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Food Subsidies in a Transforming Economy

Welfare and Dietary Implications of India's Public Distribution System

Vanshika Pahwa

Anjani Kumar

Kiran Kumara TM

Development Strategies and Governance Unit
IFPRI South Asia Regional Office (SAR)

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

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AUTHORS

Vanshika Pahwa (v.pahwa@cgiar.org) is a Research Analyst in the Development Strategies and Governance (DSG) Unit of the International Food Policy Research Institute (IFPRI), New Delhi, India.

Anjani Kumar (Anjani.Kumar@cgiar.org) is a Senior Research Fellow in the DSG Unit IFPRI, New Delhi, India.

Kiran Kumara TM (kiran.tm@icar.org.in) is a Senior Scientist at ICAR-National Institute of Agricultural Economics and Policy Research, New Delhi.

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ABSTRACT

Large-scale food subsidy programs remain central to social protection systems in many low- and middle-income countries, yet their role in structurally transforming economies remains debated. This paper examines the welfare implications of India's Public Distribution System (PDS), one of the world's largest food-based transfer programs. Using nationally representative household consumption surveys for 2011/12, 2022/23, and 2023/24, this study analyzes changes in PDS coverage and the program's implications for poverty and household dietary diversity in the context of changing food consumption patterns. PDS coverage expanded substantially following the implementation of the National Food Security Act and its temporary expansion under the Pradhan Mantri Garib Kalyan Anna Yojana food security welfare scheme. Subsidized cereal transfers account for a substantial share of household cereal consumption and provide measurable implicit subsidy transfers that result in lower simulated poverty under the accounting framework. Matching-based estimates indicate that PDS participation is positively associated with household dietary diversity. However, rising fiscal costs associated with the program highlight challenges for the long-term sustainability of cereal-based subsidies. The findings provide insights into the evolving role of food-based social protection in economies undergoing rapid structural and dietary transitions.

Keywords: Public distribution system, food consumption, poverty, dietary diversity, India

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1. INTRODUCTION

Food subsidy programs have long served as central pillars of social protection in low- and middle-income countries. Historically designed to stabilize food access and mitigate calorie deprivation, such programs emerged in response to market volatility, agrarian transitions, and chronic poverty (Pinstrup-Andersen, 1988; Barrett, 2010). As economies undergo structural transformation, however, rising incomes and urbanization, declining poverty, and changing food preferences increasingly shift household food consumption away from staple cereals toward more diverse and higher-value foods (Timmer, 1988; Pingali, 2007; Popkin 2017). These changes raise important questions about the evolving role of cereal-based food subsidies in shifting food economies.

India's Public Distribution System (PDS) provides an important case in this regard. Originally conceived as a rationing mechanism, the system was fundamentally restructured under the National Food Security Act (NFSA) in 2013 into a legally enforceable entitlement covering approximately 75 percent of the rural population and 50 percent of the urban population. This institutional shift embedded food access into a rights-based welfare framework. During the COVID-19 pandemic, the Pradhan Mantri Garib Kalyan Anna Yojana (PMGKAY) welfare scheme further expanded entitlements by providing additional free grain allocations to NFSA beneficiaries.

As a result, India now operates one of the largest food-based social protection programs in the world, reaching more than 800 million individuals. This expansion has occurred alongside rapid structural changes in the country's economy and food systems. Per capita cereal consumption and the share of cereals in household food expenditure have declined. At the same time, consumption of higher-value foods has increased, poverty has fallen, and fiscal expenditures on food subsidies have risen substantially. In this evolving context, the continued relevance and design of cereal-based subsidies merit careful empirical investigation.

Development theory suggests that rising incomes are typically accompanied by shifts in consumption patterns away from staple cereals and toward higher-value foods (Bennett, 1941; Timmer, 1981). Recent global evidence similarly links dietary diversification and nutrition transitions to income growth and urbanization (Popkin, 2017; Headey & Alderman, 2019). India reflects these broader trends, with declining cereal shares in household expenditure occurring alongside increasing consumption of non-cereal foods. These concurrent shifts in an evolving food system provide an important context for examining the contemporary welfare and redistributive role of the PDS as a large-scale cereal-based transfer program.

The broader literature comparing food and cash transfers highlights trade-offs involving targeting efficiency, market distortions, administrative feasibility, and nutritional outcomes (Gentilini, 2016; Manley

et al., 2022). Within India, existing studies on the PDS have primarily examined diversion, targeting errors, and implementation, particularly prior to or during the early years of the NFSA (Khera, 2011; Drèze and Khera, 2015; Himanshu and Sen, 2013). More recent work has examined technological reforms such as biometric authentication, portability, and the buffering role of the PDS during the COVID-19 crisis (Khera and Somanchi, 2020; Masiero et al., 2021; Muralidharan et al., 2022). However, nationally representative evidence remains limited on the post-NFSA expansion of the PDS, particularly following the expansion of foodgrain transfers under PMGKAY. Moreover, relatively little is known about the magnitude of implicit transfers associated with the expanded system and their implications for household poverty and dietary diversity in the context of changing food consumption patterns.

This paper examines the welfare implications of the expanded PDS using nationally representative household consumption data for 2011/12, 2022/23, and 2023/24. We first document changes in household food consumption and expenditure patterns, followed by changes in PDS coverage and utilization, to examine the contribution of the PDS toward household cereal consumption alongside broader changes in cereal consumption. We then estimate the implicit value of subsidized cereal transfers and assess their implications for poverty using an accounting simulation under a no-PDS transfer scenario. This analysis provides a measure of the redistributive significance of the expanded PDS while holding constant other components of household consumption.

The paper further examines the relationship between PDS participation and household dietary diversity. Using matching-based estimates, we assess whether participating households exhibit differences in dietary diversity after adjusting for observed household characteristics, providing evidence on the consumption patterns associated with PDS participation.

The analysis contributes to the literature in three aspects. First, it provides the most recent nationally representative evidence on the post-NFSA expansion of the PDS and documents the changing reach and contribution of subsidized cereal-based transfers within an evolving food consumption system. Second, it estimates the implicit subsidy transfers associated with PDS access and assesses their implications for poverty through an accounting framework. Third, it examines the association between PDS participation and household dietary diversity, thereby situating the redistributive role of cereal-based food subsidies within India's broader dietary transition. Taken together, these analyses provide evidence on the changing importance of a large-scale food subsidy program in a structurally transforming economy.

The remainder of the paper is organized as follows. Section 2 describes the data and methods, including the construction of implicit subsidy transfers, poverty simulations, and matching-based estimation. Section 3 documents trends in food expenditure shares and cereal consumption. Section 4 examines PDS coverage

and utilization patterns. Section 5 presents the implicit transfer estimates and simulated poverty outcomes. Section 6 examines the association between PDS participation and household dietary diversity. Section 7 concludes with implications for the future design of food-based social protection in structurally transforming economies.

2. DATA AND METHODOLOGY

2.1 Data

The study uses unit-level data from three rounds of the Household Consumption Expenditure Survey (HCES) conducted by the National Sample Survey Office (NSSO) in 2011/12 (68th round), 2022/23 (79th round), and 2023/24 (80th round). These nationally representative surveys cover more than 100,000 households across all states and union territories of India and collect detailed information on quantities consumed and expenditures incurred by households across a wide range of food and non-food items.

The analysis compares the 68th round with the 79th and 80th rounds. All three survey rounds adopted a multistage stratified sampling design with households as the ultimate stage units. In HCES 2011/12, data were collected using the pen-and-paper personal interview method in a single visit from a selected household over a period spanning four quarters, with equal units assigned to each quarter. HCES 2022/23 and 2023/24 divided the survey schedule into four modules: household characteristics questionnaire (HCQ), food items questionnaire (FDQ), consumables and services items questionnaire (CSQ), and durable goods questionnaire (DGQ). The data were collected using the computer-assisted personal interview method for FDQ, CSQ, and DGQ schedules at random in a selected household in three consecutive visits in a quarter, with data for HCQ collected on the first visit. For both rounds, the survey period was divided into 10 panels that were a quarter long, with equal units assigned to each panel.

