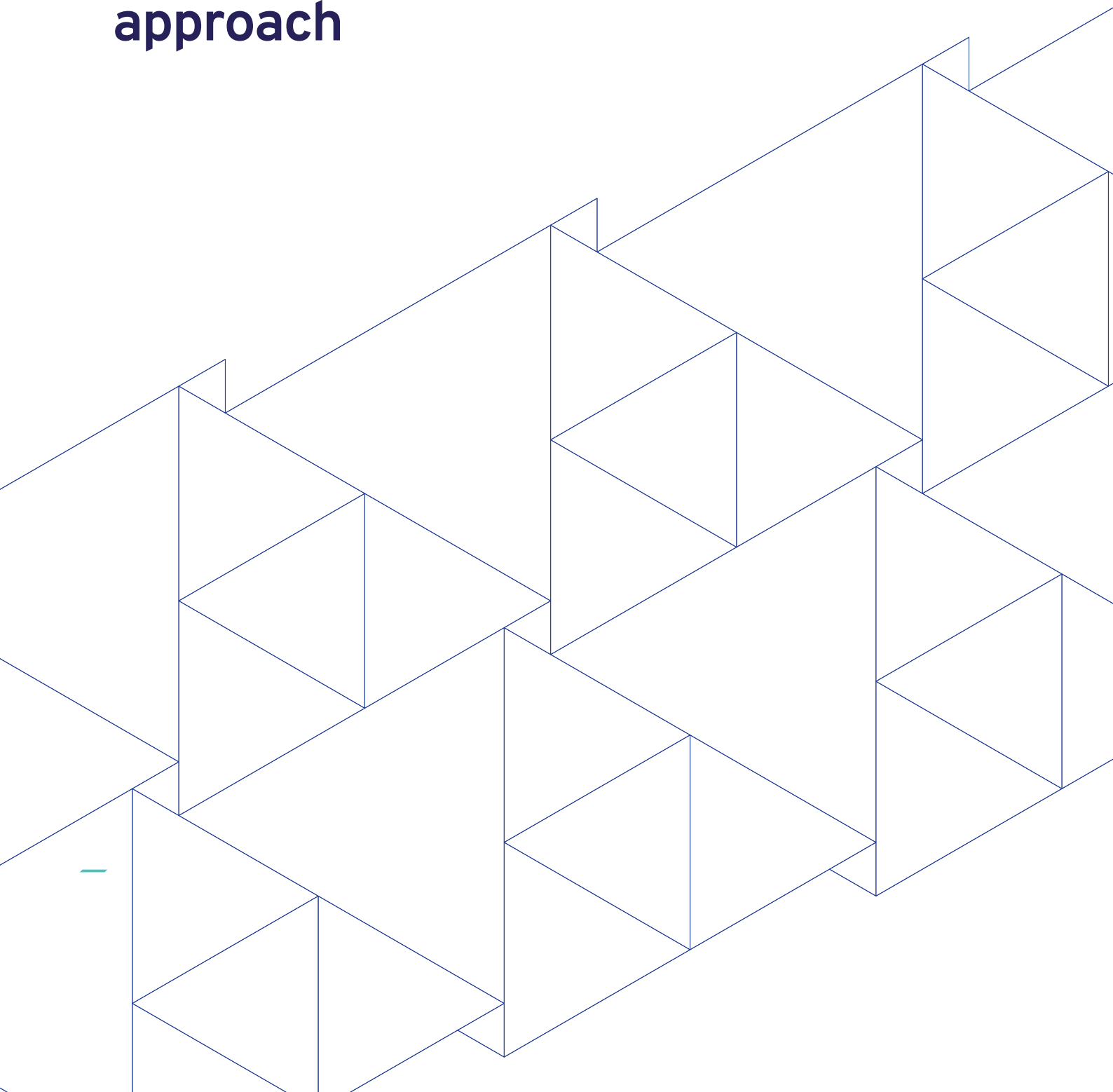




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► Setting national minimum wages in India: a need-based approach



Setting national minimum wages in India: a need-based approach

Mr Anup Karan

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First published 2021

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ISBN 9789220355039 (print)

ISBN 9789220355046(web PDF)

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Preface

The socio-economic effects of the COVID-19 crisis and have brought into light the relevance and importance of minimum wage institutions in protecting the most vulnerable workers and their dependants. More than ever now, adequately balanced minimum wage adjustments must take into account both social and economic factors to safeguard jobs, while at the same time sustain demand in the rebuilding of the economy.

Effective wage-setting institutions, particularly minimum wages, can determine 'an adequate level of wages' through social dialogue, underpinned by evidence-based assessments. This requires using data and information along with the credible methodologies to enable social partners to factor in social and economic evidence that could then yield a desirable outcome.

Setting an adequate minimum wage can ensure effective protection for workers and their families while also advocating for the development of sustainable enterprises. This balancing act is essential and recognized in various ILO instruments, including the Minimum Wage Fixing Convention, 1970 (No.131) and the ILO Minimum Wage Policy Guide.

This study proposes a methodology for need-based assessment to set the minimum wage in India. It attempts to estimate the needs of workers and their

families through the use of evidence. It offers social partners a very descriptive methodology that may be used or contrasted in the light of the discussions and social dialogue that arise when setting an adequate level of minimum wages. It explores how income and expenditure surveys from national statistical offices can be utilized to estimate these needs, considering food and non-food items, such as housing; health and education; and other essential needs.

This study has been supported by an ILO project on 'Indicators and methodologies for wage-setting' through the Ministry of Foreign Affairs of the Netherlands. The project sought to develop indicators and methodologies that can strengthen the capacity of governments and social partners to negotiate and set adequate wage levels, which take into account the needs of workers and their families along with economic factors.

The ILO is committed to supporting the use of evidence-based decisions grounded in social dialogue and backed by sound technical capacity. I trust constituents and stakeholders will find this study useful.

Ms Dagmar Walter

Director, ILO DWT for South Asia and Country Officer for India

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► Setting national minimum wages in India: a need-based approach

Background:

Setting the minimum wage level and adjusting the same regularly is perhaps the most challenging part of a country's minimum wage process. To set a minimum wage level, the International Labour Organization policy emphasizes the need for an evidence-based transparent methodology and the use of statistics and other data, taking into account the needs of the workers and their families and economic factors.

Method:

We focus specifically on a "need-based approach" to estimate the minimum consumption needs of workers in the food and non-food categories. Hence, we estimated the minimum cost of a consumption basket considering food and non-food categories. We used nationally representative data on consumption expenditure, nutritional contents of food items and recommended nutritional norms to estimate the minimum cost of food expenditure. The minimum cost was estimated using fractile based distribution of households and linear programming methods. For non-food expenditure, we classified all the non-food items into essential and other categories and used non-food expenditure of median class and 6th fractile of consumption expenditure distribution for estimation of minimum wage. We also estimated the rent of housing separately to be added to the minimum wage. To estimate the minimum wage, under the need-based approach, we adjust the total consumption expenditure need of workers and their families with the average number of wage workers per household and the current unemployment rate among wage workers.

Results:

Minimum cost of food basket varied in a range of INR 840 to INR 1,190 per consumption unit per month as of January 2012. Per consumption unit, monthly non-food expenditure was estimated to be INR 1,288, which included rent of INR 522 as of January 2012. After adjusting for inflation, the average number of wage workers per household and the current unemployment rate daily minimum wage rates varied in the range of INR 371 to INR 432 as of July 2020.

Discussions and Recommendations:

We used a rigorous and transparent methodology to estimate India's national minimum wage based on a needs-approach. Our estimates on daily national minimum wage are in the close range of the Expert Committee's recommendations on Determining the Methodology for Fixing the National Minimum Wage, appointed by the Ministry of Labour and employment in 2019. We recommend that the methodology proposed in this study could be used to fix the national-level minimum wage in India, enhancing robustness and transparency in the fixation of minimum wage.

► I. Introduction

The minimum wage is considered a vital labour market instrument for improving living standards of wage earners and their families. The International Labour Organization (ILO) Resolution 2010 considers minimum wage a tool for social protection and poverty reduction (ILO 2014). The role of minimum wages in protecting the workers from unduly low wage payments is particularly exemplified in a country like India where overwhelmingly a significant proportion (more than 80%) of workers are employed in the informal sector (Ministry of Statistics and Programme Implementation [MoSPI] 2012). However, setting the minimum wage level and adjusting it regularly is perhaps the most challenging part of a country's minimum wage process. The Minimum Wage Fixing Convention, 1970 (No. 131) of the ILO emphasizes that setting-up of minimum wage in a country should result from evidence-based social dialogue, taking into account both the needs of the workers and their families and economic factors. The present study focuses on a methodology for measuring the needs of the workers and their families. It aims to test such an evidence-based and transparent "need-based approach" to fix minimum wages in India.

The 2019 ILO Centenary Declaration for the Future of Work inspires "adequate minimum wages, statutory or negotiated". Similarly, Convention No 131 calls for setting minimum wages after careful consideration of both social and economic factors. Furthermore, the ILO minimum wage policy guide also emphasizes the need for an evidence-based transparent methodology to fix minimum wages in a country (ILO 2014; Dickens 2015). Global experience on the fixation of minimum wages has been diverse. The mechanism for setting minimum wages may take various forms. Minimum wages are fixed by statute; decisions of the competent authority, with or without formal provision for taking account of other bodies; decisions of wages boards or councils; industrial or labour courts or tribunals; or giving the force of law to provisions of collective agreements. Whatever the mechanism, credible methodologies should be used to ensure that deliberations and arguments are supported

by evidence and conclusions are not driven by biases (ILO 2014).

