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How responsive are nutrients in India? Some recent evidence

Jaya Jumrani

Department of Economics, Delhi School of Economics, University of Delhi, Delhi 110007, India
ICAR-National Institute of Agricultural Economics and Policy Research (ICAR-NIAP), Dev Prakash Shastri Marg, Pusa, New Delhi 110012, India

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ABSTRACT

The relationship between nutrient intake and income is an issue of huge policy relevance, especially in the developing world. Using large-scale household-level data from India, this paper analyzes how macronutrient and micronutrient intakes respond to changes in income in both rural and urban areas. It also investigates how food consumption patterns change over time. In a first, this paper employs different estimation approaches i.e., parametric, semi-parametric and non-parametric estimation models to obtain more recent and robust nutrient-income elasticity estimates for three macronutrients and four essential micronutrients. The parametric (OLS) calorie-expenditure elasticities were lower than those estimated for protein and fat. Micronutrients also yielded positive and statistically significant elasticities. In terms of the parametric (IV) estimation, elasticities also declined over time and had lower magnitudes than the parametric (OLS) estimates. Relative to protein, fat and micronutrient intakes, caloric intakes are less sensitive to changes in income. According to parametric (OLS and IV) estimation, calcium is the most income-responsive micronutrient, while zinc is the least. The preferred semi-parametric estimation strategy provides full flexibility to income effects while also simultaneously controlling for additional covariates parametrically, assisting in determining the true relationship between nutrient intake and income. Consistent with the parametric estimation, elasticities were positive and statistically significant. The augmented semi-parametric elasticities, which address endogeneity concerns, were lower than the non-augmented ones. The semi-parametric elasticity curves depict that the relationship between demand for nutrients and income is indeed non-linear and non-monotonic. The findings from this research demonstrate that it is critical to evaluate the effect of income across the entire income distribution, and not just at the means. Even when the elasticities are low, they are always more pronounced for the poor, who are the most vulnerable to malnutrition. The study conducts a battery of checks that further lend credence to the robustness of the main findings. Given the current landscape of India's nutrition economy, the findings of this study would serve to be useful for designing apt future nutritional interventions and public health policies.

1. Introduction

In the last three decades, the study of food and nutrition security and economic well-being has gained significant attention in academic circles, particularly in the developing world. There is now a renewed interest in the economics of food and nutrition security, especially so after the global food, fuel and financial crises of the late 2000s. Nutrition is specifically targeted in the United Nations' Sustainable Development Goal (SDG) 2; in addition, 11 of the 17 SDGs relate to it in some form or other. The developing world is rapidly transitioning from a stage of acute hunger in non-conflict areas to one of an increase in diet-related non-communicable diseases such as diabetes and cardiovascular ailments. A host of factors influences this nutrition transition, including the rate of economic progress, urbanization, technological progress and changes in the social environment.

India presents with a rather perplexing case when it comes to nutrition. Despite a significant increase in food production and a decline in poverty since the onset of the Green Revolution, India still has a high incidence of undernutrition. According to the latest *The State of Food Security and Nutrition in the World* report, there were 224 million undernourished people (16.4 percent of the population) in India during 2019–21 (SOFI, 2022). This has also been accompanied by a rapidly rising incidence of overweight and obesity among its population. In the last decade itself, obesity has almost doubled and nearly 20 percent of the population is prone to it with a body mass index of ≥ 25, and this is not just restricted to urban areas alone. In addition to this dual burden of malnutrition, India is also characterized by hidden hunger or micronutrient deficiencies, sometimes referred to as the triple burden of

E-mail address: jayajumrani.ncap@gmail.com.

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malnutrition (Pinstrup-Andersen, 2007; Meenakshi, 2016; Masters et al., 2022). This aspect has received less attention. Micronutrient deprivation, particularly of iron, zinc and vitamin A, is a leading cause of infant mortality, stunted growth and anemia (Hoddinott et al., 2012). It is a far greater problem than caloric deficiency in many developing countries due to their lack of dietary diversity and excessive reliance on calorie-dense staple foods. In addition, various forms of malnutrition are known to increase the risk and severity of infectious diseases, with the coronavirus pandemic being a recent example, by acting as a driver of immune function.

The earlier literature focused on the efficiency wage hypothesis, proposed by Leibenstein (1957) and Mazumdar (1959), which suggests that wages determine worker productivity. Workers tend to buy food that is more nutritious when they have higher earnings which consequently results in greater productivity. Employers thus do not reduce wages beyond a certain point since a lower wage level shall not enable the workers to have sufficient consumption for them to work effectively (Swamy, 1997). Much of the literature,[1] however, focuses on the relationship between nutrient (particularly caloric) intakes and income. Some researchers (see, for example, Behrman & Deolalikar, 1987; Bouis & Haddad, 1992) have argued that the responsiveness of calories to income changes is not significantly different from zero, and income-mediated policies would thus not influence nutrient intakes. On the other hand, few others (Subramanian & Deaton, 1996; Gibson & Rozelle, 2002; Abdulai & Aubert, 2004; Aromolaran, 2004; Skoufias et al., 2011; Colen et al., 2018; Gao et al., 2020) find that calorie-income elasticity is statistically different from zero and positive implying that an increase in income reduces undernourishment. The calorie-income elasticities that such studies report for India range from 0.04 to 0.50. These studies, however, do not analyze whether elasticities vary across income classes. Exceptions include Viswanathan & Meenakshi (2006) who examine if calorie-income elasticities vary by quintile expenditure groups across rural and urban India in 1999–2000, and Subramanian & Deaton (1996) who address whether the poor can access adequate calories given their daily wage income.

Furthermore, outside of estimating calorie-income elasticities, however, there has been relatively little research evaluating the relationship between income and micronutrients. Against this background, the objective of this paper is to provide more recent and robust evidence on both macronutrient- as well as micronutrient-income elasticities in India. Using nationally representative data spaced out across 18 years, this study analyzes the patterns and trends (both overall and across different food group categories) in nutrient consumption for three macronutrients[2] i.e., calories, protein and fat, and four vital micronutrients i.e., iron, zinc, vitamin A and calcium. Second, and more importantly, it undertakes a fully flexible characterization of the nature of the relationship between nutrient intake[3] and income, while simultaneously accounting for endogeneity.

The paper contributes to the long-established, yet evolving, literature on food demand estimation in the following ways: it adds to the limited literature investigating the relationship between income and nutrients (besides calories) and provides more recent and robust nutrient-income[4] elasticities by employing three estimation techniques *viz.* parametric, non-parametric and semi-parametric estimation approaches. The simultaneous use of all three methods places prominence on the sensitivity of these elasticity estimates. Additionally, the study conducts various robustness checks to assess the validity of the main findings. No previous study has utilized all these approaches simultaneously to investigate the relationship between changes in income and nutrient intakes in India. In addition to providing elasticities for both macronutrients and micronutrients, it enables a fully flexible characterization of the relationship between income and nutrient intakes. Furthermore, this work simultaneously accounts for endogeneity concerns thereby allowing us to infer causality from the findings. It thus provides a detailed portrayal of elasticities, wherein the effect of income changes is evaluated at every point of the income distribution and not just at the means.

The remainder of the paper is organized as follows. The subsequent section discusses the data sources and empirical strategy employed. Section 3 covers the results and discussion under various sub-sections. Section 4 employs a battery of checks to evaluate the robustness of the main findings. The last section discusses a summary of the key findings and their policy implications.

2. Data and methodology

2.1. Data sources

The unit-level household data employed in this analysis comes from India's nationally representative Consumer Expenditure Surveys (CES) of the National Sample Survey Office (NSSO). Three rounds i.e., 50th round, 61st round and 68th round for the periods 1993–94, 2004–05 and 2011–12, respectively, have been utilized. The most recent available CES data is from the 68th round (2011–12). The CES measures both quantity consumed and expenditure incurred on various food and non-food items. It does not canvass information on savings and measures the population's standard of living in terms of the monthly per capita expenditure (MPCE). Given that the CES does not collect information regarding a household's income, I thus employ MPCE, and the terms income and expenditure have been used synonymously throughout the analysis. Moreover, estimating MPCE is often easier than computing household incomes, particularly for the poor as current incomes are more volatile than current expenditures (Skoufias et al., 2009; Rahman, 2017). Real MPCE was estimated using the consumer price index (CPI) for agricultural laborers and industrial workers[5] (at 2001 prices) as the deflator for rural and urban areas, respectively.

The analysis relies on the Schedule Type 1 data collected in the CES rounds i.e., it has a uniform 30-day recall period for various food items while for certain durable items (such as clothing, bedding, footwear, education etc.) the same household reports the spending information for two reference periods (last 30 and 365 days). Each of the survey rounds considered in this study has a sample size of more than 100,000 households.

The CES rounds adopt a stratified multi-stage sampling process[6] and cover the entire Indian Union, except for areas such as the interior villages of Nagaland and Andaman and Nicobar Islands, which are inaccessible throughout the year. Besides these, certain other districts such as those in Leh (Ladakh) and Jammu and Kashmir are excluded due to unfavorable field conditions. Floating populations, people living in military and paramilitary forces' barracks, convicted prisoners serving their sentences, orphanages, rescue homes, ashrams and vagrant houses are also excluded. All the states and union territories (UTs) are further

[1] For an extensive review on this, see Santeramo & Shabnam (2015) and Ogundari & Abdulai (2013).

