMKSN = 1) from PMKSN and those who have not been benefitted (PMKSN = 0) from it. Members in the PMKSN beneficiary households sought immediate care, more care in private facilities, and higher care-seeking for both adult men and women (see Table 9). PMKSN beneficiaries also reported having adequate meals and more quantity and variety of food. They also skipped fewer meals. From the women sample in Table 10, PMKSN beneficiaries received higher ANC, especially during their first trimester of pregnancy. Children in PMKSN beneficiary households received higher immediate postnatal care (Table 11).

4 Conclusion

Understanding the role of crop insurance as a risk-mitigating strategy for poor farmers is essential. Crop insurance can help enhance the farm output and improve households' food and nutrition security and healthcare utilization by women and children.

Our study uses district-level variations in crop insurance adoption to find its effect on healthcare utilization by pregnant women in their reproductive age and children's nutritional status. We find that crop insurance adoption positively impacts prenatal care, institutional delivery, and postnatal care. We find that crop insurance leads to women seeking more ANC visits. Women belonging to districts with higher crop insurance also preferred institutional delivery. Women in these districts are more likely to choose private facilities for delivery and postnatal care than women in districts with low crop insurance exposure. Thus, the findings indicate that exposure to crop insurance allows households to opt for better health-seeking practices. However, we failed to find any statistically significant effect of crop insurance on child nutritional outcomes.

The primary data analysis also shows that government income support programme, like Pradhan Mantri Krishi Samman Nidhi, helps in increasing the treatment-seeking behaviour of households and provide food security. It also positively impacts pregnant women's early antenatal care-seeking behaviour and children's immediate care after birth.

Thus, our empirical research provides an understanding of the link between the crucial aspects of the agricultural households' decision-making, including risk mitigation through crop insurance and health-seeking and nutritional outcomes among women and children. Our primary analysis also provides a broader understanding of the role of the government's income support initiatives to the farmers and its linkage with households' health-seeking behaviour and nutritional outcomes, especially for women of their reproductive age and children below 5 years of age. A

Table 9 Two-sample T-test for the full sample of households and individuals (primary survey)

Variables	PMKSN = 0	PMKSN = 1	Diff. in means (p-values)
SEEKHC	0.760	0.829	−0.07*** (0.000)
IMMTRT	0.413	0.468	−0.054*** (0.008)
PVTHC	0.556	0.641	−0.085*** (0.000)
PUBHC	0.196	0.156	0.04** (0.010)
TRTADULTMALE	0.149	0.179	−0.03** (0.047)
TRTADULTFEMALE	0.360	0.393	−0.033* (0.096)
TRTCHILDMALE	0.105	0.092	0.013 (0.276)
TRTCHILDFEMALE	0.170	0.190	−0.019 (0.222)
HI	0.057	0.053	0.004 (0.669)
PVTHI	0.004	0.015	−0.011*** (0.008)
PUBHI	0.019	0.016	0.003 (0.555)
ADQMEALSGEQ3	0.627	0.677	−0.05** (0.011)
FOODENOUGH	0.234	0.286	−0.052*** (0.005)
WORRIED	0.881	0.868	0.013 (0.358)
SKIPPED	0.115	0.085	0.030** (0.014)
NSKIPPED	0.022	0.009	0.012** (0.011)
LNCONSEXP	8.885	8.912	−0.027 (0.218)
No. of observations	1,016	1,413	

Source Authors' own calculations; *Notes* ***, **, and * denote significance at 1, 5, and 10%, respectively. Figures in parentheses indicate p-values

Table 10 Two-sample T-test for pregnant women (15–49 years) (primary survey)

Variables	PMKSN = 0	PMKSN = 1	Diff. in means (p-values)
TRTHP	0.354	0.370	−0.016 (0.743)
ANC	0.846	0.902	−0.057 (0.100)
NANC	3.506	3.634	−0.128 (0.429)
ANC_FIRSTTRIM	0.451	0.543	−0.092* (0.078)
ANC_SECONDTRIM	0.390	0.361	0.030 (0.558)
TTINJAT3	0.098	0.112	−0.014 (0.646)
IFAAT100	0.201	0.211	−0.010 (0.807)
INSTDEL	0.919	0.916	0.003 (0.921)
PUBDEL	0.486	0.553	−0.068 (0.184)
PVTDEL	0.434	0.363	0.071 (0.157)
WIMMPOSTNATAL	0.483	0.421	0.061 (0.226)
No. of observations	177	218	

Source Authors' own calculations; *Notes* ***, **, and * denote significance at 1, 5, and 10%, respectively. Figures in parentheses indicate p-values

Table 11 Two-sample T-test for children (0–2 years) (primary survey)