Many countries have developed standard methods to estimate the needs of workers and their families. The Russian Federation uses a minimum subsistence threshold based on a consumption basket of food and non-food goods and services, including tax and other payments. The food component has differentiated caloric intake from 1,670 kcal (pensioners) to 2,730 kcal for male adults. Some regions have been assigned higher values of calorie intake due to the extreme cold weather. As in the Russian Federation, an official minimum consumer basket serves as a reference point to estimate the minimum wage in other countries¹. In Vietnam, the food component is crucial for estimating the cost of living concerning minimum basic needs. Brazil establishes that the minimum wage should be sufficient to cover basic living needs such as housing, food, education, sanitation, leisure, clothing, health, transport and social security. On the other hand, Malaysia uses the regional poverty line income (PLI) perworker to address the cost of living level, establishing a lower need-based threshold for setting the minimum wage criteria.

The idea of the population's minimum consumption needs is deeply grounded in the empirical literature on poverty estimation, particularly in developing countries. One of the basis of determining poverty line in developing countries (including India) has been the minimum expenditure required for purchasing a food basket providing a recommended level of nutrition, more specifically calories per person per day (Deaton and Kozel 2005) and an allowance for non-food consumption expenditure in a fixed ratio of food expenditure. Although the recommendations on adequate level calories intakes have been an issue of intense debate in the literature (Deaton and Dreze 2009), recent literature on poverty estimation in India has used approximately 2,250 K/cal per person per day (with allowing variations across rural and urban areas) as a norm to set poverty lines (Government of India [GOI] 2009; 2014). Nutrition and poverty literature also reflects considerable debates on the changing requirements of nutrition by the Indian population (Deaton and Dreze

¹ Argentina, Belarus, Central African Republic, Ecuador, Guatemala, Kyrgyzstan, Latvia, Nicaragua, Niger and Bolivarian Republic of Venezuela

2009). More recent literature emphasises a ‘balanced diet’ approach instead of focusing only on calories intakes. A ‘balanced diet’ approach mainly includes a range of macro- and micro-nutrients as the basic needs required for a healthy life (Food and Agriculture Organization of the United Nations [FAO] 2009; Indian Council of Medical Research [ICMR] 2010).

However, a worker’s minimum needs of food and non-food may differ from that of the general population as a worker needs to maintain required levels of work efficiency. The Indian Council of Medical Research (ICMR) recommends that an adult worker in the age group of 15-59 years involved in heavy work needs 3,490 K/cal per day (ICMR 2010). Various other institutions, including FAO, have also made similar recommendations. Since the ICMR (2010) recommends different levels of required nutrition for different age, gender and workload of individuals, the demographic structure of workers’ families will determine the levels of nutrition required for workers and their families. Similarly, the minimum need for non-food includes many items such as transportation, housing, clothing, fuel and electricity etc., to perform day-to-day activities at their work place. The Indian Labour Conference (ILC), in 1957, included clothing, house rent,

fuel, lighting and other miscellaneous items of expenditure in the formulae for calculating minimum wages (GOI 1957). The Supreme Court of India (SCI) further ruled to include health, education and recreation into the formulae for estimating minimum wages in India (Supreme Court of India 1992).

With this brief background on the mechanisms of fixation of minimum wages in India and minimum consumption needs, the present study aims to revisit determining workers’ minimum needs and their families and methodology to determine a “need-based” national level minimum wage rate in India. Using the broad framework of methods suggested by the ILC (1957) and the Expert Committee on Determining the Methodology for Fixing the National Minimum Wage in India (MoL&E 2019), the present study presents a range of alternative analyses on the minimum consumption needs of workers. Finally, it presents a range of National Minimum Wages (NMW) for policy consideration. In addition to the National level minimum wage, we also estimated minimum wages for two selected states, Jharkhand and Punjab, to advocate that the methods used in this study are replicable at the state level too.

► II. Evolution of minimum wage fixation mechanisms in India

India is a pioneer among the developing countries in establishing a minimum wage policy and evolving a mechanism of setting minimum wage levels. India enacted the Minimum Wage Act 1948 (GoI 1948) in the following year of Independence, ensuring workers in low-paid informal jobs were paid the minimum wage. However, the minimum wage for all groups of wage earners. Instead, India has the system of fixation of minimum wages for certain Scheduled Employments², where workers are not protected by collective bargaining mechanisms, as per the Minimum Wages Act of 1948. Since, labour and employment are subjects of the Concurrent List of the Constitution of India³, various scheduled employments fall under the domain of both federal and state governments. Accordingly, the minimum wage rates vary depending on the sector of employment and workers' skill levels. India currently has more than 1,900 minimum wage rates, 48 falling under the Central sphere (federal government) and rest under different state governments. Although the coverage of employment groups under 'Scheduled employment' category has increased over the years, only up to 76% of total workers in India is protected by the Minimum Wages Act 1948 (ILO 2018). Past studies also indicated that even if workers are covered in the 'Scheduled Employment' category, a large proportion of them are paid below the national floor level and state level minimum wages (Belser and Rani, 2011; Rani and Belser 2012).

The Minimum Wages Act of 1948 did not provide the exact criteria or norms for fixing or quantifying minimum wages statutorily. The latter became the biggest challenge to deal with for most minimum wage boards or tripartite committees. The mechanisms for setting minimum wage level for other scheduled employment was established in a tripartite Conference, the 15th Session of the Indian Labour Conference (ILC) 1957, participated by workers, employers and government representatives. The ILC (1957), for the first time, provided a broad framework for determination and fixation of the minimum rate of wages in India, which mainly recommended the fixation of minimum wage should be "need-based and should ensure the minimum human needs of the industrial worker, irrespective of any

other consideration" (GoI 1957). The minimum need of industrial workers was defined as expenditure required for a minimum intake of 2,700 calories of nutrition per day per adult person, clothing requirements of 72 yards per family per year, and a minimum of house rent and fuel, lighting and other miscellaneous items of expenditure all for a family of two adults and two children including a wage earner (See Box: 1).

Box 1: ILC (1957) recommendations for defining minimum needs of workers and their families

- the standard working class family includes a wife and two children apart from the earning worker (earnings of women, children and adolescent should be disregarded); an equivalent of three adult consumption units;
- a net intake of 2,700 calories per day per consumption unit, as recommended in 1948 by Aykroyd (Aykroyd 1937), first director of the Department of Nutrition at the United Nations Food and Agricultural Organization (FAO);
- clothing requirements of 18 yards per year per capita or 72 yards (65.8 metres) per year per family;
- a minimum housing rent charged by the government for low-income groups; and
- fuel, lighting and other miscellaneous items of expenditure to constitute 20 per cent of the total minimum wage.

Source: GOI 1957

The SCI Rulings further strengthened the mechanisms of setting the minimum wage rates in India, 1992 to include additional components (children's education, medical requirements, minimum recreation including festivals/ ceremonies and contingencies such as old age and marriage) as part of the minimum needs to account for 25 per cent of the total minimum wage (Supreme court of India 1992).

The mechanisms of fixation of minimum wage rates across different employment and different states were

² Scheduled employment is an employment specified in the list appended to the Minimum Wages Act 1948, updated from time-to-time. Federal and state government announce and update the list of scheduled employment in their respective areas for the purpose of fixation of minimum wages.

³ The Concurrent List of the Constitution of India includes subjects, which both federal and state governments can legislate on.

also contributed by various Committees, Commissions and Expert Groups over the years, including the first and second National Commissions on Labour (NCL), 1969 and 1999–2002, respectively.

The first National Commission on Labour (1969) believed that a uniform national minimum wage was neither feasible nor desirable, but that efforts should be made to fix regional minima comprised of different homogenous regions within the state (GoI 1969). It further stressed that when fixing the need-based minimum wages, the industry's capacity to pay will have to be considered. The Bhoothalingam Committee (1978) argued for adopting a binding National Floor Level Minimum Wage to ensure a uniform minimum wage for all workers (GoI 1978). In 1991, the National Commission on Rural Labour (NCRL) made recommendations to set up a National Floor Level Minimum Wage (NFLMW) to be fixed based on per day equivalence of the rural 'poverty line' and be updated from time to time, taking into account the rise in the consumer price index (GoI 1991). The NFLMW was implemented in 1996. Currently, it is fixed at INR 176 per day and is not a statutory binding measure but only advisory.

As the NFLMW couldn't effectively address the prevalence of undue low wages and wage disparities across states (ILO, 2018), the demand for a statutory minimum wage took further momentum and culminated with the government enacting the Code on Wages on August 8, 2019. The Code on Wages consolidates four wage-related regulations⁴, provides universal coverage to all employees, and makes a recommendation for a statutory floor wage (Code on Wages, 2019). The wage code states that the central government's statutory 'floor wage' will be fixed considering the worker's minimum living standards. Such a floor wage can be a single floor for the entire country or on a different floor for different geographical areas. Most importantly, the wage code puts a dynamic process wherein the state governments

are prohibited from setting their respective minimum rate of wages below the floor and will protect an additional 7.64 crore wage earners, not covered under the minimum wage regulation of 1948 (Satpathy et al., 2021).

As far as updating the minimum wage rates is concerned, the Labour Ministers' Conference, 1968, decided that minimum wages should be adjusted twice a year using the Consumer Price Index for Industrial Workers (CPI-IW) to address the changes in the cost of living over time. Since then, state governments have been updating the minimum wage rates for their respective states' employment schedules. Studies reflect that the state governments have very frequently lagged behind the updating of the rates as the latest data on the CPI-IW have been available from time to time, leading to gross inequalities in the wage rates across the states on the one hand and falling below the consumption needs of the worker on the other (ILO 2018).