Across all survey rounds, the value of goods consumed but not purchased, including those received as gifts, loans, or in exchange of goods and services, as well as those obtained through free collection, is imputed using prevailing average market prices.. Additionally, HCES 2022/23 and 2023/24 have the provision to collect data on food and non-food items received and consumed by the households free of cost through social welfare programs, the imputed value of which is used to generate estimates of monthly per capita consumption expenditure (MPCE) with imputation. Throughout the analysis, we use the MPCE measure excluding the imputed value of free goods received through social welfare programs.

HCES 2011/12 covered about 347 items, while HCES 2022/23 and 2023/24 included 405 items, after including new items and merging obsolete ones. The 68th round used two recall schedules: In Schedule Type I, all food items were reported using a 30-day recall period, and in Schedule Type II, frequently consumed food items were recorded using a 7-day recall period, while the remaining items followed a 30-day recall. This approach, known as the modified mixed reference period, was also adopted by the HCES 2022/23 and 2023/24 surveys. To ensure comparability across survey rounds, we use data from Schedule Type II of HCES 2011/12, which follows the same recall framework as the recent HCES rounds.

For major food grains, including rice, wheat, and coarse cereals (such as pearl millet, sorghum, and maize), the surveys also collect data on quantities purchased from government Fair Price Shops under the PDS. This allows us to examine both the coverage and utilization of the PDS following the implementation of the NFSA in 2013 and the expansion of food transfers under the PMGKAY during the COVID-19 period. Given that cereals constitute the primary commodities distributed through the PDS, the analysis focuses on cereal-related PDS coverage and utilization.

2.2 Methods

The study combines descriptive and empirical analyses. The descriptive analysis examines structural changes across time and states in household food consumption and expenditure, with a focus on the shift from cereals toward high-value food items, as well as trends in PDS coverage and its contribution to cereal consumption.

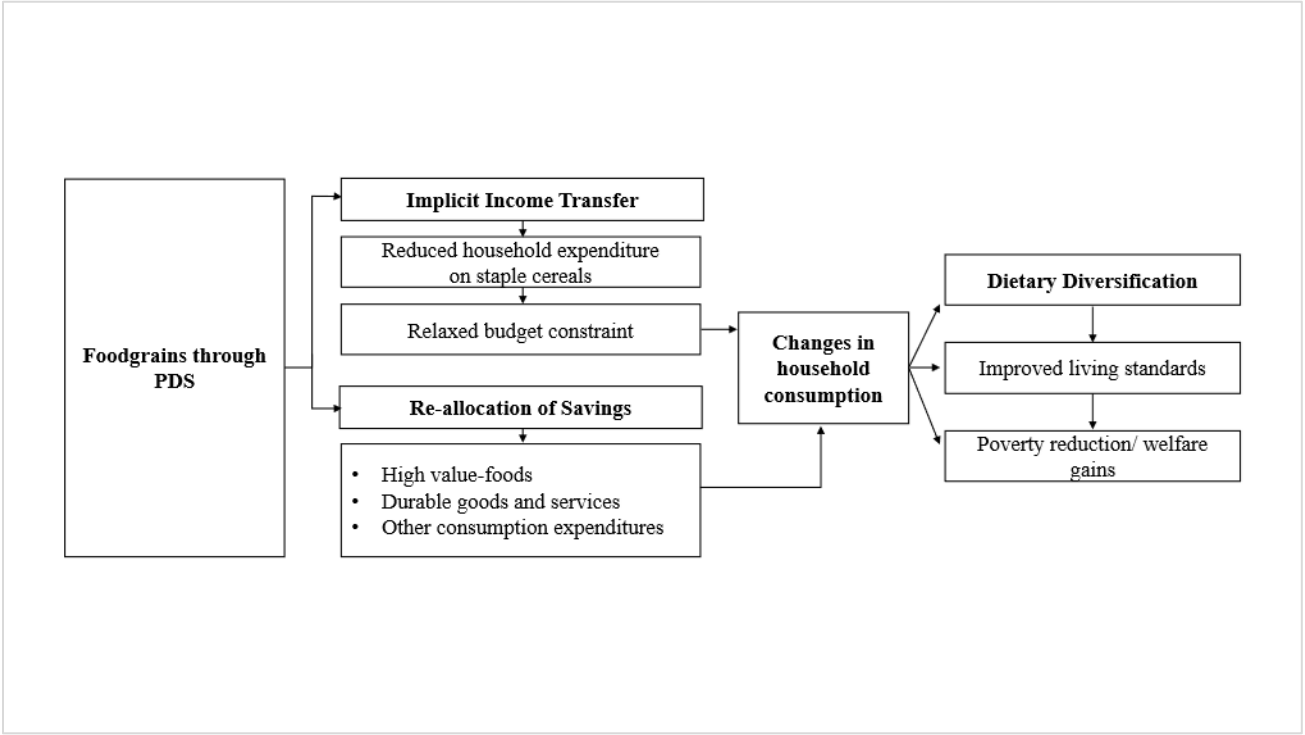
The performance of the PDS is evaluated along two key dimensions: (1) poverty reduction and (2) dietary diversity outcomes. To estimate the redistributive contribution of the PDS, we adopt a fiscal transfer approach that measures the implicit income transfers generated through subsidized grain distribution. The estimated implicit transfers are treated as subsidies received by households through the PDS, and their estimated value is used to construct a counterfactual MPCE by subtracting the subsidy from observed household MPCE. We estimate the headcount ratio (HCR) and poverty gap index (PGI) under the constructed counterfactual MPCE to simulate poverty outcomes in the absence of the estimated PDS transfer, holding constant other components of household consumption.

To examine the association of PDS participation with household dietary diversity, we employ coarsened exact matching (CEM), which compares PDS participants with observationally similar non-participants. Estimating the causal effects of program participation is challenging, because households accessing subsidized grain may differ systematically from those that do not. These differences may arise from observable socioeconomic characteristics, such as income, land ownership, or demographic factors that influence both program participation and consumption behavior. Matching-based methods help address this issue by balancing observable covariates between treatment and control groups, thereby reducing selection bias and enabling estimation of the average treatment effect on the treated (ATET). While matching approaches cannot fully eliminate bias arising from unobserved characteristics, they provide a credible framework for estimating treatment effects using observational survey data.

To guide the empirical analysis, we conceptualize the welfare effects of the PDS through two primary channels. First, subsidized cereals reduce household expenditures on staple foods, generating an implicit income transfer that relaxes household budget constraints. Second, households may reallocate these savings

toward higher-value foods, such as fruits, vegetables, and animal-source products or toward other consumption needs, including durable goods and services. These adjustments can contribute to dietary diversification, improved living standards, and poverty reduction. Figure 1 illustrates the conceptual framework linking PDS participation to household consumption behavior, dietary diversification, and welfare outcomes.

Figure 1 Conceptual framework of welfare effects of the Public Distribution System



2.2.1 Estimation of fiscal transfers

Since PDS commodities are distributed at prices below prevailing market prices, access to the PDS generates an implicit income gain for beneficiary households. We treat this implicit income gain as a subsidy transfer and estimate its value as the difference between the market price and the subsidized PDS price, multiplied by the quantity of grain obtained through the PDS.[1]

The transfer can be expressed as:

$$Y = (P_m - P_s)Q_s$$

[1] The estimates for implicit income transfers are restricted to rice and wheat. This reflects the need for a consistent valuation of the subsidy across survey rounds, given the limited and geographically uneven availability of coarse grains in the PDS data, particularly the 68th survey round. Thus, the estimated transfer should be interpreted as the implicit subsidy associated with rice and wheat rather than all PDS foodgrain transfers.

where:

- Y represents the estimated per capita value of the implicit income transfer received through the PDS,
- P_m denotes the open market price,
- P_s represents the subsidized PDS price, and
- Q_s is the monthly per capita quantity of grain obtained through the PDS.