[2] Calories or energy is not a macronutrient, but it has been referred to being one throughout the paper for simplification purposes.

[3] It is important to point out here that throughout the analysis the term nutrient intake refers to nutrient availability, and these terms have been used interchangeably. The CES provides us with the information regarding the purchases made during the reference period, and not as to how much quantity was actually consumed or stored for later future consumption.

[4] The terms nutrient-income elasticity and nutrient-expenditure elasticity have been used synonymously throughout the paper.

[5] The consumer price indices for agricultural laborers and industrial workers were obtained from the Labour Bureau, Ministry of Labour and Employment, Government of India.

[6] For further details on the sampling design, refer to NSS Report Nos. 405, 513, and 560.

classified into rural (villages) and urban (blocks) sectors.

To estimate the nutrient-income elasticities for households, data on household-level characteristics and food consumption have been utilized. These survey data provide detailed information on the socio-economic characteristics of a household. Specifically, age (and its squared term) and gender of the household head, educational status of the household head, household's occupational structure, religion, social status, and household's demographic composition (number of members across different age and gender groups 0–4, 5–9, 10–14, 15–54, and above 55 years) were used for this analysis.

The information on quantities of various food items consumed by different households enables the measurement of nutrients consumed by each surveyed household, as well as the estimation of daily per capita intake of each of these nutrients and its distribution across households. The nutrient conversion factors are then used to compute the nutrient intakes of different food items. The conversion factors used in this analysis are largely based on the most recent Indian Food Composition Tables (NIN, 2017) and Nutritive Values of Indian Foods (by Gopalan et al. (1991), revised and updated by Rao et al., 2020). Wherever possible, all quantities have been converted to their standard units. For instance, appropriate conversions were undertaken to ensure that all food items were measured in kilograms or liters. Furthermore, consumption of some commodities like other vegetables, other fresh fruits etc. is reported in value (rather than quantity) terms. After deciding on the constituents of that food item, the nutrient content per rupee has been derived, which is then used as the conversion factor. A significant amount of effort has gone into determining the nutrient intakes. The specifics of the adopted procedure, which involves certain assumptions, are not discussed here but are available upon request.

The final estimation sample includes 208,133 rural and 133,382 urban households. Furthermore, all the outliers i.e., observations in terms of daily per capita nutrient intake and real MPCE that are most likely misreported, are identified and removed from this estimation sample. These outliers constitute about 2–3 percent of the entire sample.[7]

2.2. Empirical strategy

The primary goal of this study is to investigate the relationship between income and nutrient intake in Indian households. A natural starting point is to estimate the nutrient demand function, which is specified as:

$$K_i = f(Y_i) + \beta X_i + \varepsilon_i \quad (1)$$

where K_i is the natural logarithm of per capita nutrient demand, Y_i is the natural logarithm of real MPCE for household i and X_i is a vector of exogenous variables with known or assumed functional form that affect nutrient demand. Equation (1) is estimated separately for each nutrient of interest considered in this analysis. These nutrients of interest include three macronutrients or proximate principles (calories, protein and fat) and four essential micronutrients (iron, zinc, vitamin A and calcium). These micronutrients have been selected due to their relative importance in a nutritional context in India. These essential vitamins and minerals are commonly found in fruits and vegetables, dairy products and animal-source foods that are considered to be important components of a well-balanced diet. The vector of exogenous variables X_i includes age (and its squared term) of the household head, gender and educational status of the household head, household's occupational structure, religion, social status, and household's demographic composition (number of male and female members across different age groups 0–4, 5–9, 10–14, 15–54, and above 55 years). Besides these socio-economic characteristics, locality-specific fixed effects have also been included. These fixed effects account for price differentials and any other time-invariant location-specific effects such as tastes, policies, weather etc. that could directly influence nutrient intake. A locality here refers to the first stage units (FSUs) (i.e., villages in rural and blocks in urban areas), unless stated otherwise. Standard errors have also been clustered by these FSUs to account for any kind of arbitrary intra-cluster correlation. Rural and urban households were examined separately to capture the gross differentials in activity levels and lifestyles.

In order to aptly account for the impact of socio-economic factors in determining the effects of an increase in income on nutrient intake, a suitable parametric approach is required. The nutrient-income elasticities are thus first estimated using the parametric estimation approach. Consistent parametric estimation is primarily dependent on selecting the correct functional form of the model. The ordinary least squares (OLS) technique is employed to estimate equation (1), where $f(Y_i)$ is specified as the natural logarithm of real MPCE and the dependent variables include the natural logarithm of daily per capita intakes of the aforementioned nutrients of interest. It also takes into account all the previously mentioned covariates as well as FSU-specific fixed effects. Following Paternoster et al. (1998), a formal test checking for the equality of coefficients across rural and urban India has also been undertaken.

There are a few important issues, which are related to the relationship between nutrient intake (K) and expenditure (Y), that merit some discussion here. It is likely that Y may be correlated with the error term ($Cov(Y, \varepsilon) \neq 0$). There are two possible sources of this correlation. First, there could be a reverse causality between K and Y, which implies that those who eat less have poorer health outcomes and thus earn less. Reverse causality will likely not be a major problem in this case, predominantly for calories, as the daily cost of calories constitutes a small proportion of a person's daily wages in India (Subramanian & Deaton, 1996). Alternatively, certain unobservable factors, such as individual food preferences, eating habits and/or social norms, may be correlated with income, thereby leading to biased OLS estimates. The second source of correlation between Y and the error term (ε) might arise from measurement errors. A distinct problem is that nutrient intake K is derived from the quantity of food purchased. Although the quantity information is collected independently of the expenditure information, there is a likelihood that the measurement error for the quantity purchased is related to the measurement error associated with the purchase value and thus to total household expenditure, as was first pointed out by Bouis & Haddad (1992). This likely correlation can lead to a potential bias in the OLS estimates. The direction of bias in OLS estimates will typically depend upon whether the bias from the correlated errors outweighs the standard attenuation bias from measurement error in consumption[8] or vice-versa. Another potential measurement error may arise from the proportion of food fed to guests/workers, outside home consumption, easy availability of relatively cheap unhealthy processed foods and wastage (Bouis, 1994; Tandon & Landes, 2011; Pingali et al., 2019).

In this study, the simultaneity bias and measurement error problems are addressed by employing the Instrumental Variables (IV) estimation approach. A standard IV estimation necessitates the use of an instrument

[7] All the outliers, i.e., observations in terms of per capita nutrient intake and monthly per capita expenditure that are most likelymisreported were identified using an objective approach of blocked adaptive computationally efficient outlier nominators (BACON) algorithm as proposed by Billor, Hadi, and Velleman, and implemented using the user-written Stata command bacon (Weber, 2010).

[8] However, the likelihood of measurement error arising out of changes in questionnaires is quite low in this analysis because similar questionnaires and same nutrient content tables have been utilized across all the survey rounds. There is a noted reduction in the number of food items canvassed over the years, but it is difficult to measure the exact impact of these listing changes as some of the food items have simply been combined or redefined (Meenakshi & Viswanathan, 2017).

or variable that causes exogenous variation in the predictor of interest, which then cleanly estimates the relationship between the predictor and outcome variable. Non-food expenditure and wealth-based measures are the often-used instruments to address the measurement error problem in calorie-income elasticity estimation (Subramanian & Deaton, 1996; Meng et al., 2009).

Next, to address the aforementioned endogeneity concerns, equation (1) is also estimated parametrically using the IV estimation approach. In this study, a linear combination of the natural logarithm of locality median non-food expenditure and its squared term is employed as the instrument. I also employ -two additional sets of instruments to check for the robustness of these results. However, only the results from the first set of instruments are reported as part of the main tables, while findings from the other two sets have been relegated to the appendix.

One of the main advantages of the parametric approach is that it enables us to control for a large set of control variables, including fixed effects. However, it is also restrictive in the sense that it assumes that the nutrient-income elasticity is constant i.e., the conditional relationship between income and nutrient intake is linear and monotonic. One could address this concern by employing flexible non-linear specifications of equation (1), which can be still linear in parameters, but allow the elasticity to vary with income.[9] Even with these flexible specifications, the parametric model may be incorrectly specified resulting in inconsistent estimates and thereby possibly failing to accurately capture the true relationship between income and nutrient intake.

Given the preceding discussion, one option is to specify equation (1) non-parametrically to allow a fully flexible relationship between the dependent and independent variables and permit the data to speak for itself (Delgado & Robinson, 1992). This approach, however, suffers from the curse of dimensionality problem (DiNardo & Tobias, 2001) and does not allow for the precise exploration of multi-variate relationships because multiple variables make estimation computationally difficult, especially with large datasets like the ones used in this study. However, for the sake of comparison, I estimate the bivariate relationship between the outcomes (natural logarithm of daily per capita nutrient consumption) and the key variable of interest (natural logarithm of real MPCE) across both sectors.