Ministry of Labour and Employment, Government of India, also appointed an Expert Committee⁵ in 2018 to determine the methodology for fixing the National Minimum Wage (NMW), which may become a baseline minimum wage in India covering all workers - irrespective of their skills, sectors, occupations and rural-urban locations (MoL&E 2019). The Expert Committee submitted their report in early 2019, which recommended an evidence-based analysis for determining the minimum needs of workers and their families and, in turn, for the fixation of an NMW. The Committee recommended a NMW of INR 375 per day with five regional rates accounting for the levels of development and labour markets situations in 5 groups of states. The Committee using the broad framework of fixing the minimum wage rates as suggested by the ILC (1957), provides a detailed methodology grounded in the latest data and other information available.

⁴ Payment of Wages Act, 1936 ("Payment of Wages Act"), the Minimum Wages Act, 1948 ("Minimum Wages Act"), the Payment of Bonus Act, 1965 ("Payment of Bonus Act") and the Equal Remuneration Act, 1976 ("Equal Remuneration Act")

⁵ Authors of the present report were the members of the Committee.

► III. Methods

3.1. Data sources

As fixation of minimum wage level/s is a practical policy issue, not as such a theoretical exercise, the methods and estimations of minimum wages need to be grounded in data and evidence. The present study uses an array of nationally representative data from various sources. The primary data sources used in this study are briefly presented in this section as follows:

Consumer Expenditure Survey (CES) conducted periodically (mostly once in five years) by the National Sample Survey Office (NSSO), Ministry of Statistics and Programme Implementation, Government of India, provides detailed information on the current consumption pattern of households in India (NSSO 2011-12). The latest available CES is for the year 2011-12 (NSSO 68th Round). The survey collected information on the quantity consumed and expenditure incurred on a detailed list of food and non-food items of current consumption. The sample size of CES 2011-12 in 101,662 households (59,695 rural and 41,967 urban) covering all the states and districts of India. We used CES 2011-12 for estimating average monthly total consumption expenditure, the quantity of consumption of different food items, expenditure incurred thereon, and expenditure on non-food by households. The data was also used for estimating average nutrition (calories, fats and proteins) consumption by households by determining nutrient contents of food items as given in the NSSO report on “Nutritional Intake in India 2011-12” (NSSO 2014).

Periodic Labour Force Survey (PLFS) conducted by the NSSO for the year 2017-18 (NSSO 2017-18) was used to estimate the demographic structure of households, average household size and average consumption unit (also referred to as adult equivalent household size). PLFS 2017-18 covered a sample of 102,113 households and

433,339 individuals spread across rural and urban areas. For converting household size (number of all members in a household) to consumption units (adult equivalent household size), we alternatively used information on estimated coefficients for individuals in different age groups and gender as suggested by i) NSSO report on “Nutritional Intake in India, 2011-12 (NSSO 2014) and ii) FAO/WHO report on “Human Energy Requirements” (FAO/WHO 2001).

For the nutritional (calories, fats and proteins) content of different food items, we used information collated in NSSO (2014). The nutritional chart available in NSSO (2014) provides information on calories, fats and proteins content of 150 items of consumption, including tobacco and alcohol products. We used this information after merging a few food items (separately given for rural and urban areas) and excluding tobacco and alcohol products. We used a nutritional value of 135 food items per unit of quantity consumed. Here it is important to note that while the nutrient contents of most of the food items are provided per unit of quantity, for a few food items such as cooked and ready made meals, snacks and ‘other’ categories comprising of a mix of food items, the nutrient content is available per unit of expenditure. We made necessary adjustments for these food items while estimating the amount of nutrients intakes.

In addition, we used data on recommended nutrition intakes (calories, fats and proteins) as recommended by the ICMR dis-aggregated by age-sex and workload of individuals (ICMR 2010). We also used a similar FAO recommendation on calorie requirements by different age and sex individuals (FAO/WHO 2001).

⁵Reserve Bank of India handbook of statistics on Indian states as accessed on 20th November 2020
<https://m.rbi.org.in/Scripts/PublicationsView.aspx?id=20005>

3.2. Estimation of Minimum Needs

We estimated the minimum consumption needs of workers and their families, considering all consumption items covered in the CES 2011-12, separately under the two broad categories of consumption: i) food expenditure (FE) and non-food expenditure (NFE). Taken these two together (FE+NFE) constituted total consumption expenditure (TCE) needs of households.

$$TCE = FE + NFE \dots\dots\dots (1)$$

The types of food consumed by workers are supposed to provide work efficiency to workers. Simultaneously, the amount of expenditure on non-food items may represent the quality of non-food expenditure by workers. In the following paragraphs, we present strategies for estimating minimum consumption needs for the two categories of consumption.

3.2.1. Nutrition requirements and adult equivalent consumption unit:

As a first step towards defining the food component of the minimum needs of workers and their families, we computed the average requirements of nutrients per adult person per day at the all- India level. Although most literature on minimum wages and nutritional requirements of workers focus on calories (ILC 1957), we propose a 'balanced diet' approach by including minimum requirements of proteins and fats along with calories. Although the balanced diet concept includes many other micronutrients such as iron, vitamins, calcium, zinc, folic acid, etc., for simplicity, our methods only considered three major nutrients – calories, proteins, and fats (FAO-WHO 2009).

We estimated per adult person equivalent nutritional requirements using ICMR (2010) recommendations on nutritional intakes and household survey data. Nutritional need of an adult age 15-59 years were considered per adult person equivalent nutritional requirements. However, since ICMR (2010) recommends nutritional

requirements for an adult person according to the types of work a person is engaged with (See Appendix Table A-I), we estimated weighted (by the proportion of the population) adult equivalent nutritional requirement over types of work: i) sedentary, ii) moderate, iii) heavy and iv) non-workers.

One of the most critical issues with NSSO 2011-12 (CES) is the survey collected food consumption data (quantity consumed and expenditure) at household levels and not at individual levels. We used a scale of "consumption unit" (CU) as suggested in NSSO (2014) to estimate per consumption unit consumption and expenditure. The method converts the individuals in a household into male adults (between 20 and 39 years old) equivalent using an "adult equivalent energy intake" (AEEI). As an alternative, we also used a similar FAO recommendation (FAO/WHO 2001). Appendix Table A-IIa and A-IIb present the consumption unit scale. Using the AEEI scales from NSSO (2014) and FAO/WHO (2001), nutritional contents of food items from NSSO (2014) and consumption of food items from CES 2011-12, we estimated per consumption unit per day nutritional intakes of calories, fats and proteins, ' n_{pcu} ' as presented in equation (3).

$$n_{pcu} = \frac{f * N}{CU_h} \dots\dots\dots (3)$$

Where, $CU_h = \sum K_{cal_i} / K_{cal_{m20-39}}$; ' f ' is a portion (quantity) of food items consumed by a household, ' N ' as the nutrient content (calories, fats and proteins), CU_h is the total consumption unit in a household, K_{cal} is the calorie requirement of an individual ' i ', and ' $m20-39$ ' is male in the age group of 20-39 years.

3.2.2. Estimating the minimum cost of a food basket with a balanced diet:

The information on normative nutritional requirements (calories, fats and proteins), the nutritional content of food items, behavioural current consumption pattern,

and unit prices of food items can derive a minimum cost required for workers and their families' recommended nutrition level.

We estimated the minimum cost required for purchasing a food basket complying balance diet by observing the households' consumption pattern in the lowest fractile (20 equal groups based on per person total consumption expenditure) subject to meeting the nutritional norms. This essentially implies that we identify the lowest fractile groups using the survey data that met the balanced nutritional norm. This identified the fractile group's average food expenditure, which in turn represented the minimum food expenditure required for purchasing the consumption basket with the recommended nutritional norms.

Alternative method: A linear programming solution

As an alternative to fractile group based solution and as a robustness check, we used the methods of solving a 'linear programming problem' (LP) to estimate the minimum cost of the food basket meeting the minimum nutritional norms. We used implicit prices (expenditure incurred divided by quantity consumed) for different food items recorded in the NSSO data and ICMR (2010) recommendations on nutrients intakes (for calories, fats and proteins) as constraints to estimate the minimum cost of a food basket meeting the nutritional norms. In general, LP solutions are known to provide an 'optimal minima' with the kind of food basket that may not be genuinely culturally representative. To address this, we applied the current average consumption pattern of different food items by all households as additional constraints (call it cultural constraints) (Mahal and Karan 2007; Darmon 2002a, 2002b), also known as 'lower bound' in LP literature. The LP solution of the food basket was arrived at using the set of equations (4).

$$\min C = F' \cdot P_i \dots\dots\dots (4a)$$

Subject to:

$$n_{ij} \cdot F_i \geq N_j \dots\dots\dots (4b); \text{ and}$$

$$(F_i \geq 0) \dots\dots\dots (4c)$$

Where C is an objective cost function to minimize; F and P are vectors of quantity and respective prices of different food items, 'n' is the amount of the nutrient per unit of individual food items, and N is a vector of Recommended Nutritional Allowance (RNA) of nutrients.