The market prices are calculated as unit values from the consumption and expenditure data from the HCES surveys. We identify the outliers using an interquartile range criterion and replace outlier and missing unit values with the most locally relevant median price available at progressively broader geographic levels (state, region, district, stratum, area, and commodity). PDS prices are estimated using a similar procedure, allowing the observed expenditure incurred by households on PDS purchases to be incorporated into the transfer calculation. The implicit income transfers from the PDS are defined as the difference between the market and PDS prices, multiplied by the monthly per capita quantity obtained through the PDS.[2] Since grain received under PMGKAY is provided free of cost, its transfer value is estimated as the market price multiplied by the monthly per capita quantity received under PMGKAY. The resulting transfer estimates are used to construct a counterfactual MPCE under a no-PDS-transfer scenario by subtracting the estimated transfer from observed MPCE, holding constant other components of household consumption.

To simulate the poverty outcomes under a no-PDS-transfer scenario, we use the updated poverty lines proposed by Himanshu and colleagues (2025), which build on the methodology of the Tendulkar Committee poverty lines. Poverty outcomes are assessed using the HCR, which measures the proportion of the population living below the poverty line, and the PGI, which measures the depth of poverty.

These estimates constitute an accounting simulation under the assumption that households do not adjust other components of consumption in response to the withdrawal of the estimated PDS transfer.

Price adjustment and deflation

To ensure comparability across survey rounds, all expenditure and implicit income transfer values are expressed in constant 2011/12 prices using the combined (general) index series of the consumer price index (CPI) for the corresponding rural, urban, and combined sectors. Following the deflation procedure used in HCES reports, nominal expenditure and implicit income transfers for the 2022/23 and 2023/24 survey

[2] Although food grains distributed under PMGKAY were provided free of cost, food grains under the NFSA/PDS were also free from January 2023 onward. Nevertheless, the HCES 2023/24 data record households' actual expenditure on PDS purchases.

rounds are converted to 2011/12 prices by multiplying them by the ratio of the CPI for the 2011/12 reference period (July 2011–June 2012) to the CPI for the corresponding HCES reference period (August 2022–July 2023 for HCES 2022/23 and August 2023–July 2024 for HCES 2023/24).

2.2.2 Coarsened exact matching model

To estimate the association between PDS participation and household dietary diversity, we employ CEM. CEM is a non-parametric matching method that reduces selection bias on observables by improving the balance of observed covariates between treatment and control groups (Iacus, King, & Porro, 2012). The method works by temporarily coarsening covariates into meaningful categories and matching observations that fall within the same strata. This process improves covariate balance and reduces model dependence relative to conventional matching approaches. Unlike propensity score matching, CEM allows researchers to set the desired level of covariate balance ex ante, ensuring that the matched samples achieve acceptable levels of imbalance before estimation. Previous studies show that CEM performs well in reducing imbalance, estimation bias, and mean square error (Iacus et al., 2012; King et al., 2011).

In this study, households participating in the PDS constitute the treatment group, defined as households that consumed at least one cereal (rice, wheat, or coarse grains) obtained through the PDS in the last 30 days. Non-participating households form the control group. Households are matched on key socioeconomic and demographic characteristics including MPCE; age, education, and gender of the household head; household size; rural–urban residence; social group; land ownership status; and institutional characteristics such as participation in the Mid-Day Meal scheme.

Following matching, we estimate the ATET using weighted regression models with CEM weights:

$$Y_i = \alpha + \beta \cdot participate_PDS + \gamma X + \varepsilon$$

where:

- Y_i represents the outcome variable (monthly per capita expenditure on food or non-food items),
- $participate_PDS$ is a binary indicator of PDS participation,
- X is a vector of household covariates, and
- ε is the error term.

2.2.3 Robustness checks

To assess the robustness of the CEM estimates, we also employ the inverse-probability weighted regression adjustment (IPWRA) estimator. IPWRA combines propensity score weighting with regression adjustment

and provides doubly robust estimates of treatment effects. This means that consistent estimates can be obtained as long as either the treatment model or the outcome model is correctly specified. In this framework, treatment probabilities are first estimated using household socioeconomic characteristics. Observations are then weighted by the inverse probability of receiving their observed treatment status. These weights are applied to the outcome regression to estimate treatment effects. Our analysis focuses on the ATET, capturing the impact of PDS participation on households that participate in the program. However, as the analysis relies on observational survey data, the estimates should be interpreted as conditional associations after controlling for observable characteristics rather than fully causal effects.

2.2.4 Outcome variable

The primary outcome variable of interest in our analysis is household dietary diversity, which represents the diversity of food groups consumed by a household. We capture household dietary diversity by constructing the household dietary diversity score (HDDS) using recall-based data on household consumption from HCES. The HDDS is described as the number of food groups that a household has consumed over the previous 24 hours (FAO 2011). We construct an HCES-based HDDS by mapping the individual food items covered in the survey to the 12 food groups that constitute the standard HDDS, as per methods prescribed in FAO (2011) and Swindale and Bilinsky (2006). These include cereals, white tubers and roots, vegetables, fruits, meat, eggs, fish and other seafood, legumes, nuts and seeds, milk and milk products, oils and fats, sweets, spices, condiments, and beverages. Since the diversity scores reflect a household's economic ability to access a variety of food items, it will be of interest to see how PDS participation is associated with household dietary diversity. However, the scores cannot be used as a proxy for nutrition adequacy and further overlook gender-based dimensions and intrahousehold consumption allocation, which is a limitation of this study.

3. STRUCTURAL CHANGES IN FOOD CONSUMPTION

3.1 Trends in the Share of Food Expenditure in Monthly per Capita Consumption Expenditure

We begin by examining changes in the share of food expenditure in MPCE. Table 1 shows that the share of food expenditure in MPCE declined significantly between 2011/12 and 2023/24 in both rural and urban areas. The decline was more pronounced in rural areas, where the food share fell from 52.9 percent in 2011/12 to 47.0 percent in 2023/24. In urban areas, the share declined from 42.6 percent to 39.7 percent during the same period. These changes occurred alongside substantial increases in real consumption levels. Real MPCE increased by about 45 percent in rural areas, from 1,430 rupees in 2011/12 to 2,079 rupees in 2023/24, and by about 38 percent in urban areas, rising from 2,630 to 3,632 rupees. The simultaneous decline in the food share and increase in real consumption is consistent with Engel's law, which predicts that the share of food expenditure falls as income rises (Engel, 1857). This pattern also reflects the early stages of the dietary transition in which rising incomes reduce reliance on staple cereals while increasing demand for higher-value foods such as milk, fruits, vegetables, and animal-source products (Pingali, 2007). In this context, the continued expansion of a cereal-based subsidy system raises an important policy question regarding the role of food subsidies in a diversifying food economy**.**

Table 1 Trends in the share of food expenditure as part of monthly per capita consumption expenditure in India

Year	MPCE (Rs.)			Share of food in MPCE (%)		
	Rural	Urban	All	Rural	Urban	All
2011/12	1,430	2,630	1,773	52.9	42.6	48.5
2022/23	2,008	3,510	2,436	46.4	39.2	43.5
2023/24	2,079	3,632	2,545	47.0	39.7	44.0

Source: Authors' estimates based on unit-level data from NSSO surveys.
Note: MPCE = monthly per capita consumption expenditure; Rs. = rupees.

The decline in the food share is observed across most states, although the magnitude varies considerably (Table 2) with some states, including Tripura, Manipur, Jharkhand, and Odisha, showing substantial reductions in the food share of MPCE. These differences likely reflect variations in income growth, food price dynamics, and dietary transitions across states.