Given that non-parametric estimation is often restricted to low-dimensional relationships, I next consider the semi-parametric estimation approach, which is considered to be a good compromise between fully parametric and non-parametric models (Rodriguez-Poo & Soberon, 2016). This approach permits the inclusion of other covariates, besides MPCE, that also determine nutrient demand. Equation (1) is semi-parametric in the sense that there are covariates such as socio-economic characteristics that appear linearly and MPCE which appears as a non-linear function $f(Y_i)$. This technique gives full flexibility in terms of the functional form specification of the nutrient demand function and determines the true nature of the relationship between income and nutrient intake. The parametric βX and non-parametric f(Y) component parts are additively separable in this model. The subscript i in equation (1) represents the i^{th} household and the function f is a smooth, single-valued function with a bounded first derivative.

Semi-parametric models enable us to strike a balance between the curse of dimensionality concern and the choice of completely non-parametric specifications to measure the impact of certain variables of interest such as expenditure in this analysis. These models, particularly the partial linear models, are commonly employed in nutrition studies (Tian & Yu, 2015). The partial linear models are traditionally estimated by either using the conditional expectation method proposed by Robinson (1988) or the differencing method proposed by Yatchew (1997, 1998). For the purposes of this analysis, I have adopted the latter as the study is primarily concerned with the estimation of f(Y). The partial linear model, one of the semi-parametric estimators that relies on differencing, was first proposed by Yatchew (1997, 1998). The estimation essentially involves a two-step procedure. The sample is first ranked according to the Y variable in an ascending manner and the first difference of equation (1) obtains:

$$\Delta\ K_i = \Delta f(Y_i) + \beta\Delta X_i + \Delta\varepsilon \tag{2}$$

where Δ of a variable stands for the difference between observations i and i-1. Given that Y_i is bounded as the sample size increases, $\Delta f(Y_i) \approx 0$ as $f(Y_{i-1})$ tends to cancel $f(Y_i)$. Provided Y and other independent variables are not perfectly correlated, OLS estimation of equation (2) will give consistent estimates of β. The objective of this step is to almost eradicate the effect of the non-parametric component f(.) and retain only the parametric component. The error term has a first-order moving average structure and it reduces the efficiency of the OLS estimator. This efficiency of the estimator can be improved by using higher-order differencing[10] of the sorted data (Yatchew, 1998). Subtracting the estimated parametric part from both sides of equation (1) using the consistent estimates of β, we get:

$$\mathrm{ui} = \mathrm{Ki} - \widehat{\beta}\mathrm{Xi} = \mathrm{f(Yi)} + \varepsilon\mathrm{i} \tag{3}$$

and then any of the non-parametric methods can be applied to estimate the relationship between K_i and f(Y). Due to the plausible biases associated with kernel regressions (see Fan (1992, 1993) for a discussion on this), particularly at the endpoints of an estimated regression, the smooth local regression technique proposed by Fan (1992, 1993), employed by Subramanian & Deaton (1996) and Deaton (1997), has been employed here with a chosen bandwidth[11] and each observation i is weighted by a quartic kernel. At any point of y, a weighted linear regression of the natural logarithm of the dependent variable in equation (3) on the natural logarithm of real MPCE is estimated. The weights are chosen such that they are largest for the points close to y and diminish with distance from y. Also, as the sample size increases, the weight given to the immediate neighborhood of y is increased such that, in the limit, only y is represented.

Furthermore, the augmented semi-parametric regression technique as proposed by Blundell et al. (1998) is employed to evaluate the magnitude to which the standard semi-parametric estimation may be biased.[12] The idea here is to find a valid instrument (Z) to estimate the first-stage equation of:

$$\mathrm{Yi} = \lambda\mathrm{Zi} + \theta\mathrm{Xi} + \upsilon_i \tag{4}$$

The estimated residual ($\widehat{\upsilon}$) is then plugged back into equation (2) and the above-mentioned Yatchew's (1998) semi-parametric regression procedure is then followed again.

[9] A few flexible specifications in the parametric framework, including the introduction of squared log-transformed expenditure term, inverse quadratic expenditure terms and higher order of expenditure terms, were also estimated to account for any potential non-linearities in the nutrient-income relationship. These estimations have not been reported. The coefficients derived from these specifications were statistically significant, but none of these could closely approximate the shape of the semi-parametric elasticity curves so derived from the partial linear models.

[10] After exploring for various orders, the differencing order was finally set at seven.

[11] A bandwidth of 0.5 was chosen to balance the tradeoff between bias and variance.

[12] Another alternative approach to estimation under endogeneity has been undertaken by Blundell et al. (2007) wherein they adopt an IV approach unlike the parametric additive control function approach adopted here. Both these approaches provide a good representation of the demand behavior for households in the UK Family Expenditure Survey dataset.

Table 1
Mean nutrient intakes.

	Rural			Urban		
	1993–94	**2004–05**	**2011–12**	**1993–94**	**2004–05**	**2011–12**
Calories per capita per day (Kcal)	2116	2008	2157	2084	2009	2302
Protein per capita per day (g)	60	56	60	59	56	67
Fat per capita per day (g)	29	32	42	40	44	133
Iron per capita per day (mg)	16	14	15	15	14	18
Zinc per capita per day (mg)	11	10	11	10	10	15
Vitamin A per capita per day (mcg)	1252	1275	1049	1434	1515	1316
Calcium per capita per day (mg)	429	387	428	478	455	543
Real monthly per capita expenditure (Rs.)	446	508	647	823	939	1231

Table 2
Nutrient-income elasticities – Parametric (OLS) estimation.

	Daily per capita calorie intake			Daily per capita protein intake			Daily per capita fat intake		
MPCE	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12
Panel A: Rural	0.444[a]	0.364[a]	0.304[a]	0.471[a]	0.402[a]	0.356[a]	0.775[a]	0.675[a]	0.564[a]
	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)	(0.005)	(0.004)	(0.005)
Adjusted R-squared	0.734	0.695	0.523	0.745	0.726	0.556	0.836	0.821	0.672
Village fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	68,092	77,733	55,031	68,161	77,782	57,473	68,427	77,922	54,314
Panel B: Urban	0.371[a]	0.306[a]	0.297[a]	0.376[a]	0.321[a]	0.339[a]	0.641[a]	0.568[a]	0.639[a]
	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)	(0.004)	(0.005)	(0.004)	(0.010)
Adjusted R-squared	0.702	0.666	0.442	0.671	0.666	0.463	0.815	0.790	0.421
Block fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	45,384	44,398	37,770	45,408	44,441	40,433	45,543	44,518	41,468
Z statistic	17.21[a]	16.09[a]	1.40	22.39[a]	19.09[a]	3.01[a]	18.95[a]	18.92[a]	−6.71[a]

	Daily per capita iron intake			Daily per capita zinc intake			Daily per capita vitamin A intake			Daily per capita calcium intake		
MPCE	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12
Panel A: Rural	0.413[a]	0.375[a]	0.364[a]	0.403[a]	0.341[a]	0.323[a]	0.619[a]	0.567[a]	0.541[a]	0.756[a]	0.685[a]	0.618[a]
	(0.004)	(0.004)	(0.005)	(0.004)	(0.003)	(0.004)	(0.009)	(0.007)	(0.008)	(0.006)	(0.005)	(0.005)
Adjusted R-squared	0.783	0.801	0.620	0.775	0.768	0.518	0.664	0.678	0.630	0.730	0.765	0.714
Village fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	68,638	78,479	58,784	68,485	78,361	57,245	68,601	78,268	59,076	68,415	78,275	59,074
Panel B: Urban	0.341[a]	0.307[a]	0.358[a]	0.316[a]	0.274[a]	0.394[a]	0.559[a]	0.504[a]	0.495[a]	0.612[a]	0.563[a]	0.548[a]
	(0.004)	(0.004)	(0.005)	(0.004)	(0.003)	(0.007)	(0.009)	(0.009)	(0.008)	(0.006)	(0.005)	(0.005)
Adjusted R-squared	0.699	0.726	0.495	0.674	0.684	0.380	0.589	0.572	0.578	0.702	0.701	0.658
Block fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	45,679	44,745	41,370	45,583	44,688	41,039	45,580	44,556	41,656	45,276	44,545	41,605
Z statistic	12.73[a]	12.02[a]	0.85	15.38[a]	15.79[a]	−8.81[a]	4.71[a]	5.53[a]	4.07[a]	16.97[a]	17.25[a]	9.90[a]

Notes: Standard errors clustered at FSU level are reported in parentheses; [a] $p < 0.01$, [b] $p < 0.05$, [c] $p < 0.1$. Statistical test for evaluating equality of coefficients, $Z = (b_1 - b_2) / \text{sqrt}\{(SEb_1^2 + SEb_2^2)\}$ has been employed following Paternoster et al. (1998).