We used a cultural constraint on the consumption of different items in equation (4) by replacing '0' (in eq. 4c) with minimum culturally acceptable values of different food items. We used the objective function (price vector) and cultural constraints of consumption pattern for three different population groups: i) average of all households, ii) 65th percentile (65-70%) households and iii) 75th percentile (75-80%) households. The rationale of using 65th and 75th fractile as representative fractile groups emanates from the fact the the median class in most low and middle inclem countries actually is weighted disproportionately by consumption pattern of lower fractile groups. For a representative nutritional basket, higher than the median class may represent required nutritional intakes. Studies have estimated this representative nutritional basket by using 25th and 75th percentiles as the 'lower' and 'upper' bounds of the constraints in the LP solutions (Mahal and Karan 2007). More details on the exact specification under different equations are provided as an Annexure.

3.2.3. Non-food expenditure:

The second component of the total consumption expenditure of a household is non-food expenditure. To determine the minimum required levels of non-food expenditure, we used the broad framework and guidelines as suggested by the ILC 1957 and the SCI judgement 1992

on the types of non-food items that should be considered for estimating total non-food expenditure needs. Besides, we also used the broad methods suggested by the Expert Group to Review the Methodology for Measurement of Poverty (Rangarajan) (GoI, 2014) for classifying the non-food items into two categories: 'essential' and 'other'.

We classified all the non-food items as reported in the CES 2011-12 into two broad categories: i) essential (NFE_e) and ii) other (NFE_o). 'NFE_e' included clothing, fuel and light, house rent, education, medical expenses, footwear, and transport (or conveyance). The 'NFE_o' group included all other non-food items of usual expenditure such as recreation, festivals/ceremonies and provision for marriage expenditure, within year expenditure on purchase and maintenance/repair of consumer durables, taxes paid as reported in the CES 2011-12⁶. Following the Rangarajan Expert Committee Report (2014) methodology, we used the average monthly expenditure of the median class (50th percentile) of the consumption distribution as the representative non-food expenditure for essential non-food items. For the second group – other non-food items – the poverty level fractile (the fractile group in which Rangarajan Committee based poverty line falls) may represent the reasonable average expenditure on other non-food items⁷. Accordingly, the need-based total non-food expenditure of workers' families is obtained by adding the two groups' expenditure together as follows:

$$NFE_h = NFE_{e_med} + NFE_{o_pov} \dots \dots \dots (6)$$

Where 'med' is the median class, and 'pov' is the poverty line, fractile group.

In the non-food category, expenses on housing occupy central importance. UN-Habitat (2019) emphasises that a decent place to live removes the barriers to opportunity, success and health. The need-based approach of

estimating minimum wage considers expenditure on housing irrespective of whether workers own or rent a house (ILC 1957; Anker and Anker 2017, Maitre 2019). Studies in the past used different methods to estimate the cost of housing for workers. For instance, Maitre (2019) for estimating cost of housing in Vietnam used the level of decency of the houses using a scoring system based on the housing characteristics available in the Vietnam Living Status Survey data 2016. The study used the relationship between the level of decency and the rent to estimate the cost of adequate housing which is identified using national and international standards on adequate housing characteristics. India's minimum wage considers the rental value of government-provided low-cost housing to the poor population (ILC 1957). Other studies used a normative value of low-cost housing, including the cost of utility services. A recent study by Maitre (2019) attributed the value of rent equivalent was estimated using the information on house structure and basic infrastructure in household survey data. As in most household surveys, the rent value of housing in the CES 2011-12 (NSSO 2011-12) is highly under-reported. Only 7% of households in rural and 37% of households in urban areas reported direct housing rent payment. This is because most households (including those depending on wage labour for their livelihood) either owned a house or lived in shared accommodation where more than one household/worker shared rent payment. The latter is particularly true for low paid wage workers who often live in slums or similar clumsy locality. However, CES 2011-12 provided information on imputed rent for homeowners in urban areas. We estimated rent allowance for workers by considering both actual rents paid for renting families and imputed rent for homeowners.

⁶ Other non-food items of usual consumption include: entertainment, durable goods, toilet articles, other household consumables, consumer services excluding conveyance, and consumer taxes.

⁷ The Rangarajan Expert Committee (2014) considered the sixth fractile for other non-food items, mainly because the poverty-level calories, proteins and fats intake norms were met by households in the sixth fractile group.

3.3. Estimation of Minimum Wage

Once the minimum needs of workers and their families are estimated, the minimum wage rate can be fixed so that the minimum wage must cover all the minimum needs of workers and their families. This essentially implies that wage workers must be given a wage to cover the minimum consumption needs of his/her families to maintain work efficiency and a reasonable level of living. However, the workers’ family may have more than one wage worker. Hence, a standard minimum wage rate per worker must adjust for the average number of wage workers per family. However, in that case, we also need to consider the availability of days of employment for wage workers. This requires upscaling the minimum wage so that the per worker earnings must be sufficient to meet the total consumption expenditure within the available days of employment to wage workers. We up-scaled the estimated minimum wage rates taking into account the average working hours of workers and adjusting it to full time standards. We considered at least 48 hours of

work per week to estimate full time employed workers. The minimum wage rate for wage worker, hence, can be computed as follows:

$$MW = \frac{TCE \cdot (1 + \frac{U}{100})}{N} \dots\dots\dots (6)$$

Where MW is the minimum wage rate, TCE is the total household consumption expenditure need of workers, N is the average number of wage workers per family, and the U is underemployment rate estimated as number of hours unemployed as a ratio of full time employment of 48 hours.

Further, there is a need to account for weekly off for workers. Workers must be allowed at least one day off per week with the full wage paid. If the minimum wage rate is fixed at a daily rate, equation (5) must be adjusted (multiplied) with a ratio of (30/26) for covering household expenditure for 30 days with 26 days of wage.

▶ IV. Results

We present our results on the estimated average household size and consumption units and the average number of wage earners per household among different types of households classified based on the primary source of livelihood (Table 1). Among different types, households drawing their main livelihood from wage labour (regular and casual wage earners taken together) constitute approximately 43% of all households. Also, most households depending on casual wage labour for their livelihood belong to poorer economic stratum and less advantaged social groups (Appendix Table A-III). The average household size is estimated to be 4.2, which translates into 3.4 consumption units using the

adult equivalence scale as provided in NSSO (2014). The average consumption unit per household using the “Adult Equivalent Energy Intake” (AEEI) as recommended by FAO/WHO (2001) is estimated to be marginally higher, compared with NSOO 2014 based estimate, as 3.5. Average household size and consumption units are the highest among the self-employed in agriculture households, followed by self-employed in non-agriculture households. The average total number of workers per household is 1.4, and approximately half of them (0.68 per household) are wage workers. However, the number of wage workers among the households drawing their livelihood mainly from wage labour is estimated to be approximately 1.4.

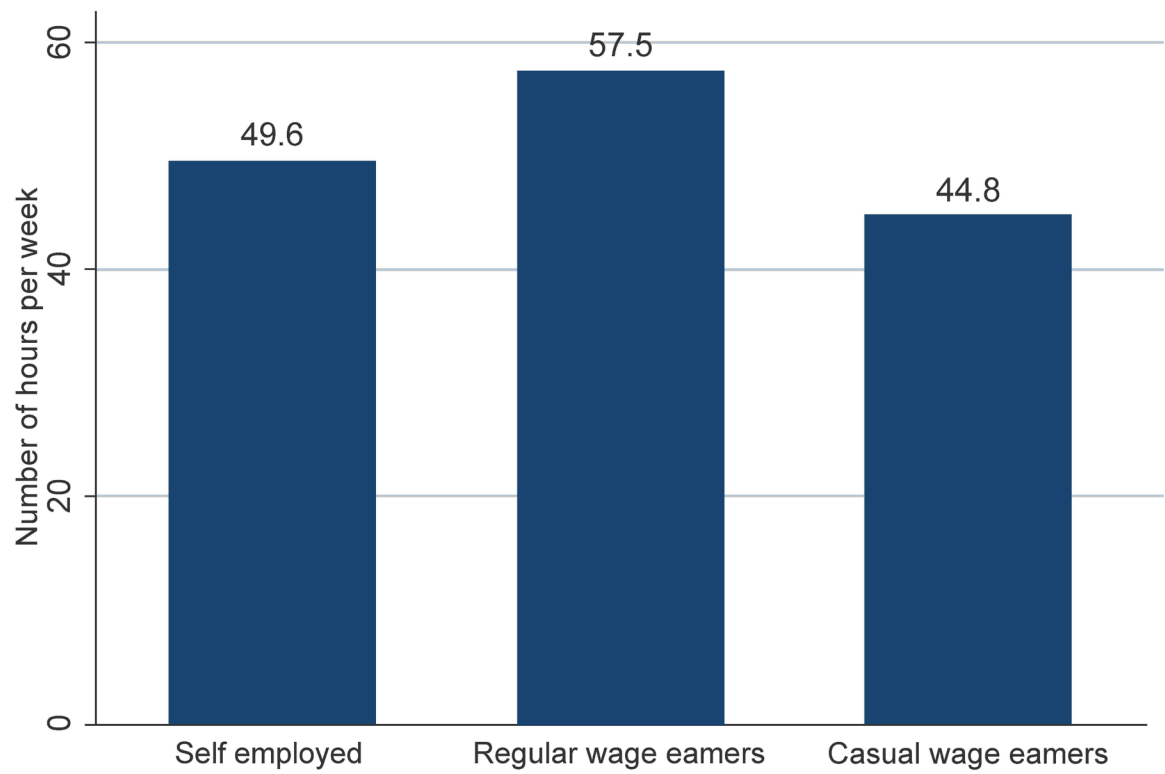
Table 1: Average household size, consumption units and number of wage workers across different types of households

Types of households	Household size	Consumption Unit (ICMR)	Consumption Unit (FAO)	Number of workers	Number of wage workers
Self-employed in agriculture	4.70	3.82	3.90	1.70	0.16
Self-employed in non-agriculture	4.51	3.67	3.74	1.51	0.24
Regular wage earnings	4.12	3.34	3.43	1.48	1.32
Agriculture labour	3.98	3.23	3.29	1.64	1.56
Other casual labour	4.40	3.58	3.58	1.50	1.36
Any wage work	4.18	3.39	3.45	1.52	1.38
Others	2.46	1.84	2.04	0.15	0.08
Total	4.18	3.38	3.46	1.41	0.68

Notes: 1. types of household are classified based on their primary source of earnings; 2. number of workers are estimated ‘using principal status’ of individuals.