Table 3 presents the composition of food expenditure. The overall decline in the food share is driven primarily by a sharp reduction in expenditure on cereals and cereal substitutes. The share of cereals in MPCE fell from 9.0 percent in 2011/12 to 4.5 percent in 2023/24. This decline partly reflects the expansion

of subsidized food grain distribution through programs such as the PDS and PMGKAY, which reduce household expenditure on staple cereals by providing them for free or at highly subsidized prices.

At the same time, expenditure on several non-cereal food items increased. In particular, the share of spending on milk and milk products, fruits, and processed food items rose during the period. These patterns are consistent with broader dietary diversification accompanying rising incomes and structural transformation in the food system.

Table 2 Trends in the share of food expenditure as part of monthly per capita consumption expenditure across states in India

State	MPCE (Rs.)			Share of food in MPCE (%)		
	2011/12	2022/23	2023/24	2011/12	2022/23	2023/24
Jammu and Kashmir	1,913	2,528	2,612	53.0	46.7	49.1
Himachal Pradesh	2,169	3,127	3,153	46.5	42.6	43.7
Punjab	2,510	3,090	3,277	42.8	41.3	41.9
Uttarakhand	1,890	2,758	2,891	48.5	41.3	41.9
Haryana	2,669	3,208	3,328	46.5	43.0	44.8
Rajasthan	1,794	2,504	2,569	48.7	42.5	43.6
Uttar Pradesh	1,348	1,915	1,985	50.0	44.9	45.5
Bihar	1,164	1,851	1,945	58.1	53.2	52.1
Sikkim	1,765	4,795	5,379	50.0	49.2	48.9
Arunachal Pradesh	1,947	3,170	3,398	49.7	49.0	48.7
Nagaland	2,140	2,740	3,029	52.3	46.2	46.0
Manipur	1,497	2,418	2,493	53.7	45.5	47.1
Mizoram	2,081	3,382	3,691	50.8	44.3	43.8
Tripura	1,463	3,041	3,364	55.9	47.3	45.9
Meghalaya	1,663	2,115	2,251	50.1	46.5	47.6
Assam	1,326	1,999	2,107	58.8	52.9	52.2

State	MPCE (Rs.)			Share of food in MPCE (%)		
	2011/12	2022/23	2023/24	2011/12	2022/23	2023/24
West Bengal	1,644	2,043	2,178	52.2	48.6	48.6
Jharkhand	1,220	1,700	1,755	54.2	46.4	46.3
Odisha	1,142	1,759	1,921	54.2	46.3	46.6
Chhattisgarh	1,218	1,534	1,628	49.1	43.7	44.7
Madhya Pradesh	1,383	1,925	2,042	48.8	42.9	42.2
Gujarat	1,953	2,647	2,774	49.8	45.3	45.8
Maharashtra	2,329	2,755	2,831	45.7	38.9	38.9
Andhra Pradesh	1,987	2,935	3,020	48.4	42.0	43.4
Karnataka	2,067	2,998	3,105	45.7	40.7	41.4
Goa	2,723	4,372	4,614	48.0	47.5	48.3
Kerala	2,865	3,468	3,675	41.1	37.5	38.3
Tamil Nadu	2,109	3,420	3,499	46.6	40.0	41.1
Telangana	2,150	3,376	3,569	46.5	38.4	40.3
All India	1,773	2,436	2,545	48.5	43.5	44.0

Source: Authors' estimates based on unit-level data from NSSO surveys.
Note: MPCE = monthly per capita consumption expenditure; Rs. = rupees.

Table 3 Food expenditures across categories

Category name	MPCE (Rs.)			Share in MPCE (%)		
	2011/12	2022/23	2023/24	2011/12	2022/23	2023/24
Cereals and cereal substitutes	160	107	114	9.0	4.4	4.5
Pulses and their products	45	43	45	2.5	1.8	1.8
Sugar and salt	27	19	19	1.5	0.8	0.8
Milk and milk products	135	192	202	7.6	7.9	7.9
Vegetables	102	115	133	5.8	4.7	5.2
Fruits	55	91	98	3.1	3.8	3.9
Eggs, fish, and meat	76	106	111	4.3	4.4	4.3
Edible oil	58	76	60	3.3	3.1	2.4
Spices	54	64	73	3.0	2.6	2.9
Beverages, refreshments, and processed food	148	244	264	8.4	10.0	10.4

Source: Authors' estimates based on unit-level data from NSSO surveys.
Note: MPCE = monthly per capita consumption expenditure; Rs. = rupees.

3.2 Trends in Cereal Consumption

Changes in expenditure patterns are accompanied by shifts in reported consumption. Table 4 presents trends in monthly per capita consumption across food categories between 2011/12 and 2023/24. Across both rural and urban areas, cereal consumption has declined steadily over time. In rural areas, average monthly per capita rice consumption fell from 6.1 kg in 2011/12 to 5.1 kg in 2023/24, while wheat consumption declined from 4.4 kg to 3.9 kg. Urban areas show a similar pattern, with rice consumption declining from 4.7 kg to 4.2 kg and wheat consumption from 4.3 kg to 3.6 kg over the same period. Consumption of coarse grains also declined between 2011/12 and 2022/23. However, a modest increase is observed in 2023/24 in both rural and urban areas, suggesting a partial revival of coarse cereals in some regions.

Table 4 Trends in consumption across food categories

Category name	Monthly per capita consumption (Kg.)								
	2011/12			2022/23			2023/24		
	Rural	Urban	All	Rural	Urban	All	Rural	Urban	All
Rice	6.1	4.7	5.7	5.3	4.3	5.0	5.1	4.2	4.8
Wheat	4.4	4.3	4.4	3.9	3.6	3.8	3.9	3.6	3.8
Coarse	0.6	0.3	0.5	0.3	0.2	0.3	0.4	0.2	0.3
Cereals and cereal substitutes	11.3	9.3	10.7	9.6	8.1	9.2	9.4	8.0	9.0
Pulses and their products	0.8	0.9	0.8	0.8	0.8	0.8	0.7	0.8	0.8
Sugar and salt	1.0	1.1	1.1	1.0	1.0	1.0	0.9	1.0	0.9
Milk and milk products	4.4	5.5	4.7	5.2	6.2	5.5	5.4	6.2	5.6
Vegetables	6.8	7.0	6.9	7.0	7.0	7.0	7.3	7.2	7.3
Fruits (fresh)	1.4	2.1	1.6	2.0	2.9	2.3	2.1	3.0	2.4
Fruits (dry)	0.1	0.2	0.1	0.2	0.3	0.2	0.2	0.3	0.2
Eggs	0.1	0.2	0.1	0.2	0.3	0.2	0.2	0.2	0.2
Fish and meat	0.5	0.6	0.6	0.7	0.8	0.8	0.8	0.8	0.8
Edible oil	0.7	0.9	0.8	0.9	1.0	0.9	0.9	1.0	0.9
Spices	0.4	0.5	0.5	0.5	0.6	0.5	0.5	0.5	0.5

Source: Authors' estimates based on unit-level data from NSSO surveys.

The decline in cereal consumption is observed across most states (Table 5). Between 2011/12 and 2023/24, rice consumption declined in 23 out of 30 states. Similar trends are observed for wheat and coarse cereals where consumption declined in most states over the study period. Taken together, these patterns indicate a gradual shift away from cereal-heavy diets.