3. Results and discussion

In this paper, nutrient-income elasticities have been estimated by employing three different estimation methods i.e., parametric, non-parametric and semi-parametric approaches. The empirical literature in this domain has largely focused on the relationship between calories and income. This work goes beyond calories and estimates elasticities for two other proximate principles (i.e., protein and fat) and four vital micronutrients (i.e., iron, zinc, vitamin A and calcium). The entire analysis has been undertaken separately for both rural and urban areas owing to their differences in terms of lifestyles, cultures, tastes and preferences. A formal test of equality of coefficient (Paternoster et al., 1998) concerning the main predictor (i.e., real MPCE) is also largely rejected across rural and urban India, as is presented in Table 2. In addition, prevalent patterns in nutrient intakes across food groups and inter-temporal trends in intakes have also been briefly evaluated.

3.1. Food consumption patterns

A preliminary analysis of the trends in nutrient intake is set out in Table 1. The table provides the average nutrient intakes across food group categories. Within macronutrients, calories are measured in kilocalories (Kcal), protein and fat in grams (g), iron, zinc and calcium in milligrams (mg), and vitamin A[13] in micrograms (mcg). In rural areas, calorie and protein intakes declined between 1993–94 and 2004–05 and increased thereafter. A similar pattern is evident in urban areas (Table 1). In 2011–12, an average rural individual consumed 2157 Kcal per day, while an urban individual consumed 2302 Kcal. The daily protein intakes stood at 60 g in rural areas, while these increased to 67 g in urban areas in 2011–12. Fat intakes in both sectors considerably increased between 1993–94 and 2011–12, with the growth being much starker in urban areas. Fat consumption in urban households grew by 233 percent compared to 45 percent in rural households.

In terms of micronutrients, in 2011–12, an average rural individual daily consumed approximately 15 mg of iron, 11 mg of zinc, 428 mg of calcium and 1049 mcg of vitamin A. During the same period, its urban counterpart consumed 18 mg of iron, 15 mg of zinc, 543 mg of calcium

[13] As the diet contains both retinol and beta-carotene, I have employed retinol (vitamin A) in terms of beta-carotene as – Total beta-carotene (mcg) = 4*retinol content + beta-carotene content. Throughout the analysis, vitamin A is synonymous to this expression.

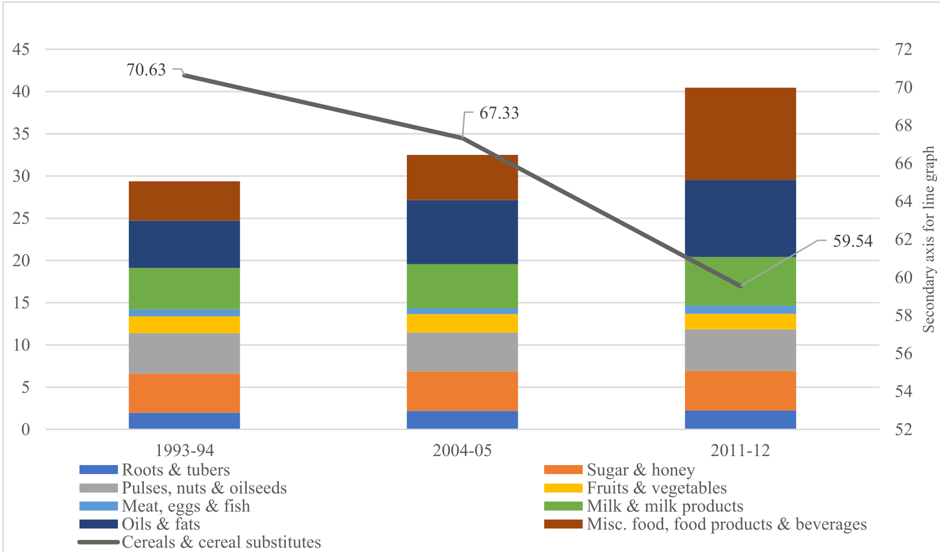

Fig. 1a. Share (%) in total caloric intake across food groups – Rural India.

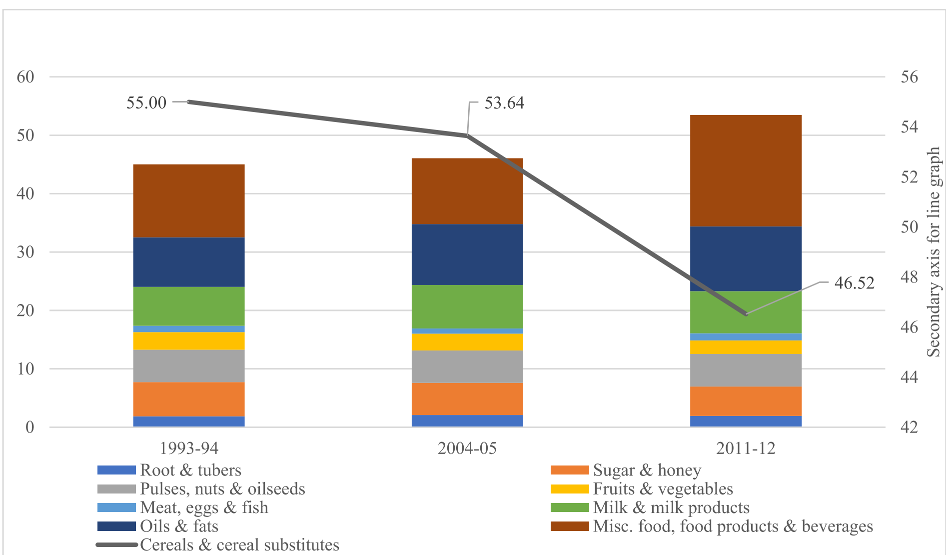

Fig. 1b. Share (%) in total caloric intake across food groups – Urban India.

and 1316 mcg of vitamin A. On average, all of these appear to be lower than their respective dietary norms associated with a sedentary male worker in India. Except for vitamin A, micronutrient intakes decreased between 1993–94 and 2004–05, followed by an increase thereafter in both sectors. Over a span of 18 years, rural consumption of iron and vitamin A has decreased, while zinc consumption has remained more or less constant. The decline in vitamin A consumption has been to the tune of 16 percent while that for iron has been at 6 percent. Except for vitamin A, all micronutrient intakes increased between 1993–94 and 2011–12 in urban areas. Zinc consumption increased the most, followed by iron and calcium intakes. Table 1 also presents the average real MPCE (at 2001 prices) for rural as well as urban India. These expenditures increased dramatically between 1993–94 and 2011–12; however, rural spending levels are substantially lower than in urban India.

A natural question that arises next is where exactly are these calories coming from? To answer this, I examine the prevalent patterns in food consumption spread out across nine food groups[14] across all the three survey rounds (i.e., 50th, 61st and 68th) under consideration. Figures 1a and 1b show that, except for cereals and cereal substitutes and roots and tubers, the calorie share derived from all remaining food groups is higher in urban households than in rural households between 1993–94 and 2011–12. During this period, the share of cereals and cereal substitutes decreased significantly; the decline was much starker in rural areas. Cereals and their substitutes, as expected, are the most common

[14] The food groups considered include cereals and cereal substitutes, root and tubers, sugar and honey, pulses, nuts and oilseeds, fruits and vegetables, meat, eggs and fish, milk and milk products, oils and fats, and miscellaneous food, food products and beverages. Pan, tobacco and intoxicants category has not been considered while computing the nutritional content as these items are not nutritionally important and are also consumed by only a few members in a household.

source of calories in rural households, followed by oils and fats across all survey rounds except for 2011–12. In 2011–12, the miscellaneous food products and beverages category accounted for about 11 percent of the overall calories. Similarly, this category also had the highest share among all food groups in urban households, followed by oils and fats. This increase in the miscellaneous foods category is most likely a lower bound of the true estimate as calories estimated from processed foods are systematically underestimated in household survey data (see Tandon & Landes, 2011 for a discussion on this).

Fruits and vegetables are rich sources of vitamins and minerals, whereas dairy products are rich in vitamin A and calcium. Nonetheless, fruits and vegetables account for only about 2–3 percent of the overall caloric intake. This share, however, also marginally declined between 1993 and 94 and 2011–12. Milk and milk products have witnessed a marginal improvement of 0.84 (0.50) percentage points in rural (urban) areas during the same period (Figures 1a and 1b). Sugary and fatty foods, which are known to cause non-communicable diseases like diabetes and cardiovascular ailments, are expanding more rapidly in diets than relatively healthier options like fruits and vegetables, dairy products and animal-source foods. The overall picture emerging from this preliminary exploration is that nutrient intakes and caloric shares do vary over time and across households at different rungs of the economic ladder. These findings are dealt with in more detail in the analysis below.

3.2. Parametric estimation approach

Equation (1) is estimated separately for each survey round using parametric estimation approaches (i.e., both OLS and IV[15]) for both rural and urban areas separately, wherein $f(Y_i)$ is specified as the natural logarithm of real MPCE. Table 2 presents the estimated elasticities across nutrients from OLS estimation across rural and urban areas. The detailed tables, which provide the estimated coefficients for all the other considered covariates in the OLS estimation of equation (1), are not reported but are available upon request. All the nutrient-income elasticities for macronutrients are positive and statistically significant, both over time and across sectors. Between 1993–94 and 2011–12, the estimated elasticities for calories ranged from 0.304 to 0.444 in rural areas and 0.297 to 0.371 in urban areas.