Source: PLFS 2017-18

Figure 1: Weekly average number of hours worker employed by employment status of workers



Source: PLFS 2017-18

Further, casual wage workers are employed on an average for approximately 44.8 hours per week (Figure 1). Considering 48 hours of employment per week for daily wage-earning, casual wage workers are underemployed by a daily margin of 3.2 hours per week on average. This essentially implies a 6.7% underemployment rate among casual wage earners.

4.1. Estimation of Minimum Food Expenditure

Results on average per consumption unit per day nutrients (calories, fats and proteins) intake and monthly expenditure on food by fractile groups are presented in Table 2. Average per consumption unit per day intakes of calories, fats and proteins are estimated to be 2,522 K/cal, 54 gms and 68 gms, respectively. The per consumption unit food expenditure for the entire population is INR 871 monthly.

Table 2: Per consumption unit per day calories, fats and proteins intakes and monthly food expenditure by fractile groups

Fractile group	Nutritional intakes			Food expenditure (INR per month)	
	Calories (K/ cal per day)	Fat (gms. per day)	Protein (gms. per day)	All households	Only households meeting the nutrient norm
1	1977	27	52	390	463
2	2131	33	56	491	559
3	2195	37	59	556	640
4	2263	40	60	599	668
5	2335	43	63	643	699
6	2383	45	64	678	732
7	2405	48	64	723	776
8	2453	50	66	761	810
9	2489	52	67	801	852
10	2533	54	68	839	889
11	2558	56	69	873	924
12	2600	58	71	918	962
13	2671	61	73	968	1014
14	2706	63	74	1028	1091
15	2723	65	74	1067	1128
16	2765	68	76	1124	1193
17	2866	72	79	1224	1283
18	2948	78	82	1343	1415
19	3097	84	86	1530	1619
20	3470	98	97	2120	2214
Total	2522	54	68	871	1078

Sources: NSSO 2011-12 and nutrition content of food items NSSO 2014

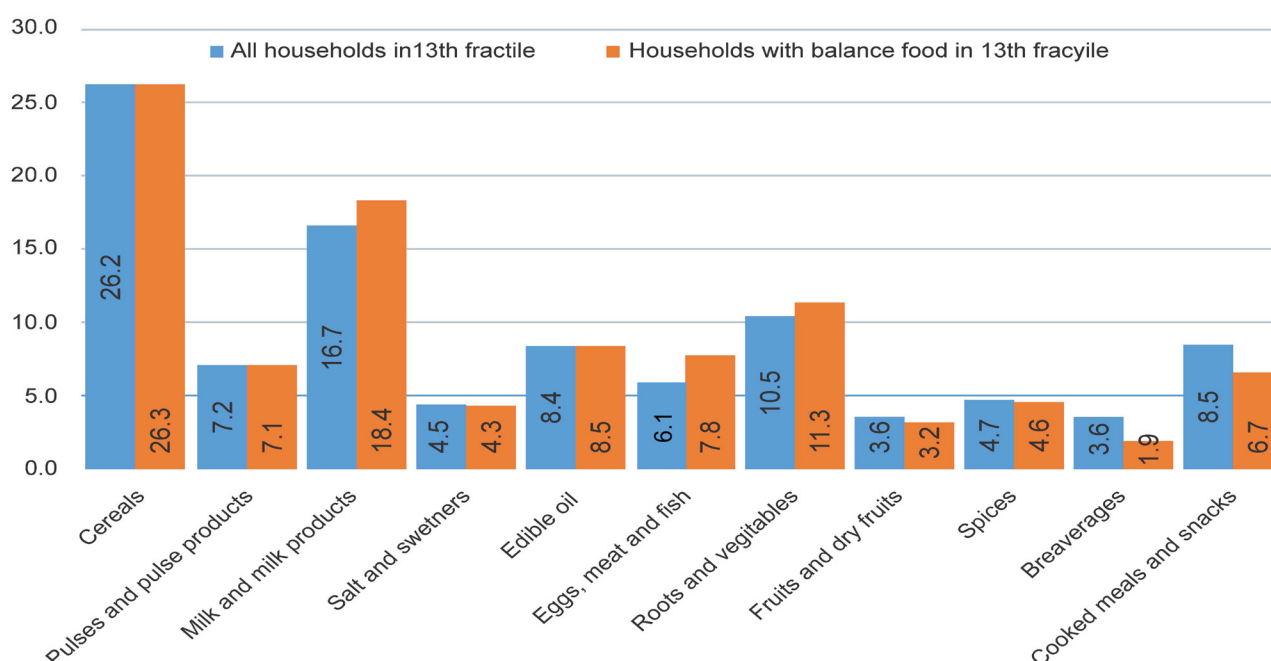
Using the PLFS 2017-18 data and the ICMR recommendations on nutritional intakes, per adult equivalent person requirements of calories, fats and proteins for wage earning households are estimated to be 2,654 k/cal, 29 gms. And 60 gms. respectively (see Appendix Table AI). Table 2 reflects that the lowest fractile meeting these thresholds is the 13th fractile. The average per consumption unit expenditure on food by all households in the 13th fractile is INR 968. We also estimated food expenditure only for households meeting

the nutrients norms in each fractile group. Such households are present in each of the fractile group. However, since the 13th fractile is the lowest fractile that meets the required nutrient norms average, we consider this group's food expenditure as a representative consumption pattern with the minimum expenditure. If we consider only those households in the 13th fractile who met the nutrients norm, the food expenditure is estimated to be INR 1014 per consumption unit per month.

The food baskets of the households in the 13th fractile with and without balance food are similarly the same except that the households consuming balance food spent a little higher share of their food expenditure on 'milk and milk products', 'eggs, meat and fish', and 'roots and vegetables' as compared to that among all households in the 13th fractile (Figure 2). This also led to an overall higher per consumption

unit monthly expenditure on food items by households consuming balanced food than other households in the 13th fractile. The per consumption unit monthly quantity consumed and expenditure incurred by broad food items is presented in is available with authors and can be accessed on request.

Figure 2: The percentage share of food expenditure on different food groups by all households and households with balance food in the 13th fractile.



Source: NSSO 2011-12

LP solutions

As an alternative to the fractile based estimates of food expenditure, we also estimated the minimum cost of a food basket meeting the minimum levels of nutritional norms using LP methods. We estimated each food item's implicit price from the NSSO 2011-12 data and using the nutritional norms as constraints and additional constraints of palatability of food basket. We estimated a food basket with per consumption unit of quantity of food items meeting the nutritional norms set as the constraints.

We estimated the results under three different scenarios of implicit prices and consumption pattern: i) average for all households, ii) households in 65th percentile (65-70%) and iii) households in 75th percentile (75-80%), as follows:

The per-consumption unit's monthly expenditure on food under the four different scenarios are presented in Table 3.

Table 3: Linear programming solution on per consumption unit monthly food expenditure

Households	LP solution*
All households	840.07
65 th percentile	927.84
75 th percentile	1189.47

Note: * per consumption unit monthly expenditure (INR) on food

Source: Authors' estimate using CES 2011-12

Appendix Table AIII presents the food basket with several food items and the related implicit prices and total expenditure per consumption unit per month for all households. The LP solutions vary from NR 840 on the lower side to INR 1,189 on the higher side, depending on the types of implicit prices and consumption constraints used. The LP solution for the 65th percentile (INR 928) is closer to the value of food expenditure estimated using the fractile approach (INR 968).

4.2. Estimation of Minimum Non-food Expenditure

Next, we present estimates on non-food expenditure classified into two categories, 'essential' and 'other' (Table 4). The total per consumption unit monthly expenditure on non-food items is estimated to be INR 1,093. A little less than 70% is classified under the essential category (INR 748) and the rest in the 'other' category (INR 345). Per consumption unit monthly expenditure on main non-food items included in the two categories are presented in Appendix Table A-IV.