Table 5 Trends in cereals consumption across states in India

State	Monthly per capita consumption (Kg.)								
	Rice			Wheat			Coarse		
	2011/12	2022/23	2023/24	2011/12	2022/23	2023/24	2011/12	2022/23	2023/24
Jammu and Kashmir	8.0	6.0	6.4	3.8	3.7	3.5	0.6	0.1	0.3
Himachal Pradesh	4.3	3.5	3.8	6.5	5.5	5.7	0.8	0.0	0.3
Punjab	1.0	0.9	0.8	7.9	6.5	6.6	0.1	0.0	0.0
Uttarakhand	4.7	3.9	3.7	7.0	4.8	5.1	0.1	0.0	0.0
Haryana	0.8	1.0	0.8	8.2	6.8	6.8	0.1	0.1	0.3
Rajasthan	0.3	0.4	0.4	9.3	8.9	8.6	1.8	0.1	1.1
Uttar Pradesh	3.8	3.5	3.2	7.2	5.6	5.6	0.1	0.0	0.0
Bihar	6.2	6.1	5.5	5.7	4.8	5.0	0.1	0.0	0.0
Sikkim	9.1	6.9	8.8	1.0	0.8	0.8	0.2	0.0	0.2
Arunachal Pradesh	11.3	9.6	9.8	0.6	0.2	0.3	0.6	0.0	0.0
Nagaland	12.9	9.6	9.2	0.2	0.1	0.1	0.1	0.0	0.0
Manipur	13.8	11.2	11.1	0.1	0.0	0.1	0.0	0.0	0.0
Mizoram	12.1	9.3	9.0	0.3	0.1	0.0	0.1	0.0	0.0
Tripura	13.2	10.7	10.4	0.3	0.5	0.4	0.0	0.0	0.0
Meghalaya	9.7	8.5	8.3	0.5	0.2	0.2	0.0	0.0	0.0
Assam	11.9	8.9	8.5	0.6	0.4	0.4	0.0	0.0	0.0
West Bengal	9.5	8.5	7.9	1.8	2.2	2.1	0.0	0.0	0.0
Jharkhand	8.4	6.5	6.5	3.2	3.3	3.3	0.1	0.0	0.0
Odisha	12.1	9.9	10.1	1.0	1.1	1.1	0.1	0.0	0.1
Chhattisgarh	10.8	9.3	9.6	1.2	1.0	1.1	0.1	0.0	0.0
Madhya Pradesh	2.2	2.5	2.4	8.4	6.7	6.5	0.5	0.0	0.1

State	Monthly per capita consumption (Kg.)								
	Rice			Wheat			Coarse		
	2011/12	2022/23	2023/24	2011/12	2022/23	2023/24	2011/12	2022/23	2023/24
Gujarat	2.1	2.4	2.2	4.3	4.4	4.6	2.0	0.3	0.9
Maharashtra	3.3	3.0	3.0	4.5	4.1	4.1	1.4	0.4	0.8
Andhra Pradesh	10.3	8.2	8.1	0.5	0.5	0.6	0.3	0.1	0.2
Karnataka	5.7	5.7	5.1	1.4	1.3	1.2	2.3	1.0	1.5
Goa	6.3	6.8	6.5	2.3	2.3	2.1	0.0	0.0	0.1
Kerala	7.3	5.6	5.8	1.1	0.7	0.8	0.0	0.0	0.0
Tamil Nadu	8.1	6.8	6.7	0.8	0.6	0.6	0.1	0.0	0.1
Telangana	5.7	8.6	8.5	0.8	0.7	0.8	0.3	0.1	0.2
All India	5.7	5.0	4.8	4.4	3.8	3.8	0.5	0.2	0.3

Source: Authors' estimates based on unit-level data from NSSO surveys.

3.3 Dietary Diversification

The decline in cereal expenditure and consumption is accompanied by rising consumption of several non-cereal food items (Table 4). Between 2011/12 and 2023/24, consumption of high-value food items increased, including for milk and milk products, fruits, vegetables, and animal-source foods such as fish and meat. These trends suggest an ongoing transition toward more diversified diets. While cereal consumption has declined in both rural and urban areas, they have experienced an increase in consumption of high-value foods. Overall, the evidence points to a gradual shift from cereal-dominated diets toward more diversified consumption baskets, reflecting rising incomes and changing food preferences.

Taken together, these patterns highlight an important structural shift in India's food economy. While cereal consumption and expenditure shares have declined as incomes rise and diets diversify, the scale of public cereal distribution through the PDS has expanded substantially over the same period. This juxtaposition creates an important policy question: how does a large cereal-based subsidy system operate in an economy where household diets are gradually moving away from cereals toward more diversified food baskets? One possible interpretation is that the PDS increasingly functions not only as a mechanism for calorie security but also as a form of implicit income transfer. By lowering household expenditure on staple cereals,

subsidized grain transfers may free up resources that households can allocate toward higher-value foods and other consumption needs. The following sections examine this possibility by analyzing PDS coverage, its contribution to cereal consumption, and its redistributive implications for household welfare.

4. EXPANSION AND ROLE OF THE PUBLIC DISTRIBUTION SYSTEM

4.1 Expansion of Public Distribution System Coverage

We examine changes in PDS coverage by analyzing the share of households purchasing cereals through the PDS between 2011/12 and 2023/24. This period captures the implementation of the NFSA in 2013 and the temporary expansion of food transfers under the PMGKAY after the COVID-19 pandemic. Table 6 shows that PDS coverage expanded substantially, particularly in rural areas, where the share increased from 52 percent in 2011/12 to more than 83 percent in 2023/24. The increase in urban coverage was modest, rising from about 30 percent to nearly 50 percent. The stronger expansion in rural areas reflects the NFSA design, which allocates coverage to 75 percent of the rural population compared with 50 percent of the urban population.

Disaggregated results show that the increase was driven primarily by expanded access to rice and wheat through the PDS. The latest survey also captures procurement of coarse grains through fair price shops in selected states, indicating a modest but growing presence of coarse cereals in the PDS basket.

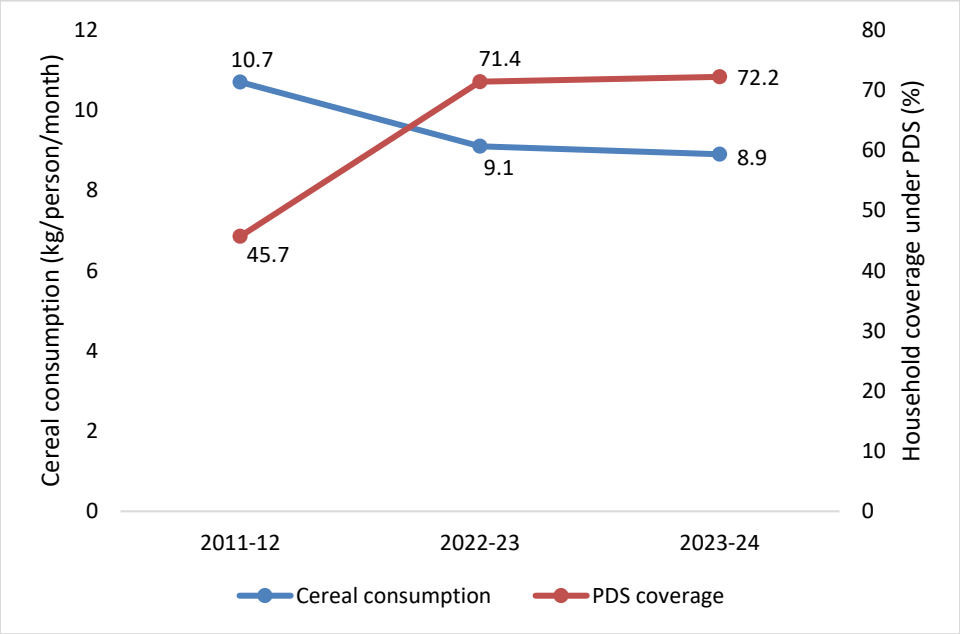
Table 6 Households purchasing cereals from the Public Distribution System

Cereal name	Households purchasing cereals from PDS (%)								
	2011/12			2022/23			2023/24		
	Rural	Urban	All	Rural	Urban	All	Rural	Urban	All
Rice	48.2	25.3	41.2	76.4	46.3	67.1	77.3	46.5	67.3
Wheat	38.0	21.1	32.7	50.7	27.5	43.5	53.6	27.0	44.9
Coarse	-	-	-	7.3	6.7	7.1	13.7	10.4	12.7
Total	52.4	29.8	45.7	81.2	49.3	71.4	83.0	49.4	72.2

Source: Authors' estimates based on unit-level data from NSSO surveys.
Note: PDS = Public Distribution System.