This essentially characterizes Engel's Law, which states that as a family's income increases, the proportion of their spending on food either remains constant or decreases. In other words, as a household's income rises, its demand for food rises less than proportionately. The elasticity estimates for protein and fat are larger than those found for calories, as one might anticipate. In both rural and urban areas, fat consumption is more responsive relative to calorie consumption. Between 1993–94 and 2011–12, protein and fat elasticity estimates ranged from 0.356 to 0.471 and 0.564 to 0.775, respectively, in rural areas, and from 0.321 to 0.376 and 0.568 to 0.641 in urban areas. Except for the calorie elasticity estimate in 2011–12, magnitudes among rural households are significantly higher than that observed among urban households (Table 2), which is consistent with the differences in living standards between rural and urban India.

The four essential micronutrients considered in this analysis yielded similar results. All the estimates are positive and highly statistically significant both across rural and urban India (Table 2). Calcium has been the most income-responsive micronutrient, followed by vitamin A, iron and zinc in both sectors. Households usually demand food baskets and not individual nutrients, and they tend to smoothen their consumption over time. It is therefore not essential that the demand for calories is independent of the demand for other macronutrients and vital micronutrients. As expected, iron estimates were quite similar to calorie estimates, since cereals are consumed in large quantities, thereby making them a major source of dietary iron in Indian diets. Anemia has not declined over time, but rather increased (Meenakshi, 2016). In addition, Indian diets are largely vegetarian and consumption of pulses has been stagnant over time. Here too, barring calorie and zinc elasticities in 2011–12, there did exist a significant differential – rural households had higher elasticities than urban households. Except for urban iron and zinc estimates, all other elasticity estimates have decreased over time (Table 2).

The parametric (OLS) estimation indicates that income elasticities for macronutrients have declined in both rural and urban areas. Over time, with increased income, there has been a decline in the intake of macronutrients. This fall in elasticities may be attributed to the fact that as an average household's income increases, the household may decide to prioritize food quality over quantity. The elasticity estimates for micronutrients were also in line with the ones observed for macronutrients. In rural areas, elasticities for all four micronutrients declined over time. However, these estimates observed an increase in the case of iron and zinc in urban India. Vitamin A and calcium intakes were more responsive to changes in income in both sectors.

Next, to address the aforementioned endogeneity concerns, I employ the Instrumental Variables (IV) estimation strategy. As earlier discussed, in an IV setup, an endogenous regressor i.e., real MPCE is instrumented with a variable such as income that is assumed to be exogenous. The CES rounds, however, do not collect information on a household's income. A precise empirical validation of an instrument is impossible since the actual error term is unknown, and most IV selection decisions are thus largely theoretically motivated. Following Skoufias et al. (2009), in the absence of an income variable, a linear combination of locality-median non-food expenditure and its squared term is employed here as instruments. These are expected to be correlated with a household's real MPCE and to influence nutrient intakes indirectly. One can expect that a household's MPCE would be correlated with its locality-specific median non-food expenditure as the likelihood of an average household spending more on non-food items is likely to be higher if a greater proportion of households spend on non-food items in the community. Given that these variables are community specific and not household specific, they are less likely to suffer from the correlated measurement errors problem. The locality-specific median non-food expenditure and its squared term, like the endogenous regressor i.e., MPCE, are in natural logarithmic form and real terms. The IV estimation approach incorporates all the covariates considered in the OLS estimation. Similar to the OLS estimation, here as well, the standard errors have been clustered by FSUs i.e., villages in rural and blocks in urban areas. Further, to account for time-invariant location-specific characteristics, locality-specific fixed effects are also included. As the instruments employed here vary at the FSU level (i.e., villages in rural and blocks in urban areas), these fixed effects consist of district dummies for the years 2004–05 and 2011–12 (while these include state-region dummies in the 1993–94 sample as this survey did not collect information on the district identifiers).

The first-stage regression estimation results from the IV estimation are reported in Tables A11 and A12 of the appendix for rural and urban areas, respectively. These findings indicate that the locality-specific median non-food expenditure is highly correlated with the monthly spending of an average household. The strength of the first-stage F statistics indicates that all the instruments seem to have ample power. Given that this IV estimation is concerned with the evaluation of the strength of instruments in a non-homoscedastic framework, I report here the Kleibergen-Paap F statistic, which is equivalent to the robust F statistic in the case of a single endogenous regressor, as in the present context. Alternatively, as proposed by Olea & Pflueger (2013), the effective F statistic that accounts for a multiplicative correction in models with non-homoscedastic errors based on the robust variance estimate is also reported. The Montiel Olea and Pflueger (MP) test

[15] The OLS and IV approaches have been estimated using the user-written Stata commands reghdfe (Correia, 2014) and ivreghdfe (Correia, 2018), respectively.

assesses the strength of the employed instruments by testing for the null hypothesis of weak instruments.[16] This test is applicable in the case of an over-identified model with a single endogenous regressor. In non-homoscedastic settings, the effective F statistic is the preferred test for detecting weak instruments in the case of an over-identified model with a single endogenous regressor (Andrews et al., 2019). The magnitudes of the robust and effective F statistics were both quite large. The effective F statistics at a 5 percent confidence level are reported to be highly significant and much higher than the rule-of-thumb value of 10 and even 104.7 as proposed by Lee et al. (2022). They are also significantly higher than the critical values across different proportions of worst-case bias as derived from the MP test, which are not reported here for the sake of brevity. This is indicative of the relevance and strength of the employed instruments used in both sectors. No over-identification tests have been provided here as no consensus has been reached in the literature on what inference procedures are to be used in over-identified models with non-homoscedastic errors (Andrews et al., 2019). The rejection of the null hypothesis of exogeneity of specified endogenous regressor (Tables 3a and 3b) suggests that MPCE can be considered as an endogenous regressor in both rural and urban India for all outcomes.

The elasticity estimates derived from the IV approach are set out in Tables 3a and 3b for rural and urban India, respectively. For all macronutrients, these IV elasticity estimates are lower than those obtained using the OLS approach. The IV elasticity estimates for calories, protein and fat have declined over time in rural areas, similar to the OLS estimates. Elasticity estimates for calories declined from 0.244 in 1993–94 to 0.207 in 2011–12 in rural India. In both rural and urban areas, fat consumption is more responsive to changes in income than the consumption of calories and protein. Between 1993–94 and 2011–12, protein and fat elasticity estimates ranged from 0.232 to 0.267 and 0.413 to 0.510, respectively in rural areas, and from 0.113 to 0.195 and 0.282 to 0.517 in urban areas. Fat elasticity estimates were higher in urban areas than rural areas, except for 2004–05. Calorie elasticities in urban areas have marginally decreased from 0.187 in 1993–94 to 0.130 in 2011–12. Protein elasticities have declined over time in both rural and urban India. However, these estimates for calories and protein are larger in rural areas than in urban areas.

In terms of the nutrient-income elasticities for the four vital micronutrients considered in this analysis, all the estimates are positive and statistically highly significant across both rural and urban India (Tables 3a and 3b). Except for two minerals, i.e., urban zinc and calcium intakes in 2011–12 and calcium intakes in 1993–94, all the rural estimates are higher than their urban counterparts. In both rural and urban areas, calcium and vitamin A have been relatively more responsive to income changes, followed by iron and zinc. Rural households had higher elasticities than urban households for most micronutrients across survey rounds. Except for rural zinc and urban iron estimates, all other micronutrient elasticity estimates have decreased across survey rounds, mirroring the trend observed in OLS estimation.

Some of the findings concerning other covariates point to certain intriguing results, which have been briefly discussed here. The positive influence of the household head's age lasted only until a threshold number of years for both OLS and IV estimation. More experienced household heads had a better understanding of the benefits of adequate nutrition. Compared to an average male-headed household, a female-headed household had a positive effect on nutrient intake in both rural and urban areas conditional on controlling for all the other considered covariates. This suggests that women-controlled households spend more on education and health (Duflo, 2003).

With IV estimation, the surprising results from the OLS approach of declining intakes with greater educational attainment were altered. Relative to an illiterate head in rural areas, more educated households consumed more calories and protein, with fat consumption increasing the most. These effects were also prevalent in urban areas. Compared to the base category of an illiterate head, higher levels of education led to greater micronutrient consumption among households in both rural as well as urban India. These effects were however not as high in magnitude as macronutrients and were insignificant in some cases. Only among calcium intakes did education have a consistent positive influence. These effects were stronger in urban areas, as expected, due to their relatively higher purchasing power capacity (Tables 3a and 3b). These findings suggest that higher educational attainment does not necessarily imply better nutritional knowledge and thereby higher consumption of essential vitamins and minerals.

In rural areas, as one would expect, socially progressive caste categories consumed more calories, protein and fat. No such consistent pattern was observed in urban areas. Compared to rural ST households, other progressive social classes had higher intakes of vitamin A, iron, zinc and calcium, but here too, the magnitudes were highest for calcium consumption. Similarly, in urban locations, only calcium intakes were consistently higher for those households in the upper echelons of the societal ladder.