Table 4: Per consumption unit monthly non-food expenditure classified into essential, others and total by fractile groups

Fractile group	Essential	Other	Total
1	208	79	288
2	270	107	377
3	311	127	438
4	351	148	499
5	386	159	545
6	420	175	594
7	463	194	657
8	498	212	709
9	548	225	773
10	591	249	839
11	645	268	913
12	685	294	979
13	760	320	1081
14	833	367	1199
15	918	401	1320
16	1021	451	1471
17	1189	531	1719
18	1459	672	2131
19	1992	959	2950
20	3534	2151	5685
Total	748	345	1093

Source: CES 2011-12

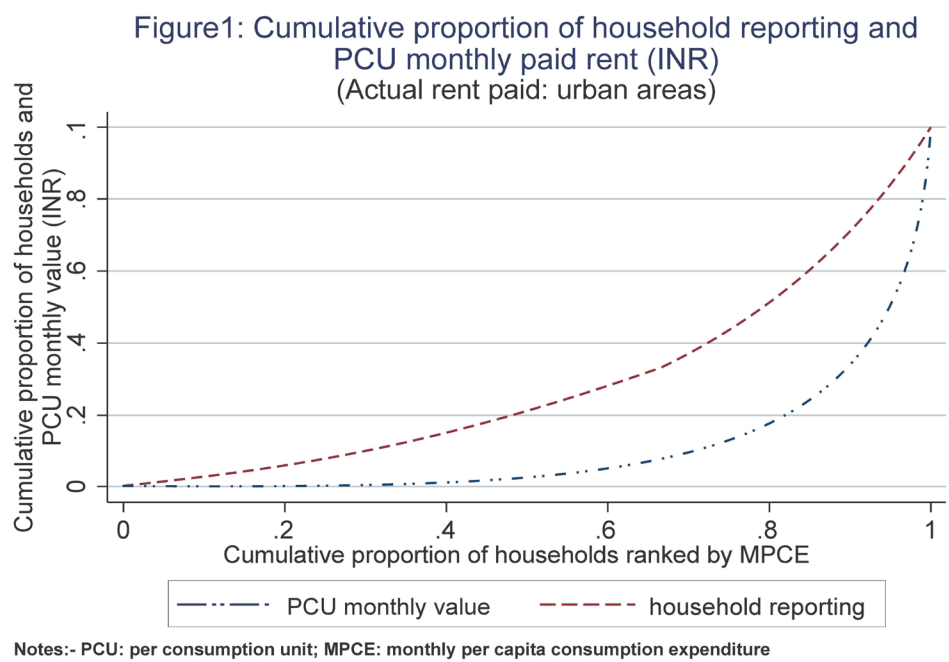
The per consumption unit monthly value for the essential group of non-food items in the median class distribution is INR 591. For the other non-food items, we consider the 6th fractile as the representative expenditure (INR 175) to estimate the minimum wage. As per the Expert Group (Rangarajan) poverty line basket, it is essential to mention that the poverty line basket is located in the 6th fractile for rural areas (GOI 2014). Taken these two together adds up to per consumption unit monthly INR 766 (591 +175), which will constitute minimum wage.

Rent allowance:

The cost of housing is one of the most essential components of non-food expenditure for workers and their families. The non-food expenditure, as presented in Table 4, includes house rent of INR 43.4 monthly per

consumption unit grouped in the ‘essential’ category. This translates into approximately monthly INR 152 per household. By any standard, this is an abysmally low value. This is mainly because an overwhelmingly large proportion of households didn’t report house rent expenditure, either because most households reside in their own house or live without paying rent otherwise. As a result, reporting on rent is highly skewed in favour of wealthier households. We plotted the cumulative proportion of households and per consumption unit monthly value of rent as against the cumulative proportion of households ranked by households’ total consumption expenditure, which reflects that both percentage of households and value of rent increases sharply among the top 25% of households based on total household consumption expenditure (Figure 3).

Figure 3: Cumulative proportion of households reporting and per consumption unit value of monthly paid rent (INR)



Source: NSSO 2011-12

This implies that the value of rent estimated for the median class of distribution is meagre (INR 43 monthly per consumption unit, rural and urban combined). However, the minimum wage must provide a reasonable allowance for housing even if

workers live in rent-free houses (Anker and Anker 2017; Maitre 2019). NSSO collected data on the imputed rent of houses if households are residing in their own homes in urban areas. The average value of such imputed rent should be part of minimum wages.

Table 5 presents the percentage of households reporting rentals if households rented a house and imputed rent if households resided in their own houses and the average value of monthly rent and imputed rent per consumption unit. Approximately 7% and 37% of households in rural and urban areas reported paying any house rent with average per consumption unit monthly rent paid estimated as INR 138 and INR 668. The median rent paid

was INR 51 in rural and INR 387 in urban areas. However, the values of imputed rent in urban areas are significantly higher and increases with fractile groups. On average, the imputed rent in urban areas area is estimated to be monthly INR 833 per consumption unit, with the median imputed rent being INR 701 monthly per consumption unit.

Table 5: Percentage of households reporting an average per consumption unit monthly rent and imputed rent (INR) for reporting households, 2011-12

	Percentage of households reporting				Average per consumption unit monthly value (INR) of rent*			
	Rent paid		Imputed rent		Rent paid		Imputed rent	
	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
Fractile								
1	3.3	12.7	--	85.7	2.2	94.5	--	177.2
2	3.7	16.2	--	83.4	5.9	124.1	--	243.0
3	4.7	19.7	--	80.3	8.3	149.9	--	285.9
4	4.7	22.7	--	77.5	5.5	182.8	--	324.6
5	3.8	26.1	--	74.4	11.8	213.4	--	389.0
6	5.3	26.0	--	72.5	14.0	253.1	--	449.3
7	5.3	26.1	--	72.8	23.0	302.2	--	517.1
8	5.3	32.0	--	68.3	25.8	321.2	--	565.7
9	4.9	30.9	--	69.5	31.3	351.0	--	595.4
10	6.0	37.4	--	63.2	50.8	387.3	--	700.9
11	5.9	40.4	--	59.3	43.6	458.4	--	734.1
12	5.7	41.9	--	57.7	54.0	458.2	--	834.2
13	5.6	42.5	--	56.5	99.7	535.4	--	969.5
14	5.7	42.6	--	55.9	80.4	593.3	--	1001.3
15	5.5	50.1	--	51.7	97.6	639.2	--	1324.7
16	7.1	50.8	--	45.8	174.1	702.7	--	1363.9
17	7.9	49.3	--	52.6	183.4	850.9	--	1604.1
18	7.7	51.5	--	51.5	220.1	1033.7	--	2114.3
19	12.0	54.0	--	50.5	343.9	1555.5	--	2930.8
20	24.9	65.3	--	41.1	615.5	3090.6	--	6140.1
Total	6.8	36.9	--	63.5	137.8	667.6	--	833.1

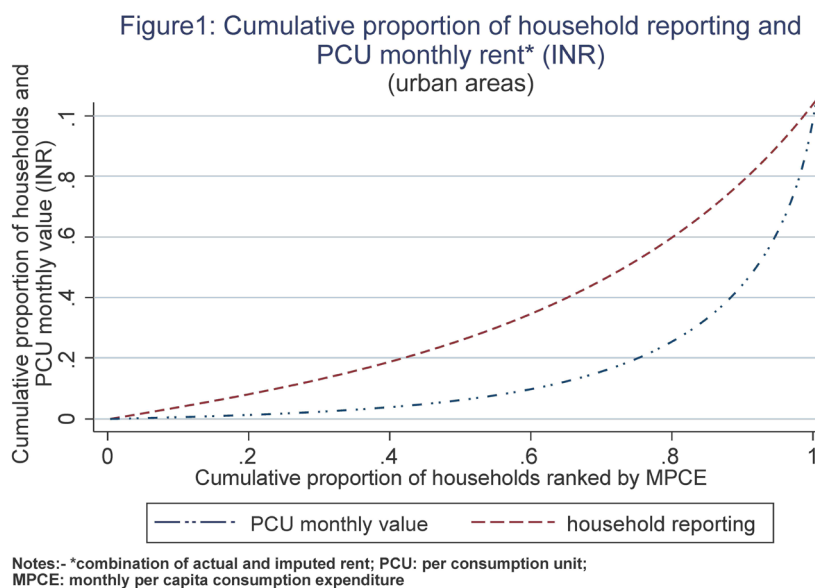
Notes: *for reporting households; -- Not available;

Source: NSSO 2011-12

We estimated rent in urban areas as the combination of rent paid and imputed rent only for the reporting households in the respective categories (rent paid or imputed rent). The estimated rent still increases with fractile groups reflecting that wealthier households, in

general, reported higher rent (Figure 3). However, the percentage of households reporting either actual or imputed rent and the value of rent reflects a somewhat better distribution than only actual rent (Figure 4).

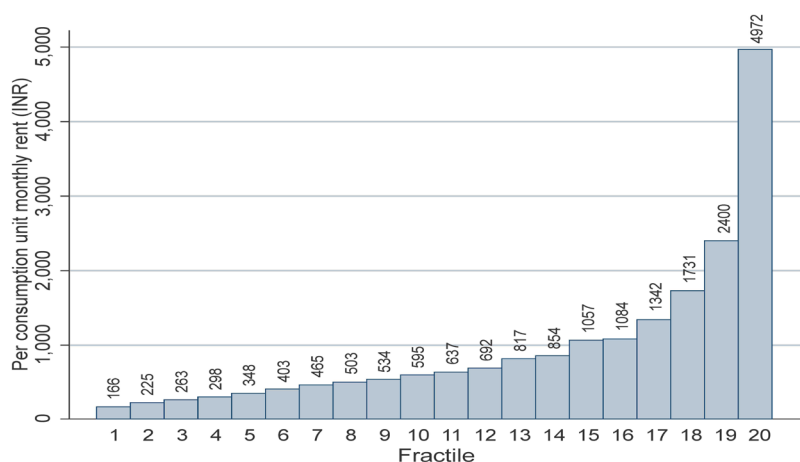
Figure 4: Cumulative proportion of households reporting and per consumption unit monthly value (INR of reported and imputed rent in urban areas)



Source: NSSO 2011-12

The average per consumption unit monthly rent is estimated to be INR 793, with INR 595 for the median fractile. At the household level, this amounts to be INR 2,100 per month for the median fractile and INR 2,800 monthly for all households taken together (Figure 5).