Figure 2 shows that between 2011/12 and 2023/24, monthly per capita cereal consumption steadily declined over time, even as the share of households purchasing cereals through the PDS increased, further confirming a shift away from cereal-heavy diets.

Figure 2 Trends in cereal consumption and Public Distribution System coverage over time



Source: Authors' estimates based on unit-level data from NSSO surveys.

Note: PDS = Public Distribution System.

The expansion of PDS coverage is evident across most states, although the magnitude varies considerably (Table 7). In several states, including Uttar Pradesh, Bihar, and West Bengal, shares increased dramatically, reflecting the expansion of NFSA coverage and improvements in delivery systems. In contrast, states such as Punjab and Haryana continue to exhibit relatively low reliance on PDS cereals. This likely reflects stronger market access and higher local availability of grains, reducing household dependence on subsidized procurement through the PDS.

Table 7 Households purchasing cereals from the Public Distribution System across states in India

State	Households purchasing cereals from PDS (%)								
	Rice			Wheat			Total cereals		
	2011/12	2022/23	2023/24	2011/12	2022/23	2023/24	2011/12	2022/23	2023/24
Jammu and Kashmir	72.2	69.4	78.4	54.1	44.5	44.8	76.6	72.9	80.6
Himachal Pradesh	81.7	78.2	82.3	76.8	76.6	81.3	84.3	78.8	83.2
Punjab	0.3	0.0	0.0	17.0	41.5	40.7	18.7	41.5	40.6
Uttarakhand	53.2	56.6	56.7	59.2	47.9	46.8	65.0	56.8	57.1
Haryana	0.6	0.3	0.0	16.0	38.8	48.0	14.9	38.9	48.0
Rajasthan	1.3	0.0	0.2	27.2	60.7	61.3	25.9	60.6	61.1
Uttar Pradesh	21.2	73.4	75.9	23.9	62.4	74.3	24.7	73.9	76.5
Bihar	42.5	72.1	75.3	42.3	46.2	66.7	44.1	72.2	75.4
Sikkim	46.4	63.1	65.5	2.6	0.2	0.1	50.4	63.1	65.5
Arunachal Pradesh	53.2	61.5	72.7	10.1	0.0	0.0	52.2	61.5	72.7
Nagaland	12.3	79.4	87.7	1.3	0.0	0.0	14.8	79.4	87.7
Manipur	5.1	77.6	68.6	0.1	0.0	0.0	5.6	77.6	68.6
Mizoram	92.0	95.8	97.6	24.7	0.2	0.0	92.4	95.7	97.6
Tripura	81.5	92.6	91.6	28.3	69.0	57.7	81.3	93.9	92.6
Meghalaya	62.0	67.7	63.7	2.3	0.5	0.2	60.3	67.7	63.7
Assam	50.0	75.3	82.0	8.5	2.9	1.3	51.0	75.3	82.0
West Bengal	28.8	89.0	85.4	42.1	68.6	63.4	43.7	89.3	85.8
Jharkhand	27.6	76.6	75.2	0.9	57.4	52.1	28.2	76.8	76.2
Odisha	48.9	81.8	77.0	15.2	6.5	0.0	59.8	81.8	77.0
Chhattisgarh	62.4	92.1	90.5	37.4	0.4	0.0	57.6	92.1	90.4
Madhya Pradesh	29.2	64.2	67.7	33.5	55.6	67.0	37.2	64.4	67.7
Gujarat	22.1	47.8	46.0	21.1	47.8	45.9	20.8	48.2	46.0

State	Households purchasing cereals from PDS (%)								
	Rice			Wheat			Total cereals		
	2011/12	2022/23	2023/24	2011/12	2022/23	2023/24	2011/12	2022/23	2023/24
Maharashtra	29.4	55.2	55.0	28.3	54.6	54.8	33.1	55.3	55.1
Andhra Pradesh	80.1	88.0	89.7	15.0	2.2	5.8	80.3	88.0	89.7
Karnataka	62.9	73.5	75.6	59.5	5.9	0.0	63.0	73.6	75.6
Goa	59.5	70.4	67.9	31.2	19.5	17.3	62.7	70.4	67.9
Kerala	76.2	83.2	80.0	55.6	42.7	38.8	79.5	83.3	80.0
Tamil Nadu	83.1	87.0	87.3	68.0	39.8	23.0	86.2	88.0	87.6
Telangana	67.5	75.1	81.3	5.2	0.6	0.1	67.6	75.2	81.3
All India	41.2	67.1	67.3	32.7	43.5	44.9	45.7	71.4	72.2

Source: Authors' estimates based on unit-level data from NSSO surveys.
Note: PDS = Public Distribution System.

4.2 Contribution of the Public Distribution System to Household Cereal Consumption

Beyond coverage, the contribution of the PDS to household cereal consumption has also expanded. Table 8 shows that the share of cereals sourced from the PDS increased significantly between 2011/12 and 2022/23 in both rural and urban areas. In rural areas, the PDS accounted for more than two-fifths of total cereal consumption by 2022/23, while in urban areas it accounted for more than one-fourth.

However, this share declined slightly in 2023/24, likely following the integration of PMGKAY with NFSA, which eliminated the additional 5 kg of free grain previously distributed during the pandemic.

Table 8 Contribution of the Public Distribution System to cereal consumption in India

Cereal name	Share of PDS in cereal consumption (%)								
	2011/12			2022/23			2023/24		
	Rural	Urban	All	Rural	Urban	All	Rural	Urban	All
Rice	27.2	18.9	25.3	52.8	35.9	48.7	48.0	32.9	44.1
Wheat	16.8	9.4	14.7	32.3	18.8	28.7	29.3	15.9	25.5
Coarse	-	-	-	5.5	7.7	5.9	9.3	11.5	9.7
Total	21.5	13.9	19.6	42.6	27.6	38.9	38.7	24.7	35.0

Source: Authors' estimates based on unit-level data from NSSO surveys.
Note: PDS = Public Distribution System.

State-level estimates reveal substantial heterogeneity in the contribution of the PDS to cereal consumption (Table 9). Between 2011/12 and 2022/23, the share of PDS rice in total rice consumption increased across most states, with particularly large gains in states such as Madhya Pradesh, Chhattisgarh, Uttar Pradesh, and West Bengal. However, in many states this share declined slightly in 2023/24 following the withdrawal of pandemic-era grain allocations.

Table 9 Contribution of the Public Distribution System to cereal consumption across states in India

State	Share of PDS in cereal consumption (%)								
	Rice			Wheat			Coarse		
	2011/12	2022/23	2023/24	2011/12	2022/23	2023/24	2011/12	2022/23	2023/24
Jammu and Kashmir	54.7	50.3	45.8	42.6	30.9	26.5	-	0.0	0.0
Himachal Pradesh	45.2	46.7	44.4	46.7	47.9	47.8	-	5.6	0.0
Punjab	0.2	0.1	0.0	11.0	40.8	39.4	-	4.7	0.0
Uttarakhand	31.8	42.8	41.7	21.0	25.5	22.2	-	0.0	0.0
Haryana	1.0	0.4	0.0	12.9	33.3	31.6	-	39.1	47.8
Rajasthan	1.8	0.1	0.1	12.8	40.6	32.3	-	0.6	0.1
Uttar Pradesh	19.3	57.9	51.9	8.6	28.7	28.0	-	28.8	73.7
Bihar	20.1	50.4	46.2	16.3	10.9	12.7	-	0.0	0.0
Sikkim	39.9	49.6	34.3	1.2	0.1	0.1	-	0.0	0.0
Arunachal Pradesh	35.3	33.7	34.5	9.2	0.0	0.0	-	0.0	0.0
Nagaland	5.4	33.8	32.3	4.1	0.0	0.0	-	0.0	0.0
Manipur	1.3	30.9	28.6	0.1	0.0	0.0	-	0.0	0.0
Mizoram	47.6	82.8	86.3	18.7	0.1	0.0	-	0.0	0.0
Tripura	41.0	55.4	47.4	33.2	61.4	53.4	-	0.0	0.0
Meghalaya	28.4	43.0	35.6	2.4	0.7	0.0	-	0.0	0.0
Assam	22.9	39.5	43.5	6.3	3.5	1.5	-	0.0	0.0
West Bengal	8.3	41.8	37.4	30.7	57.0	50.4	-	0.0	0.0
Jharkhand	20.3	45.1	42.2	0.7	33.2	25.9	-	1.5	2.0
Odisha	27.4	43.9	38.6	19.5	7.8	0.0	-	43.1	0.1
Chhattisgarh	36.4	77.1	73.2	33.0	0.3	0.0	-	85.6	1.4
Madhya Pradesh	18.4	60.0	52.7	16.7	26.2	24.4	-	0.6	0.0
Gujarat	11.1	43.7	37.6	10.9	25.2	20.5	-	0.6	6.1