Variables	PMKSN = 0	PMKSN = 1	Diff. in means (p-values)
IMMPOSTNATAL	0.664	0.753	−0.089** (0.022)
IMMUNIZATION	0.984	0.990	−0.006 (0.543)
FULL_IMMUNIZATION	0.834	0.833	0.001 (0.970)
IMMBREASTFEEDING	0.775	0.829	−0.055 (0.107)
BWEIGHT	2.754	2.723	0.031 (0.495)
No. of observation	254	300	

Source Authors' own calculations; *Notes* ***, **, and * denote significance at 1, 5, and 10%, respectively. Figures in parentheses indicate p-values

prudent strategy to improve household finance opportunities can play an essential role in mitigating the challenges arising due to health shocks—a timely and adequate crop insurance hedge against the income volatility linked to harvests. Crop failure can cause financial distress among these rural households leading to uncertainty and income constraints. In these circumstances, they will not be able to manage the expenses on healthcare-seeking, such as transportation costs and the opportunity cost of time. Therefore, crop insurance or other government income support can at least ensure some degree of certainty and provide income smoothing, which in turn can ensure better healthcare-seeking practices and nutritional outcomes, leading to household welfare.

However, policymakers often ignore these dynamics and look at policy in isolation. Many Indian farmers are small and illiterate and are, therefore, excluded from the formal financial service. As a result, these poor farmers are deprived of quality food intake and denied basic healthcare facilities. Health is a significant risk for rural households, especially pregnant women in rural India. Given the continuous rise in healthcare costs and ever-increasing out-of-pocket expenditure, mere health insurance coverage (primarily public health insurance) may not be enough, especially when the household is under distress due to crop failure. Crop insurance or income support in such circumstances can play a vital role in improving households' welfare parameters by addressing the needs of the vulnerable. Therefore, developing a comprehensive nationwide survey that captures multidimensional aspects of crop insurance, income support, and household welfare indicators in terms of healthcare-seeking and nutrition can provide additional insights and should be carried out in the future.

Acknowledgements First, we would like to thank Professor Mahendra Dev, Dr. A Ganesh Kumar, and Dr. Vijaylaxmi Pandey for selecting us for the SPANDAN grant and giving us this excellent opportunity to work on an exciting research topic. We are grateful to SPANDAN Grants for providing us with financial assistance. We are also thankful to Prof. Manoj Panda for his invaluable suggestions on our paper. His recommendations have tremendously helped us refine our work. We appreciate the comments and directions given by Professor Brinda Viswanathan during the interim presentation to improve our work. We are incredibly grateful to all the participants of the SPANDAN workshop held on February 14, 2020, and June 25, 202, for their insights. We would like to sincerely extend our gratitude towards Prof. Alakh Sharma, who provided invaluable mentorship to this project. We are also thankful to the entire team of IHD, especially Dr. Ashwini Kumar and Mr. BKN Singh, without whose guidance and help the primary survey would not have been possible. We would also like to thank Mr. Anurag Banerjee for his continuous research support.

Appendix

See Table A1.

Table A1 Odds ratios from fixed-effect estimates of other covariates from the multilevel regression for women 15–49 years