In terms of a household's occupational status, households engaged in more non-sedentary activities had lower consumption of macronutrients. On the other hand, households involved in more laborious work had higher macronutrient consumption. These findings were evident in terms of both OLS and IV estimation approaches. For instance, relative to a rural self-employed non-agricultural household, self-employed in agriculture category households had higher caloric intakes. Farm households also consumed more protein and fat intakes, whereas other types of laborers had lower macronutrient intakes. Similarly, self-employed agricultural households in rural areas, for instance, had higher micronutrient intakes than those self-employed in non-agricultural activities. Among these, calcium intakes were the most responsive. No such clear patterns were evident in urban areas for macronutrient consumption; however, for micronutrient intakes, households engaged in casual labor had lower intakes relative to the self-employed ones. However, these findings only provide some indication as the precise work intensity information is not captured here.

The coefficients depicting household structure also corresponded to expectations – an increase in family size did result in lower levels of consumption. A greater number of children in rural areas resulted in a larger decrease in macronutrient intakes compared to adults, with some gender differentials also evident for adolescents. A similar pattern was also present for all micronutrient intakes, except for vitamin A. In urban locations too, an increase in the household size led to a decline in nutrient intake. Similar patterns were seen here, albeit with slightly higher absolute magnitudes.

The estimates from this analysis are quite close to those obtained from some of the previous studies (Table A6). However, the parametric (OLS) caloric estimates obtained in this study are higher than those obtained by Roy (2001) in her panel data estimation using village-level data from India's semi-arid tropics. Our nutrient-income elasticities are also higher than those reported by Jha et al. (2009) using the data from the National Council for Applied Economic Research for 1994. In another study, using CES data, Gaiha et al. (2013a) estimated the nutrient-expenditure elasticities for 1993–94 and 2004–05. In rural areas, the elasticities for calories, protein and fat were 0.43, 0.49 and 1.00, respectively in 1993–94, but these declined to 0.35, 0.42 and 0.75, respectively in 2004–05.

Sharma (2006, 2015) estimated the nutrient-expenditure elasticities for 1983 and 1999–2000 across states in rural India using the CES data. Sharma (2006) was the first of a few studies that focused on evaluating micronutrient elasticities in India. Besides macronutrients, Sharma (2015) estimated elasticities for iron, vitamin C, thiamine, riboflavin, niacin and carotene in a seemingly unrelated regression framework, using both a linear and quadratic specification for income. The magnitudes of these elasticities were positive, though typically less than one,

[16] This test was conducted using the user-written Stata command weakivtest (Pflueger & Wang, 2013).

Table 3a
Nutrient-income elasticities – Parametric (IV) estimation.

Rural	Daily per capita calorie intake			Daily per capita protein intake			Daily per capita fat intake		
	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12
MPCE	0.244[a]	0.218[a]	0.207[a]	0.267[a]	0.248[a]	0.232[a]	0.510[a]	0.413[a]	0.413[a]
	(0.010)	(0.008)	(0.009)	(0.010)	(0.008)	(0.010)	(0.015)	(0.012)	(0.016)
Religion (base: Hinduism)									
Islam	−0.018[a]	−0.011[a]	−0.014[a]	−0.002	0.006	0.005	−0.035[a]	−0.034[a]	−0.027[a]
	(0.005)	(0.004)	(0.004)	(0.005)	(0.004)	(0.005)	(0.007)	(0.006)	(0.008)
Christianity	−0.006	0.001	−0.005	0.008	0.021[a]	0.004	0.029[b]	−0.019[c]	−0.060[a]
	(0.008)	(0.006)	(0.008)	(0.008)	(0.007)	(0.010)	(0.013)	(0.011)	(0.015)
Sikhism	0.047[a]	0.036[a]	0.037[a]	0.055[a]	0.043[a]	0.030[b]	0.052[a]	0.043[a]	0.063[a]
	(0.010)	(0.008)	(0.014)	(0.011)	(0.009)	(0.013)	(0.016)	(0.012)	(0.018)
Jainism	−0.016	0.010	0.034	−0.061[b]	−0.029	0.024	0.055	0.064[c]	0.024
	(0.023)	(0.028)	(0.036)	(0.028)	(0.025)	(0.036)	(0.043)	(0.035)	(0.058)
Buddhism	0.012	−0.002	0.001	0.014	0.005	0.002	0.018	0.002	−0.018
	(0.011)	(0.011)	(0.013)	(0.012)	(0.012)	(0.014)	(0.033)	(0.019)	(0.021)
Zoroastrianism	0.034	0.003	0.370[a]	0.124[a]	−0.003	0.298[a]	0.183[a]	0.164	0.301[a]
	(0.025)	(0.119)	(0.091)	(0.028)	(0.069)	(0.072)	(0.047)	(0.107)	(0.079)
Others	0.061[a]	0.012	0.009	0.058[a]	0.014	0.018	−0.109[a]	−0.093[a]	−0.018
	(0.021)	(0.015)	(0.023)	(0.019)	(0.015)	(0.023)	(0.040)	(0.027)	(0.039)
Social group (base: Scheduled tribes)									
Scheduled castes	0.011[c]	−0.004	−0.000	0.010[c]	−0.009[b]	−0.004	0.031[a]	0.021[a]	0.031[a]
	(0.006)	(0.004)	(0.005)	(0.006)	(0.004)	(0.005)	(0.009)	(0.007)	(0.008)
Other backward classes	–	0.011[a]	0.007	–	0.007[c]	0.010[b]	–	0.084[a]	0.067[a]
		(0.004)	(0.005)		(0.004)	(0.005)		(0.007)	(0.008)
Others	0.038[a]	0.017[a]	0.012[b]	0.034[a]	0.009[c]	0.014[b]	0.111[a]	0.119[a]	0.086[a]
	(0.006)	(0.004)	(0.005)	(0.006)	(0.005)	(0.006)	(0.009)	(0.007)	(0.009)
Age of household head	0.003[a]	0.006[a]	0.006[a]	0.004[a]	0.007[a]	0.007[a]	−0.000	0.003[a]	0.005[a]
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Age of household head squared	−0.000[a]	−0.000[a]	−0.000[a]	−0.000[a]	−0.000[a]	−0.000[a]	0.000[a]	−0.000[a]	−0.000[a]
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex of household head (base: Male)									
Female	0.013[a]	0.019[a]	0.016[a]	0.009[b]	0.016[a]	0.015[a]	0.050[a]	0.055[a]	0.028[a]
	(0.004)	(0.003)	(0.004)	(0.004)	(0.003)	(0.004)	(0.005)	(0.004)	(0.006)
Education of household head (base: Illiterate)									
Literate and literate w/o formal schooling	0.014[a]	0.010[a]	0.009[a]	0.010[a]	0.009[a]	0.008[b]	0.056[a]	0.035[a]	0.026[a]
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.005)	(0.004)	(0.006)
Literate: below primary	0.015[a]	0.013[a]	0.006[c]	0.012[a]	0.014[a]	0.007[c]	0.074[a]	0.060[a]	0.026[a]
	(0.003)	(0.002)	(0.003)	(0.003)	(0.002)	(0.004)	(0.005)	(0.004)	(0.006)
Literate: primary	0.023[a]	0.015[a]	0.007[b]	0.022[a]	0.018[a]	0.017[a]	0.119[a]	0.091[a]	0.052[a]
	(0.004)	(0.003)	(0.003)	(0.004)	(0.003)	(0.004)	(0.006)	(0.004)	(0.006)
Literate: middle	0.040[a]	0.014[a]	0.011[b]	0.037[a]	0.020[a]	0.018[a]	0.183[a]	0.116[a]	0.068[a]
	(0.005)	(0.003)	(0.004)	(0.005)	(0.003)	(0.004)	(0.008)	(0.005)	(0.007)
Literate: secondary and above	0.038[a]	0.023[a]	0.007	0.039[a]	0.032[a]	0.027[a]	0.229[a]	0.170[a]	0.090[a]
	(0.006)	(0.004)	(0.005)	(0.006)	(0.004)	(0.005)	(0.009)	(0.007)	(0.009)
Household type (base: Self-employed in non-agriculture)									
Agricultural labor (Regular wage/salary earning for 2011–12)	−0.001	−0.012[a]	0.003	−0.004	−0.016[a]	0.003	−0.104[a]	−0.078[a]	0.019[a]
	(0.004)	(0.003)	(0.003)	(0.004)	(0.003)	(0.004)	(0.006)	(0.004)	(0.006)
Other labor (Casual labor in agriculture and non-agriculture for 2011–12)	−0.019[a]	−0.017[a]	−0.004	−0.026[a]	−0.022[a]	−0.016[a]	−0.076[a]	−0.070[a]	−0.040[a]
	(0.005)	(0.003)	(0.003)	(0.005)	(0.003)	(0.003)	(0.007)	(0.004)	(0.005)
Self-employed in agriculture	0.079[a]	0.047[a]	0.032[a]	0.082[a]	0.051[a]	0.034[a]	0.096[a]	0.072[a]	0.042[a]
	(0.003)	(0.002)	(0.003)	(0.003)	(0.002)	(0.003)	(0.005)	(0.003)	(0.004)
Others	0.019[a]	−0.001	−0.008	0.012[a]	−0.005[c]	−0.018[a]	0.031[a]	0.031[a]	−0.009
	(0.004)	(0.002)	(0.005)	(0.004)	(0.003)	(0.006)	(0.006)	(0.004)	(0.009)
Males aged 0–4	−0.061[a]	−0.061[a]	−0.055[a]	−0.059[a]	−0.057[a]	−0.053[a]	−0.049[a]	−0.045[a]	−0.029[a]
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)	(0.004)
Females aged 0–4	−0.060[a]	−0.064[a]	−0.056[a]	−0.057[a]	−0.060[a]	−0.050[a]	−0.047[a]	−0.053[a]	−0.032[a]
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)	(0.004)
Males aged 5–9	−0.032[a]	−0.032[a]	−0.006[a]	−0.032[a]	−0.032[a]	−0.009[a]	−0.039[a]	−0.041[a]	−0.005
	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)	(0.003)	(0.002)	(0.003)
Females aged 5–9	−0.033[a]	−0.032[a]	−0.005[a]	−0.034[a]	−0.031[a]	−0.009[a]	−0.042[a]	−0.043[a]	−0.007[c]
	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)	(0.003)	(0.002)	(0.004)
Males aged 10–14	−0.018[a]	−0.018[a]	−0.005[a]	−0.020[a]	−0.018[a]	−0.008[a]	−0.034[a]	−0.037[a]	−0.013[a]
	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)
Females aged 10–14	−0.021[a]	−0.020[a]	−0.007[a]	−0.022[a]	−0.020[a]	−0.011[a]	−0.040[a]	−0.039[a]	−0.016[a]
	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)
Males aged 15–54	0.006[a]	0.000	−0.016[a]	0.004[a]	0.000	−0.016[a]	−0.007[a]	−0.008[a]	−0.026[a]
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)