State	Share of PDS in cereal consumption (%)								
	Rice			Wheat			Coarse		
	2011/12	2022/23	2023/24	2011/12	2022/23	2023/24	2011/12	2022/23	2023/24
Maharashtra	21.3	44.3	39.6	19.2	30.5	24.6	-	0.3	0.2
Andhra Pradesh	30.7	52.9	45.7	8.4	1.1	2.7	-	2.2	15.9
Karnataka	36.9	58.8	52.5	25.8	6.9	0.0	-	18.6	21.7
Goa	29.4	39.8	37.4	11.2	15.2	11.4	-	0.0	0.0
Kerala	33.2	44.7	37.7	35.8	31.4	27.5	-	13.0	1.0
Tamil Nadu	48.5	44.1	41.1	51.6	33.1	16.7	-	1.7	2.9
Telangana	49.6	47.1	42.4	4.6	0.8	0.2	-	1.5	0.0
All India	25.3	48.7	44.1	14.7	28.7	25.5	-	5.9	9.7

Source: Authors' estimates based on unit-level data from NSSO surveys.
Note: PDS = Public Distribution System.

5. WELFARE AND POVERTY IMPLICATIONS OF THE PUBLIC DISTRIBUTION SYSTEM

5.1 Implicit Income Transfers through the Public Distribution System

The analysis indicates a substantial increase in implicit income transfers on a real monthly per capita basis through the PDS between 2011/12 and 2023/24 (Table 10). Rural households experienced the largest gains, reflecting both higher coverage and larger quantities procured through the PDS. Although modest relative to overall consumption expenditure, the share of PDS transfers in MPCE increased steadily over time.

Table 10 Implicit income transfers through the Public Distribution System (monthly per capita)

Year	Value of income transfer (Rs.)			Share of transfer in MPCE (%)		
	Rural	Urban	All	Rural	Urban	All
2011/12	30	21	28	2.1	0.8	1.6
2022/23	72	49	67	3.6	1.4	2.8
2023/24	68	47	64	3.3	1.3	2.5

Source: Authors' estimates based on unit-level data from NSSO surveys.
Note: MPCE = monthly per capita consumption expenditure; Rs. = rupees.

State-level estimates (Table 11) show considerable variation in both the magnitude and relative importance of PDS transfers. States such as Manipur, West Bengal, Nagaland, and Chhattisgarh experienced particularly large increases in the value of transfers, with these states also exhibiting relatively high PDS coverage and reliance on subsidized grain.

Table 11 Implicit income transfers through the Public Distribution System across states in India (monthly per capita)

State	Value of income transfer (Rs.)			Share of transfer in MPCE (%)		
	2011/12	2022/23	2023/24	2011/12	2022/23	2023/24
Jammu & Kashmir	63	65	67	3.3	2.6	2.6
Himachal Pradesh	49	57	61	2.3	1.8	2.0
Punjab	8	38	39	0.3	1.2	1.2
Uttarakhand	38	52	51	2.0	1.9	1.8
Haryana	9	31	30	0.3	1.0	0.9
Rajasthan	11	49	39	0.6	1.9	1.5
Uttar Pradesh	12	58	53	0.9	3.0	2.6
Bihar	21	64	58	1.8	3.5	3.0
Sikkim	60	75	57	3.4	1.6	1.1
Arunachal Pradesh	31	51	65	1.6	1.6	1.9
Nagaland	6	58	56	0.3	2.1	1.8
Manipur	2	56	70	0.1	2.3	2.8
Mizoram	73	106	111	3.5	3.1	3.0
Tripura	46	92	73	3.1	3.0	2.2
Meghalaya	27	47	48	1.7	2.2	2.1
Assam	30	57	65	2.3	2.8	3.1
West Bengal	20	95	82	1.2	4.6	3.8
Jharkhand	30	51	52	2.5	3.0	3.0
Odisha	50	57	41	4.4	3.2	2.1
Chhattisgarh	61	91	107	5.0	6.0	6.6
Madhya Pradesh	19	49	45	1.4	2.6	2.2
Gujarat	11	41	36	0.5	1.6	1.3

State	Value of income transfer (Rs.)			Share of transfer in MPCE (%)		
	2011/12	2022/23	2023/24	2011/12	2022/23	2023/24
Maharashtra	20	48	47	0.8	1.8	1.7
Andhra Pradesh	62	105	97	3.1	3.6	3.2
Karnataka	47	83	68	2.3	2.8	2.2
Goa	31	50	56	1.1	1.1	1.2
Kerala	59	61	51	2.0	1.7	1.4
Tamil Nadu	75	84	82	3.5	2.5	2.3
Telangana	58	86	95	2.7	2.6	2.7
All India	28	67	64	1.6	2.8	2.5

Source: Authors' estimates based on unit-level data from NSSO surveys.
Note: MPCE = monthly per capita consumption expenditure; Rs. = rupees.

5.2 Poverty Outcomes

Table 12 shows that poverty declined sharply between 2011/12 and 2023/24 in both rural and urban areas. Counterfactual estimates under a no-PDS-transfer scenario indicate that the simulated poverty rate would have been higher in the absence of the estimated PDS transfers in both rural and urban areas. These estimates suggest that PDS transfers are associated with measurable reduction in simulated poverty. Approximately 25 million people are estimated to be above the poverty line under the PDS-transfer scenario relative to the no-PDS-transfer counterfactual in 2011/12, compared to about 14 million in 2023/24. State-level estimates show larger differences in simulated poverty in states with higher PDS utilization, including Chhattisgarh, Odisha, Jharkhand, and West Bengal (Table 13).

Table 12 Impact of the Public Distribution System on headcount ratio and poverty gap index

Year	Headcount ratio (%)			Poverty gap index (%)		
	HCR with PDS	HCR w/o PDS	Impact	PGI with PDS	PGI w/o PDS	Impact
			Rural			
2011/12	25.7	28.4	2.7	5.1	6.1	1.0
2022/23	6.2	8.6	2.4	1.0	1.6	0.6
2023/24	3.1	4.5	1.4	0.5	0.7	0.2
			Urban			
2011/12	13.7	14.8	1.1	2.8	3.2	0.4
2022/23	2.0	2.9	0.9	0.3	0.5	0.2
2023/24	1.0	1.4	0.4	0.2	0.2	0.05
			All			
2011/12	22.2	24.5	2.3	4.4	5.3	0.9
2022/23	5.0	7.0	2.0	0.8	1.3	0.5
2023/24	2.5	3.6	1.1	0.4	0.6	0.2

Source: Authors' estimates based on unit-level data from NSSO surveys.
Note: HCR = headcount ratio; PDS = Public Distribution System; PGI = poverty gap index.