Variables	ANC	IFA	TT	INSTDEL	PVTIINST	PNATPVT
AGE	0.992**	0.993**	0.992**	1.011***	1.028***	1.028***
	(0.0040)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)
MPRIMEDUC	1.511***	1.460***	1.595***	1.202***	1.323***	1.389***
	(0.079)	(0.062)	(0.077)	(0.059)	(0.071)	(0.082)
MMIDEDUC	1.789***	1.594***	1.924***	1.532***	1.393***	1.528***
	(0.105)	(0.071)	(0.102)	(0.085)	(0.074)	(0.089)
MSECEDUC	2.081***	1.938***	2.047***	1.980***	1.565***	1.719***
	(0.139)	(0.094)	(0.120)	(0.126)	(0.086)	(0.103)
MHSECEDUC	2.411***	2.001***	2.348***	2.782***	1.938***	2.109***
	(0.204)	(0.115)	(0.173)	(0.237)	(0.120)	(0.141)
MCOLPEDUC	2.666***	2.153***	2.312***	3.892***	2.435***	2.571***
	(0.301)	(0.158)	(0.219)	(0.495)	(0.183)	(0.202)
BO	0.916***	0.960***	0.941***	0.789***	0.790***	0.804***
	(0.015)	(0.013)	(0.014)	(0.013)	(0.014)	(0.015)
EMP	0.939	1.242***	1.010	0.714***	0.884***	0.948
	(0.045)	(0.044)	(0.043)	(0.031)	(0.035)	(0.038)
JSY	2.637***	1.681***	2.400***	4.463***	0.216***	0.249***
	(0.150)	(0.058)	(0.115)	(0.249)	(0.010)	(0.012)
DIAGCHRONIC	1.358***	1.286***	1.364***	1.0272	1.179***	1.259***
	(0.060)	(0.042)	(0.055)	(0.043)	(0.040)	(0.045)
HINDU	1.036	1.088	1.036	0.913	0.912	0.889*
	(0.072)	(0.056)	(0.065)	(0.063)	(0.052)	(0.054)
MUSLIM	0.923	0.994	0.918	0.709***	1.149*	1.040
	(0.098)	(0.077)	(0.087)	(0.070)	(0.094)	(0.089)
SC	0.896***	1.009	0.888**	0.865**	0.760***	0.780***
	(0.055)	(0.043)	(0.048)	(0.049)	(0.035)	(0.038)
ST	0.725***	0.876**	0.742***	0.712***	0.759***	0.764***
	(0.053)	(0.046)	(0.049)	(0.048)	(0.046)	(0.049)
OBC	0.933	0.905**	0.927	1.026	1.002	1.049
	(0.249)	(0.037)	(0.049)	(0.057)	(0.042)	(0.045)
BPL	1.053	1.062*	1.019	0.995	0.932**	1.001
	(0.044)	(0.033)	(0.038)	(0.039)	(0.033)	(0.038)
PUCCA	1.067	1.103***	1.075*	1.029	1.206***	1.215***
	(0.051)	(0.036)	(0.044)	(0.047)	(0.041)	(0.043)
FUEL	1.302***	1.080**	1.189***	1.641***	1.474***	1.429***
	(0.071)	(0.039)	(0.055)	(0.091)	(0.052)	(0.053)

(continued)

Table A1 (continued)

Variables	ANC	IFA	TT	INSTDEL	PVTIINST	PNATPVT
ELEC	0.923	1.102	0.970	1.564	0.989	0.945
	(0.382)	(0.381)	(0.366)	(0.661)	(0.375)	(0.374)
OWNSLAND	1.063	1.026	1.051	(0.958)	1.189***	1.194***
	(0.044)	(0.031)	(0.039)	(0.037)	(0.039)	(0.041)
HWEALTHQ: 2	1.047	0.998	1.066	0.746***	0.744***	0.797***
	(0.073)	(0.049)	(0.067)	(0.053)	(0.037)	(0.042)
HWEALTHQ: 3	0.953	0.987	0.942	0.746***	0.544***	0.588***
	(0.069)	(0.052)	(0.062)	(0.055)	(0.029)	(0.034)
HWEALTHQ: 4	0.965	0.898*	0.908	0.671***	0.435***	0.477***
	(0.080)	(0.054)	(0.067)	(0.055)	(0.028)	(0.032)
HWEALTHQ: 5	0.656***	0.725***	0.650***	0.504***	0.365***	0.399***
	(0.053)	(0.044)	(0.048)	(0.041)	(0.024)	(0.028)
FAMSZ	1.020**	0.992	1.013*	1.015**	0.977***	0.978***
	(0.008)	(0.005)	(0.007)	(0.007)	(0.006)	(0.006)
HPRIMEDUC	1.401***	1.407***	1.446***	1.043	0.993	1.056
	(0.079)	(0.064)	(0.074)	(0.055)	(0.057)	(0.066)
HMIDEDUC	1.480***	1.495***	1.517***	1.146**	1.146**	1.209***
	(0.088)	(0.070)	(0.082)	(0.065)	(0.064)	(0.074)
HSECEDUC	1.510***	1.391***	1.523***	1.229***	1.249***	1.203***
	(0.096)	(0.067)	(0.086)	(0.074)	(0.069)	(0.073)
HHSECEDUC	1.543***	1.338***	1.624***	1.152**	1.451***	1.469***
	(0.115)	(0.073)	(0.109)	(0.082)	(0.089)	(0.096)
HCOLPEDUC	1.812***	1.419***	1.836***	1.585***	1.875***	1.663***
	(0.173)	(0.092)	(0.152)	(0.152)	(0.129)	(0.121)
PROPHFFAR	0.005***	0.055***	0.009***	0.000***	0.009***	0.015***
	(0.005)	(0.045)	(0.008)	(0.000)	(0.009)	(0.015)
DISTBANK	2.945***	3.842***	3.061***	3.246***	2.772***	3.279***
	(1.018)	(1.322)	(1.014)	(1.161)	(0.919)	(1.092)
CONSTANT	3.950***	0.982	2.758**	4.081***	0.276***	0.143***
	(1.831)	(0.371)	(1.149)	(1.898)	(0.114)	(0.061)
No. of observations	35,226	35,226	35,226	35,226	35,226	35,226