(*continued on next page*)

Table 3a (*continued*)

Rural	Daily per capita calorie intake			Daily per capita protein intake			Daily per capita fat intake		
	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12
Females aged 15–54	−0.007[a]	−0.009[a]	−0.019[a]	−0.006[a]	−0.009[a]	−0.018[a]	−0.012[a]	−0.017[a]	−0.019[a]
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.003)
Males aged 55 plus	0.007[b]	0.005[b]	−0.007[b]	0.004	0.005[b]	−0.006[c]	−0.002	0.004	−0.020[a]
	(0.003)	(0.002)	(0.003)	(0.003)	(0.002)	(0.003)	(0.004)	(0.003)	(0.005)
Females aged 55 plus	−0.005[b]	−0.010[a]	−0.021[a]	−0.005[b]	−0.009[a]	−0.025[a]	−0.022[a]	−0.024[a]	−0.025[a]
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)
Observations	68,094	77,725	55,055	68,163	77,774	57,475	68,431	77,914	54,349
District fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.488	0.493	0.313	0.495	0.502	0.319	0.602	0.568	0.361
Kleibergen-Paap F statistic	4689	4777	4880	4656	4691	5061	4612	4805	4697
MP Effective F statistic	3958	3832	4602	3926	3620	4654	3963	3757	4222
Endogeneity test statistic	565.2	427.1	164.9	532.7	433.6	193.1	374	470.5	114.8
Endogeneity test P value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Rural	Daily per capita iron intake			Daily per capita zinc intake			Daily per capita vitamin A intake			Daily per capita calcium intake		
	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12
MPCE	0.293[a]	0.269[a]	0.267[a]	0.228[a]	0.220[a]	0.242[a]	0.553[a]	0.368[a]	0.327[a]	0.418[a]	0.364[a]	0.372[a]
	(0.016)	(0.012)	(0.014)	(0.012)	(0.009)	(0.012)	(0.041)	(0.034)	(0.029)	(0.019)	(0.017)	(0.015)
Religion (base: Hinduism)												
Islam	−0.008	0.016[a]	0.017[b]	−0.005	0.004	−0.002	0.142[a]	0.220[a]	0.229[a]	−0.080[a]	−0.080[a]	−0.060[a]
	(0.007)	(0.005)	(0.007)	(0.006)	(0.004)	(0.006)	(0.022)	(0.015)	(0.014)	(0.009)	(0.007)	(0.008)
Christianity	0.022[c]	0.030[a]	0.010	0.002	0.013[c]	0.009	0.103[a]	0.198[a]	0.126[a]	0.016	0.005	−0.006
	(0.012)	(0.010)	(0.015)	(0.009)	(0.008)	(0.014)	(0.035)	(0.025)	(0.021)	(0.017)	(0.015)	(0.016)
Sikhism	0.014	0.020[c]	0.004	0.028[b]	0.028[a]	0.029[c]	0.110[b]	0.119[a]	0.126[a]	0.156[a]	0.087[a]	0.069[a]
	(0.016)	(0.011)	(0.015)	(0.013)	(0.010)	(0.018)	(0.054)	(0.041)	(0.041)	(0.023)	(0.016)	(0.018)
Jainism	−0.166[a]	−0.074[b]	0.026	−0.106[b]	−0.035	0.025	0.080	0.060	0.100	0.095[c]	0.087[c]	0.043
	(0.050)	(0.034)	(0.038)	(0.043)	(0.028)	(0.047)	(0.107)	(0.085)	(0.075)	(0.052)	(0.047)	(0.047)
Buddhism	−0.004	−0.012	−0.009	−0.009	−0.001	−0.019	0.100[c]	−0.037	0.114[a]	0.005	−0.052[c]	−0.006
	(0.026)	(0.018)	(0.021)	(0.016)	(0.013)	(0.018)	(0.052)	(0.042)	(0.037)	(0.027)	(0.027)	(0.024)
Zoroastrianism	0.339[a]	0.007	0.440[a]	0.216[a]	−0.026	0.355[a]	0.308[a]	0.227[a]	0.431	0.085	0.095	0.210[a]
	(0.055)	(0.063)	(0.090)	(0.039)	(0.108)	(0.075)	(0.108)	(0.066)	(0.315)	(0.070)	(0.246)	(0.074)
Others	0.066[c]	−0.003	0.015	0.058[b]	−0.007	0.031	0.249[a]	0.191[a]	0.107[c]	0.061	−0.002	−0.028
	(0.035)	(0.023)	(0.034)	(0.024)	(0.016)	(0.029)	(0.070)	(0.053)	(0.063)	(0.042)	(0.031)	(0.041)
Social group (base: Scheduled tribes)												
Scheduled castes	0.033[a]	0.007	0.007	0.029[a]	0.003	0.006	−0.140[a]	−0.050[a]	−0.069[a]	−0.026[b]	−0.046[a]	−0.017[b]
	(0.010)	(0.007)	(0.007)	(0.007)	(0.005)	(0.007)	(0.024)	(0.016)	(0.016)	(0.012)	(0.010)	(0.009)
Other backward classes	–	0.009	0.010	–	0.010[b]	0.015[b]	–	−0.056[a]	−0.074[a]	–	0.053[a]	0.062[a]
		(0.006)	(0.007)		(0.005)	(0.007)		(0.016)	(0.015)		(0.009)	(0.008)
Others	0.035[a]	0.000	0.006	0.044[a]	0.007	0.016[b]	−0.174[a]	−0.061[a]	−0.065[a]	0.079[a]	0.100[a]	0.095[a]
	(0.010)	(0.007)	(0.008)	(0.007)	(0.005)	(0.007)	(0.023)	(0.017)	(0.016)	(0.011)	(0.010)	(0.009)
Age of household head	0.003[a]	0.006[a]	0.007[a]	0.004[a]	0.007[a]	0.007[a]	0.009[a]	0.010[a]	0.016[a]	0.005[a]	0.009[a]	0.008[a]
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
Age of household head squared	−0.000[a]	−0.000[a]	−0.000[a]	−0.000[a]	−0.000[a]	−0.000[a]	−0.000[a]	−0.000[a]	−0.000[a]	−0.000[a]	−0.000[a]	−0.000[a]
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex of household head (base: Male)												
Female	0.027[a]	0.026[a]	0.030[a]	0.010[b]	0.015[a]	0.012[b]	0.067[a]	0.044[a]	0.019[c]	0.035[a]	0.039[a]	0.038[a]
	(0.005)	(0.004)	(0.006)	(0.004)	(0.003)	(0.006)	(0.014)	(0.009)	(0.010)	(0.008)	(0.005)	(0.007)
Education of household head (base: Illiterate)												
Literate and literate w/o formal schooling	−0.000	0.001	0.007	0.004	0.006[b]	0.004	0.010	−0.004	0.015	0.046[a]	0.023[a]	0.037[a]
	(0.005)	(0.004)	(0.005)	(0.004)	(0.003)	(0.005)	(0.012)	(0.010)	(0.009)	(0.006)	(0.005)	(0.006)
Literate: below primary	−0.005	0.009[a]	0.007	0.003	0.011[a]	0.001	0.003	0.004	0.025[a]	0.055[a]	0.060[a]	0.048[a]
	(0.005)	(0.003)	(0.005)	(0.004)	(0.003)	(0.005)	(0.013)	(0.008)	(0.010)	(0.007)	(0.005)	(0.006)
Literate: primary	0.003	0.011[a]	0.015[a]	0.014[a]	0.013[a]	0.007	0.004	0.021[b]	0.032[a]	0.087[a]	0.090[a]	0.084[a]
	(0.006)	(0.004)	(0.005)	(0.005)	(0.003)	(0.005)	(0.014)	(0.010)	(0.010)	(0.007)	(0.005)	(0.006)
Literate: middle	0.003	0.008	0.017[a]	0.026[a]	0.010[a]	0.014[b]	0.058[a]	0.049[a]	0.045[a]	0.146[a]	0.132[a]	0.113[a]
	(0.007)	(0.005)	(0.006)	(0.006)	(0.004)	(0.006)	(0.019)	(0.012)	(0.012)	(0.010)	(0.007)	(0.007)
Literate: secondary and above	−0.005	0.012[c]	0.018[b]	0.017[b]	0.015[a]	0.015[b]	0.065[a]	0.082[a]	0.070[a]	0.205[a]	0.198[a]	0.160[a]
	(0.010)	(0.006)	(0.008)	(0.008)	(0.005)	(0.007)	(0.025)	(0.017)	(0.015)	(0.012)	(0.009)	(0.008)
Household type (base: Self-employed in non-agriculture)												
Agricultural labor (Regular wage/salary earning for 2011–12)	0.014[b]	−0.012[a]	0.009[c]	−0.000	−0.011[a]	0.003	−0.002	−0.044[a]	0.010	−0.042[a]	−0.087[a]	0.019[a]
	(0.006)	(0.004)	(0.005)	(0.005)	(0.003)	(0.005)	(0.016)	(0.010)	(0.008)	(0.008)	(0.006)	(0.005)