Figure 5: Per consumption unit monthly estimated* rent in urban areas



Note: * combination of rent paid and imputed rent

Source: NSSO 2011-12

Since INR 43.4 monthly per consumption unit is already included as rent allowance in the non-food expenditure estimates, we make an additional provision of INR 552 (595-43) monthly per consumption unit to be included in the non-food expenditure to estimate minimum wage.

4.3. Estimation of Minimum Wage

We finally present the results on the daily minimum wage rate (Table 6). Using different approaches used to estimate food expenditure, we present a range of workers and their families' food and expenditure needs. As mentioned earlier in the food expenditure section, the range per consumption unit per month food expenditure needs varied from a low of INR 840 to INR 1,190 on the higher side in the year 2011-12. We add together non-food expenditure, (INR 591 in the essential category, INR 175 in other and additional allowance for rent (INR 522) and estimated total consumption expenditure need of workers and their families. The total consumption expenditure needed for workers and their families is estimated in the range of INR 2,128 to INR 2,478 monthly per consumption unit at 2011-12 prices.

After accounting for inflation from 2012 to 2020 (67% increase in the consumer price index for industrial workers [CPI-IW]), the total per consumption unit monthly consumption expenditure needs ranged between INR 3,554 to INR 4,138, which translate to monthly INR 12,468 to 14,484 per family, considering an average 3.5 consumption unit per family. Since workers need to earn this in 26 days of working, the daily minimum wage rate

is estimated as ranging between INR 478 to INR 557 as of January 2020. Further, if we discount the daily wage rate by the average number of wage workers per household and adjust for the current prevailing underemployment rate (7%)⁸ among casual wage workers, the daily minimum wage rate, as of January 2020, varies between INR 371 on the lower and 432 on the higher side.

We replicated the methods for two states, Punjab and Jharkhand. Analysis of demography (age and gender) and work types suggest that the nutrients requirements for the two states remained approximately the same as for all India. However, the fractile groups which met these nutrient requirement were 14th in Punjab and 10th in Jharkhand. Also, the average number of workers per household and under-employment rates were different in Punjab and Jharkhand as compared with the all India average (see Appendix Tables A-V and A-VI). In addition, we also replicated the linear programming solutions for estimating the needed food expenditure for these two states. Using these information estimation of a range of minimum wages in the two states are presented in Appendix Tables A-V and A-VI. Daily minimum wage in these two states varied from INR 412 to INR 465 in Punjab and INR 378 to INR 419 in Jharkhand.

Table 6: Food and non-food expenditure need of workers and estimation of daily wage rate as of January 2020

		Fractile based		LP* solution		
		All hh in the 13 th fractile	hh meeting nutritional norm in the 13 th fractile	All households	Households in the 65 th percentile	Households in the 75 th percentile
Per CU** per month						
Food expenditure		968	1014	840	928	1190
Non-food expenditure	Essential	591	591	591	591	591
	Other	175	175	175	175	175
	Additional rent	522	522	522	522	522
Total expenditure		2,256	2,302	2,128	2,216	2,478
Adjust for inflation # at January 2020	67% since 2011-12	3,768	3,844	3,554	3,701	4,138
Upscale for per household	3.5 CU per household	13,186	13,455	12,438	12,953	14,484
Per day						
Adjust for number of wage workers per household	1.38 wage workers per household	368	375	347	361	404
Adjust for under employment rate##	7% in 2017-18	393	401	371	386	432

Notes: * Linear programming; **CU is consumption unit; # using the consumer price index for industrial workers (CPI-IW); ## using current weekly status (CWS) unemployment rate among casual workers concerning 48 hours per week (NSSO 2017-18)

⁸ Unemployment rate for casual workers was estimated as percentage shortfall in hours of work per day with a reference to 8 hours a day being fully employed

► V. Discussion and Recommendations

Despite several policy guidelines and directions available for setting minimum wage (ILC 1957, ILO 2014), setting the minimum wage levels and adjusting the same regularly has been one of the most challenging tasks of the minimum wage process globally. It is often argued that minimum wages can be ineffective if they are set too low. There is a risk of inflation and unemployment, and low compliance if set too high (ILO 2016). Arguments are also extended to support a national and straight forward minimum wage level in contrast to too many different rates arbitrarily set in different regions and for different types of workers (Ghose 1997; Rani and Patrick 2012). Using nationally representative data and broad policy guidelines, the present study attempted to develop and test a transparent and replicable methodology for setting a national level minimum wages, based on a needs-based approach, in India.

Despite India being a pioneer in enacting the minimum wage law (The minimum Wage Act 1948), there has not been a national minimum wage in India and federal and state governments continued to set different minimum wages rates depending on the state and nature of employment. In the background of recently enacted the Code on Wages in 2019 (MoLE 2019) in India, our methods used in this study and the findings carry particular importance as the method can be used to fix a floor level minimum wage which is independent of location and types employment. The methods used in the present study is a 'need-based approach', which considers a minimum level of food and non-food requirements of workers and their families for maintaining their work efficiency.

We estimated workers' minimum needs as the minimum expenditure required separately in two categories a) food and b) non-food. Estimates on food expenditure are based on minimum nutritional (calories, fats and proteins) requirements, as recommended by ICMR (2010) and FAO/WHO (2001) for maintaining the work efficiency of workers. The minimum cost of purchasing a food basket meeting the recommended nutritional norms varied in

a close range of per consumption unit monthly INR 840 on the lower to INR 1,190 on the higher side depending on the approaches used estimating the minimum cost. For estimating the non-food requirements, we used a framework suggested by the Expert Group (Rangarajan) on Poverty (GoI 2014). However, we made an additional allowance for housing and added estimated imputed rent in urban areas to the total non-food expenditure. The estimated minimum wage per day per worker varied in the range of INR 371 on the lower and INR 432 on the higher side.

This study broadly used the Expert Committee's methodology on Determining the Methodology for Fixing the National Minimum Wage (MoL&E 2019). However, we updated the nutritional requirement norms using the latest evidence available from PLFS data (NSSO 2017-18) and present additional analysis of a food consumption basket's minimum cost using fractile-based and linear programming analyses. Our estimates on food expenditure are relatively lower compared to those in the Expert Committee report. However, the estimates on non-food expenditure in the present study are higher compared to the Expert Committee report mainly because we, in the present study, analysed imputed rent data and made an allowance of additional rent in the non-food category. Taken the food and non-food together and adjusting the consumption need with inflation, the average number of wage workers per households. The current underemployment rate, our estimates on daily minimum wage are in the close range of what was recommended by the Expert Committee (MoL&E 2019). The Expert Committee (MoL&E 2019) recommendation on the national minimum wage was INR 375 per day as of July 2019, which was worked out to be INR 413 as of January 2020. The upper range of our estimates is INR 432 per day as of January 2020. The lowest estimate in the present study (INR 371) is 10% lower (INR 42 per day) than the Expert Committee recommendations. We argue that the range of the rates (from 371 to 432) can be considered for further consultation with stakeholders to fix the minimum wage floor level.

Studies have also highlighted a need for regional level national minimum wage. The minimum wage can take care of regional level socio-economic and cultural factors (MoL&E 2019). The methods used in this study is replicable at the regional level with regional level prices of food and non-food items incorporated in the analysis while keeping the consumption basket unchanged derived as the national average. We argue that estimating the consumption basket at the regional level has the risk of lowering the basket's value for the more impoverished region.

Several countries have tried linking minimum wages with the minimum needs of workers and their families in the past. However, most of the existing methodologies using the need-based approach used normative yardsticks (ILC 1957; Anker and Anker 2017). Our first depart in the methodology is we grounded the estimation of the minimum need of workers in empirical data on current consumption patterns (both food and non-food) of households in India publicly available from international reputed agencies, instead of using a normative approach. Hence, the methods used in this study is fully transparent and replicable. A second depart of our methodology is that we delinked the estimation of the need of workers from poverty level consumption which was the main criteria for fixing the NFLMW as suggested by the National Rural Labour Commission (GoI 1969), and a formulae based approach used in other countries (Reference:

Malaysia). Thirdly, in contrast to the existing methods, we also incorporated the number of wage workers per family and prevailing underemployment rate in estimating the minimum wage rate.

Our estimates on minimum wage rates provide a benchmark for further negotiation among stakeholders, including government, employers and workers' representatives. The estimated rates do not restrict the rates to be set higher if agreed upon among stakeholders. In India, the existing mechanism for the fixation of minimum wage allows tripartite agreement. We recommend that the present study's rates be considered the bare minimum to start with any further revisions and negotiations.

Recommendations

The methodology used and the findings in this study throw several points of policy interest. First of all, the study establishes that a national level minimum wage can be estimated using nationally representative data transparently. Second, this study highlights that update and revisions of minimum wages can be taken up frequently in scientific manner and linked with the availability of new data from time to time. Third, since the method uses a need-based approach, the minimum wage rate results are established within a range of face values, the use of social dialogue and further evidence must be critical for setting the adequate minimum wage.

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► ANNEXURE

Linear Programming solution to estimate minimum expenditure required to obtain recommended nutritional intakes

Statement of the Problem: We need to estimate the minimum cost required to purchase a food basket that can provide the minimum recommended nutritional intakes for healthy living. The linear programming solution can be obtained using the following mathematical model:

Objective function: $\min C = F'_i * P_i$ (eq. A1)

Subject to:

$s_{ij} * F_i \geq N_j$ (eq. A2); and

$(F_i \geq 0)$ (eq. A3)

Where:

C is an objective cost function to minimize; F and P are vectors of quantity and respective prices of different food items. S is the amount of the nutrient per unit of individual food items, and N is a vector of recommended diet Allowance (RDA) of nutrients.