Source Authors' own calculations; *Notes* ***, **, and * denote significance at 1, 5, and 10%, respectively. Figures in parentheses are standard errors. The likelihood-ratio test compares the model with a one-level ordinary logistic regression

References

Ahsan, S., Ali, A. A. G., & Kurian, N. J. (1982). Towards a theory of agricultural crop insurance. *American Journal of Agricultural Economics, 64*(3), 520–529. https://doi.org/10.2307/1240644

Barnwal, P., & Kotani, K. (2013). Climatic impacts across agricultural crop yield distributions: An application of quantile regression on rice crops in Andhra Pradesh, India. *Ecological Economics, 87*, 95–109. https://doi.org/10.1016/j.ecolecon.2012.11.024

Bhuiya, M. M. M., Khanam, R., Rahman, M. M., & Nghiem, H. S. (2018). The relationship between access to microfinance, health-seeking behaviour and health service uses: Evidence from Bangladesh. *Economic Analysis and Policy, 60*, 9–17.

Birthal, P. S., Khan, T. M., Negi, D. S., & Agarwal, S. (2014). Impact of climate change on yields of major food crops in India: Implications for food security. *Agricultural Economics Research Review, 27*(347-2016-17126), 145–155. https://doi.org/10.5958/0974-0279.2014.00019.6.

Burgess, R., Deschenes, O., Donaldson, D., & Greenstone, M. (2014). *The unequal effects of weather and climate change: Evidence from mortality in India.* Massachusetts Institute of Technology, Department of Economics. Manuscript.

Chambers, R. G., & Quiggin, J. (2002). Optimal producer behavior in the presence of area-yield crop insurance. *American Journal of Agricultural Economics, 84*(2), 320–334. https://doi.org/10.1111/1467-8276.00300

Cole, S. A., & Xiong, W. (2017). Agricultural insurance and economic development. *Annual Review of Economics, 9*, 235–262.

Davies, M., Guenther, B., Leavy, J., Mitchell, T., & Tanner, T. (2008). 'Adaptive social protection': Synergies for poverty reduction. *IDS Bulletin, 39*(4), 105–112.

Dowie, J. (1975). The portfolio approach to health behaviour. *Social Science & Medicine (1967), 9*(11–12), 619–631.

FAO. (2015). *Nutrition and social protection.* Food and Agriculture Organization of the United Nations. Retrieved December 20, 2019, from http://www.fao.org/3/a-i4819e.pdf.

Hau, A. (2006). Production under uncertainty with insurance or hedging. *Insurance: Mathematics and Economics, 38*(2), 347–359. https://doi.org/10.1016/j.insmatheco.2005.09.006.

He, J., Zheng, X., Rejesus, R. M., & Yorobe, J. M. (2019). Moral hazard and adverse selection effects of cost-of-production crop insurance: Evidence from the Philippines. *Australian Journal of Agricultural and Resource Economics, 63*(1), 166–197. https://doi.org/10.1111/1467-8489.12290

Leary, N., Adejuwon, J., Barros, V., Batimaa, P., Biagini, B., Burton, I., ... & Wehbe, M. (2007). *A stitch in time: Lessons for climate change adaptation from the AIACC Project*. International START Secretariat, Washington, DC.

Möhring, N., Dalhaus, T., Enjolras, G., & Finger, R. (2020). Crop insurance and pesticide use in European agriculture. *Agricultural Systems, 184*, 102902. https://doi.org/10.1016/j.agsy.2020.102902

Nair, R. (2010). Crop insurance in India: Changes and challenges. *Economic and Political weekly, 55*(6), 19–22. https://www.jstor.org/stable/25664084.

Panda, A. (2013). Climate variability and the role of access to crop insurance as a social-protection measure: Insights from India. *Development Policy Review, 31*, 057–073.

Patt, A., Suarez, P., & Hess, U. (2010). How do small-holder farmers understand insurance, and how much do they want it? Evidence from Africa. *Global Environmental Change, 20*(1), 153–161.

Smith, V. H., & Goodwin, B. K. (1996). Crop insurance, moral hazard, and agricultural chemical use. *American Journal of Agricultural Economics, 78*(2), 428–438.

Van Ittersum, M. K. (2015). Crop yields and global food security. Will yield increase continue to feed the world? *European Review of Agricultural Economics, 43*(1), 191–192. https://doi.org/10.1093/erae/jbv034.

Woldemicael, G., & Tenkorang, E. Y. (2010). Women's autonomy and maternal health-seeking behavior in Ethiopia. *Maternal and Child Health Journal, 14*, 988–998.