Table 13 Impact of the Public Distribution System on headcount ratio across major states in India

Year	2011/12			2022/23		
	HCR with PDS	HCR w/o PDS	Impact	HCR with PDS	HCR w/o PDS	Impact
Himachal Pradesh	7.9	11.0	2.1	0.5	0.7	0.2
Punjab	8.0	8.5	0.5	0.5	0.9	0.4
Uttarakhand	10.6	16.1	5.5	1.5	2.3	0.8
Haryana	11.2	11.9	0.7	3.9	4.6	0.7
Rajasthan	14.8	16.4	1.6	4.7	6.2	1.5
Uttar Pradesh	29.4	30.4	1.0	4.0	6.3	2.3
Bihar	33.5	35.9	2.4	5.0	6.9	1.9
Assam	32.0	36.0	4.0	4.8	6.9	2.1
West Bengal	20.4	22.3	1.9	5.6	9.5	3.9
Jharkhand	37.0	39.1	2.1	13.3	16.0	2.7
Odisha	33.1	39.7	6.6	4.5	7.1	2.6
Chhattisgarh	40.0	48.6	8.6	21.3	27.3	6.0
Madhya Pradesh	31.9	33.8	1.9	5.5	7.4	1.9
Gujarat	16.8	18.2	1.4	2.4	3.5	1.1
Maharashtra	17.3	19.4	2.1	9.6	11.8	2.2
Andhra Pradesh	12.1	14.2	2.1	1.3	2.8	1.5
Karnataka	21.3	24.1	2.8	1.7	2.6	0.9
Kerala	7.9	10.5	2.6	1.3	2.1	0.8
Tamil Nadu	11.6	15.1	3.5	0.7	1.5	0.8
Telangana	8.9	9.6	0.7	0.8	1.4	0.6
All India	22.2	24.5	2.3	5.0	7.0	2.0

Source: Authors' estimates based on unit-level data from NSSO surveys.
Note: HCR = headcount ratio; PDS = Public Distribution System.

Finally, we estimate the fiscal cost associated with distribution of subsidized foodgrains through the PDS.

The program cost is computed as:

$$C = \sum_{i=r,w} (E_i - P_i)O_i$$

where E_i represents the economic cost, including the cost of grain procurement and distribution, P_i is the central issue price at which foodgrains are issued to states, and O_i denotes annual offtake of food grains under the PDS. Data for this analysis are obtained from the monthly foodgrain bulletins published by the Department of Food and Public Distribution. Our estimates indicate that the fiscal cost of foodgrains distributed through the PDS increased substantially over time, rising from around 411 billion rupees in 2011/12 to 1,733 billion rupees in 2023/24. This increase reflects the expansion of PDS coverage under the NFSA alongside rising economic costs associated with grain procurement and distribution.

Taken together, the results highlight three important features of India's food subsidy system. First, PDS coverage and utilization expanded significantly following the implementation of the NFSA and the temporary expansion of transfers under PMGKAY, particularly in rural areas and poorer states. The PDS therefore accounts for a substantial share of household cereal consumption among participating households. Second, the program provides measurable implicit transfers by reducing household expenditures on staple cereals. The accounting simulations indicate that these transfers are associated with lower poverty, particularly in states with greater reliance on subsidized grain. Third, these changes have occurred alongside a broader transformation in household food consumption, characterized by declining cereal shares and increasing dietary diversification. In this context, these findings underscore the continuing role of cereal-based food subsidies in supporting household consumption while highlighting the substantial fiscal resources involved in maintaining the PDS amid changing food consumption patterns.

6. DIETARY DIVERSITY AND PUBLIC DISTRIBUTION SYSTEM PARTICIPATION

6.1 Conceptual Framework: Food Subsidies and Dietary Diversification

Food subsidies can influence household consumption patterns through both price and income effects. By providing staple cereals at highly subsidized prices, programs such as the PDS reduce the resources that households need to allocate to cereal consumption. This potentially generates an implicit income transfer through savings on these expenditures. Such savings may allow households to reallocate expenditure across a wider range of food groups. In this way, cereal subsidies may be associated with greater household dietary diversification, even though the transfers themselves are provided in the form of staple grains. The empirical analysis below examines whether PDS participation is associated with greater household dietary diversity compared with similar non-participating households.

Table 14 presents the proportion of PDS and non-PDS households reporting consumption from each food group, characterizing the dietary patterns underlying the HDDS. PDS households report higher consumption of vegetables, fruits, meat, eggs, fish and other seafood, and legumes, nuts, and seeds. While consumption of milk and milk products was lower among PDS households in 2011/12, this pattern reversed in 2023/24. PDS households also reported higher consumption of oils and fats, sweets, spices, condiments, and beverages.

Table 14 Proportion of households reporting consumption across household dietary diversity score food groups, by participation in the Public Distribution System

Food group	2011/12		2023/24	
	Non-PDS (%)	PDS (%)	Non-PDS (%)	PDS (%)
Cereals	94.8	100.0	91.2	100.0
White tubers and roots	90.4	88.0	86.0	93.2
Vegetables	94.3	99.9	89.7	99.9
Fruits	77.2	77.8	93.5	94.4
Meat	27.8	41.1	37.8	53.3
Eggs	26.3	38.9	40.1	53.4
Fish and other seafood	20.1	30.6	16.1	30.5
Legumes, nuts, and seeds	94.3	99.3	91.7	99.9
Milk and milk products	85.4	82.5	91.6	93.8
Oils and fats	94.1	99.8	89.7	99.9
Sweets	97.4	99.2	98.4	99.9
Spices, condiments and beverages	97.8	100.0	95.5	100.0

Source: Authors' estimates based on unit-level data from NSSO surveys.
Note: PDS = Public Distribution System.

6.2 Association of Public Distribution System participation with dietary diversity

Table 15 presents estimates from the CEM and IPWRA specifications examining the association between PDS participation and household dietary diversity. Inference is based on district-clustered standard errors to account for correlations among households exposed to common administrative, demographic, and geographic conditions.

PDS participation is positively associated with household dietary diversity, as measured by the HDDS. The CEM-adjusted estimates indicate that PDS participation is associated with an HDDS score that was 0.424

points higher in 2011/12 and 0.474 points higher in 2023/24. The IPWRA estimates show a similar pattern, with PDS participation associated with an HDDS score that was 0.516 points higher in 2011/12 and 0.565 points higher in 2023/24.

Table 15 Association between Public Distribution System participation and household dietary diversity

Model specification	PDS participation	
	2011/12	2023/24
Coarsened exact matching	0.424***	0.474***
	(0.028)	(0.028)
Inverse-probability weighted regression adjustment	0.516***	0.565***
	(0.031)	(0.031)

Source: Authors' estimates based on unit-level data from NSSO surveys.
Note: Robust standard errors in parentheses; *, **, and *** indicate statistical significance at the $p < 0.1$, $p < 0.05$, and $p < 0.01$ levels. PDS = Public Distribution System.

The consistency of the estimates across the two specifications indicates that the observed association between PDS participation and household dietary diversity is not sensitive to the choice of estimation method. The results are consistent with greater representation of diverse food groups in the consumption patterns of households participating in the PDS.

7. CONCLUSION AND POLICY IMPLICATIONS

Overall, the findings highlight the evolving role of large-scale food subsidy programs in structurally transforming economies. In India, the expansion of the PDS under the NFSA and its temporary augmentation under PMGKAY substantially increased households' access to subsidized cereals and associated implicit subsidy transfers. The program also contributed to poverty reduction, as indicated by the accounting simulations, and participation in the PDS is positively associated with household dietary diversity, suggesting that the provision of subsidized cereals may have broader implications for household food consumption. At the same time, the rising fiscal cost of the program underscores the importance of reassessing the long-term design of cereal-based subsidies. For countries undergoing rapid economic and dietary transitions, the central policy challenge is not whether food-based transfers should persist, but how they can evolve to remain effective, fiscally sustainable, and aligned with emerging nutrition and welfare priorities. India's experience therefore provides important lessons for other low- and middle-income countries seeking to balance food security objectives with evolving consumption patterns and fiscal sustainability.

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