Further, the cultural constraint on the consumption of different items can be introduced in equation (3) by replacing '0' with minimum acceptable values of different food items, such as:

$F_1 \geq a, F_2 \geq b, F_3 \geq c, \dots$; (eq. 3a)

Where a, b, c ... are scalar representing minimum levels of consumption of different food items. The scalar values can be obtained by observing households' current consumption pattern using household survey data. These additional constraints can be applied using the estimated average current consumption of different food items of all households or only households who draw their main livelihood from wage labour. We can use both the thresholds for obtaining a range of expenditure.

The above set of equations can be expended for any given per adult person per day recommended nutrients norms of calorie, protein and fat (say, 2,400 K/cal, 50 gms protein. and 30 gms fat) as follows:

$FE = \min(F'_1 * P_1 + F'_2 * P_2 + \dots + F'_n * P_n)$ (eq. 4);

Subject to,

$s_{11} * F_1 + s_{12} * F_2 + \dots + s_{1n} * F_n \geq 2,376 \text{ K/cal}$ (eq. 5a)

$s_{21} * F_1 + s_{22} * F_2 + \dots + s_{2n} * F_n \geq 50 \text{ gms.protein}$ (eq. 5b)

$s_{31} * F_1 + s_{32} * F_2 + \dots + s_{3n} * F_n \geq 30 \text{ gms. fats}$ (eq. 5c); and
 $F_i \geq 0$ (eq. 6)

Also, additional cultural constraints as follows:

$F_1 \geq a1; F_2 \geq a2; \dots; F_n \geq an$ (eq. 6)

Appendix Tables

Appendix Table A-I: Average calorie, protein and fats requirements for Wage earning households casual labour households

Age –Sex – Occupation* type			Population (%)	Nutrient requirements per day per person					
				Calorie K/Cal	Protein Grams	Fat Grams	Weighted nutrient requirements		
							Calorie K/Cal	Protein Grams	Fat Grams
Less than 1			0.74	585	10.2	19	4.3	0.1	0.1
1-3			5.44	1060	16.7	27	57.7	0.9	1.5
4-6			5.91	1350	20.1	25	79.8	1.2	1.5
7-9			5.52	1690	29.5	30	93.3	1.6	1.7
10-12			6.12	2100	40	35	128.5	2.4	2.1
13-14	Male		2.09	2750	54.3	45	57.5	1.1	0.9
	Female		2.06	2330	51.9	40	48.0	1.1	0.8
15-59	Male	sedentary	0.3	2320	60	25	7.0	0.2	0.1
		moderate	8.08	2730	60	30	220.6	4.8	2.4
		Heavy	17.93	3490	60	40	625.8	10.8	7.2
		Non-worker	6.48	2320	60	25	150.3	3.9	1.6
15-59	Female	sedentary	0.31	1900	55	20	5.9	0.2	0.1
		moderate	20.08	2230	55	25	447.8	11.0	5.0
		Heavy	7.81	2850	55	30	222.6	4.3	2.3
		Non worker	3.88	1900	55	20	73.7	2.1	0.8
60 & above	Male		3.56	2320	60	25	82.6	2.1	0.9
	Female		3.72	1900	55	20	70.7	2.0	0.7
ALL			100				2375.9	50.0	29.8

Notes: 1) Occupation type is defined based on the National Classification of Occupation (NCO) of workers: NCO codes for sedentary, codes for moderate, codes for heavy; 2) individuals involved in household works have been categorised in moderate occupation type.

Sources: ICMR 2010 and NSSO 2017-18

Appendix Table A-IIa: Adult Equivalent coefficients for different age and gender

Age in completed years	Male	Female
<1	0.43	0.43
(1-3)	0.54	0.54
(4-6)	0.72	0.72
(7-9)	0.87	0.87
(10-12)	1.03	0.93
13-15	0.97	0.8
16-19	1.02	0.75
20-39	1	0.71
40-49	0.95	0.68
50-59	0.9	0.64
60-69	0.8	0.51
70 +	0.7	0.5

Source: NSSO 2014

Appendix Table A-IIb: Calories requirements (K/cal per day) and adult equivalent coefficients for different age and gender

Age in years	Required kcal/day		Coefficient	
	Male	Female	Male	Female
1-2	850	950	0.29	0.32
2-3	1050	1125	0.36	0.38
3-4	1150	1250	0.39	0.42
4-5	1250	1350	0.42	0.46
5-6	1325	1475	0.45	0.5
6-7	1425	1575	0.48	0.53
7-8	1550	1700	0.53	0.58
8-9	1700	1825	0.58	0.62
9-10	1850	1975	0.63	0.67
10-11	2000	2150	0.68	0.73
11-12	2150	2350	0.73	0.8
12-13	2275	2550	0.77	0.86
13-14	2375	2775	0.81	0.94
14-15	2450	3000	0.83	1.02
15-16	2500	3175	0.85	1.08
16-17	2500	3325	0.85	1.13
17-18	2500	3400	0.85	1.15
19-30*	2550	3050	0.86	1.03
30-60*	2400	2950	0.81	1
>60*	2200	2450	0.75	0.83

Source:: FAO/WHO recommendations (available here: <http://www.fao.org/3/a-y5686e.pdf>)

Appendix Table A-1II: Socio-economic characteristics of different types of households based on primary sources of livelihood,

	Type of households						
	Agricultural labour	Other casual labour	Self-employed in agriculture	Self-employed in non-agriculture	Regular wage earnings	Others	All households
Economic classification							
poorest	28.67	32.42	21.37	20.54	11.96	13.78	21.24
2 nd poorest	23.6	22.65	18.48	19.86	15.26	15.14	19.1
middle	17.36	19.73	20.68	20.86	20.66	16.68	19.91
2 nd richest	19.86	16.26	20.78	20.32	23.29	20.88	20.43
richest	10.51	8.93	18.7	18.42	28.83	33.51	19.33
Caste group							
ST	13.96	10.46	14.75	3.74	5.47	4.59	9.14
SC	34.55	31.25	13.1	12.84	15.32	14.12	18.69
OBC	39.36	41.25	44.85	48.31	39.07	44.71	43.26
Others	12.12	17.05	27.3	35.11	40.14	36.58	28.91
Religion							
Hindu	84.7	80.8	87.02	75.92	83.8	79.83	82.35
Muslims	10.82	14.94	7.86	19.15	10.21	14.91	12.59
Other minority	4.48	4.27	5.12	4.92	5.98	5.27	5.06
Household size							
Family members of different age groups							
0-4	9.1	10.66	8.87	8.51	8.11	7.48	8.87
5-14	21.53	22.87	20.64	20.07	17.26	16.67	20.13
15-29	26.98	27.05	27.08	26.96	28.44	21.59	27.03
30-44	20.68	21.89	19.98	23.26	24.76	12.89	21.62
45-59	15.53	11.84	15.25	14.22	15.26	14.76	14.54
60 & above	6.18	5.68	8.18	6.99	6.17	26.6	7.81
Family members with level of education							
Illiterate	44.3	39.33	34.64	25.63	20.42	30.36	31.53
Below Primary	18.0	19.08	16.53	16.69	13.4	14.35	16.43
Prim Middle	28.04	29.21	28.42	28.61	25.36	20.42	27.61
sec/hsec	8.94	10.92	17.44	21.53	26.01	23.44	18.34
Grad & abov	0.72	1.45	2.97	7.54	14.81	11.43	6.09
Total	100	100	100	100	100	100	100
Sample size							

Notes: 1) Occupation type is defined based on the National Classification of Occupation (NCO) of workers: NCO codes for sedentary, codes for moderate, codes for heavy; 2) individuals involved in household works have been categorised in moderate occupation type.

Sources: ICMR 2010 and NSSO 2017-18

Appendix Table A-IV: Per consumption unit per month value of expenditure on different non-food items of consumption

fractile	Fuel & light	Conveyance	Rent	Clothing	Footwear	Education	Medical care	Entertainment	Personal care	Communication	Taxes	durables	Total non-food
1	92	13	4	53	8	14	25	4	36	24	2	13	288
2	108	19	6	66	10	22	38	8	46	33	3	18	377
3	117	25	9	76	12	29	43	10	52	39	3	23	438
4	124	32	12	82	13	33	54	12	59	48	4	24	499
5	131	39	16	90	15	37	59	13	62	51	5	27	545
6	136	47	19	94	16	46	62	15	68	54	5	31	594
7	143	55	22	99	17	54	74	17	74	62	7	34	657
8	152	63	27	105	18	56	77	20	78	69	7	37	709
9	157	72	30	112	19	71	86	21	83	72	7	42	773
10	160	78	43	120	21	74	95	24	90	79	9	47	839
11	167	89	51	122	22	82	110	25	94	87	9	53	913
12	174	99	51	130	23	96	112	29	100	94	11	61	979
13	184	116	58	138	25	108	131	31	107	102	11	68	1081
14	196	133	65	147	27	120	145	33	117	116	13	88	1199
15	202	151	78	156	28	139	164	39	123	127	13	100	1320
16	212	181	85	166	31	161	184	42	129	143	16	121	1471
17	226	217	104	181	34	200	226	48	144	169	21	149	1719
18	250	271	135	214	40	268	281	57	164	217	24	209	2131
19	275	382	242	251	47	382	413	71	194	307	31	355	2950
20	354	714	531	355	67	683	831	118	263	541	52	1176	5685
All	168	117	64	127	22	112	136	28	96	105	11	105	1093



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