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Table 3a (*continued*)

Rural	Daily per capita iron intake			Daily per capita zinc intake			Daily per capita vitamin A intake			Daily per capita calcium intake		
	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12
Other labor (Casual labor in agriculture and non-agriculture for 2011–12)	−0.001	−0.020[a]	−0.020[a]	−0.010[c]	−0.015[a]	−0.013[a]	−0.044[b]	−0.076[a]	−0.033[a]	−0.094[a]	−0.093[a]	−0.074[a]
	(0.007)	(0.004)	(0.005)	(0.006)	(0.003)	(0.004)	(0.019)	(0.011)	(0.009)	(0.010)	(0.006)	(0.005)
Self-employed in agriculture	0.067[a]	0.030[a]	0.004	0.073[a]	0.038[a]	0.016[a]	0.031[b]	0.026[a]	0.022[a]	0.158[a]	0.126[a]	0.095[a]
	(0.005)	(0.003)	(0.004)	(0.004)	(0.002)	(0.004)	(0.012)	(0.007)	(0.007)	(0.006)	(0.004)	(0.004)
Others	0.010	−0.009[a]	−0.017[b]	0.011[b]	−0.009[a]	−0.019[b]	−0.088[a]	−0.023[b]	−0.067[a]	0.015[c]	0.020[a]	−0.017[c]
	(0.006)	(0.004)	(0.008)	(0.005)	(0.003)	(0.007)	(0.015)	(0.009)	(0.016)	(0.008)	(0.005)	(0.009)
Males aged 0–4	−0.058[a]	−0.057[a]	−0.050[a]	−0.061[a]	−0.061[a]	−0.044[a]	−0.044[a]	−0.048[a]	−0.055[a]	−0.046[a]	−0.033[a]	−0.027[a]
	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.007)	(0.005)	(0.006)	(0.004)	(0.003)	(0.004)
Females aged 0–4	−0.056[a]	−0.061[a]	−0.047[a]	−0.060[a]	−0.064[a]	−0.043[a]	−0.038[a]	−0.061[a]	−0.061[a]	−0.042[a]	−0.047[a]	−0.023[a]
	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.007)	(0.005)	(0.006)	(0.004)	(0.003)	(0.004)
Males aged 5–9	−0.032[a]	−0.033[a]	−0.006[b]	−0.030[a]	−0.031[a]	0.003	−0.044[a]	−0.050[a]	−0.054[a]	−0.045[a]	−0.045[a]	−0.029[a]
	(0.003)	(0.002)	(0.003)	(0.002)	(0.001)	(0.003)	(0.006)	(0.005)	(0.005)	(0.003)	(0.003)	(0.003)
Females aged 5–9	−0.032[a]	−0.031[a]	−0.006[c]	−0.031[a]	−0.029[a]	0.003	−0.052[a]	−0.050[a]	−0.059[a]	−0.045[a]	−0.048[a]	−0.036[a]
	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.006)	(0.005)	(0.005)	(0.003)	(0.003)	(0.003)
Males aged 10–14	−0.025[a]	−0.023[a]	−0.009[a]	−0.017[a]	−0.015[a]	0.006[b]	−0.058[a]	−0.059[a]	−0.063[a]	−0.041[a]	−0.041[a]	−0.037[a]
	(0.003)	(0.002)	(0.003)	(0.002)	(0.001)	(0.003)	(0.006)	(0.004)	(0.005)	(0.003)	(0.003)	(0.003)
Females aged 10–14	−0.027[a]	−0.023[a]	−0.011[a]	−0.020[a]	−0.017[a]	−0.001	−0.054[a]	−0.057[a]	−0.061[a]	−0.048[a]	−0.047[a]	−0.037[a]
	(0.003)	(0.002)	(0.003)	(0.002)	(0.001)	(0.003)	(0.006)	(0.005)	(0.005)	(0.003)	(0.003)	(0.003)
Males aged 15–54	−0.002	−0.008[a]	−0.024[a]	0.007[a]	0.002[c]	−0.013[a]	−0.043[a]	−0.037[a]	−0.052[a]	−0.015[a]	−0.018[a]	−0.036[a]
	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.004)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)
Females aged 15–54	−0.014[a]	−0.018[a]	−0.026[a]	−0.008[a]	−0.009[a]	−0.013[a]	−0.015[a]	−0.030[a]	−0.046[a]	−0.010[a]	−0.016[a]	−0.028[a]
	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)	(0.005)	(0.003)	(0.004)	(0.003)	(0.002)	(0.002)
Males aged 55 plus	−0.003	−0.005[c]	−0.014[a]	0.007[b]	0.005[b]	−0.001	−0.044[a]	−0.041[a]	−0.048[a]	−0.011[b]	−0.008[c]	−0.020[a]
	(0.004)	(0.003)	(0.004)	(0.003)	(0.002)	(0.004)	(0.010)	(0.007)	(0.008)	(0.006)	(0.004)	(0.005)
Females aged 55 plus	−0.008[b]	−0.014[a]	−0.033[a]	−0.003	−0.008[a]	−0.017[a]	−0.029[a]	−0.034[a]	−0.053[a]	−0.018[a]	−0.015[a]	−0.037[a]
	(0.003)	(0.002)	(0.004)	(0.003)	(0.002)	(0.004)	(0.008)	(0.006)	(0.007)	(0.004)	(0.004)	(0.004)
Observations	68,640	78,469	58,784	68,487	78,351	57,248	68,603	78,259	59,076	68,418	78,266	59,074
District fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.308	0.362	0.225	0.360	0.402	0.189	0.149	0.170	0.172	0.408	0.440	0.394
Kleibergen-Paap F statistic	4684	4828	5294	4699	4792	5035	4708	4781	5304	4602	4842	5203
MP Effective F statistic	4054	3753	5042	4061	3719	4727	4151	3702	5138	3893	3763	4920
Endogeneity test statistic	103.2	123.1	66.44	276.4	238.9	62.35	19.87	58.94	85.59	352.7	359.8	276.6
Endogeneity test P value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Notes: State-region fixed effects have been employed for the 1993–94 sample. Standard errors clustered at FSU level are reported in parentheses; [a] $p < 0.01$, [b] $p < 0.05$, [c] $p < 0.1$.

as in the present analysis. The present study is consistent with the elasticity magnitudes obtained by Sharma (2015). It is also coherent in terms of declining calorie and protein elasticities, higher magnitudes for fat elasticities and different behavior for non-cereal-based micronutrients such as vitamin A and calcium intakes. The estimates for micronutrient elasticities were however higher than the ones obtained by Behrman & Deolalikar (1987).

The parametric (IV) estimates derived from this analysis are lower than those derived from OLS estimation. They are, however, positive and statistically different from zero. The IV elasticities for macronutrients declined between 1993–94 and 2011–12. Except for iron in urban areas and zinc in both rural and urban areas, estimates for all other micronutrients have decreased over time. Rahman (2017) estimated the IV elasticity estimates for calories, protein and fat in rural India, which were 0.32, 0.34 and 0.62, respectively in 2004–05, and these estimates declined to 0.29, 0.32 and 0.55 in 2011–12, respectively. More recently, Bhuyan et al. (2020) estimated the calorie-expenditure elasticities using quantile regressions. They find that the IV calorie-income elasticities are higher for rural (0.26) than urban (0.24) India.

Table 4 sets out the OLS and IV calorie-income elasticities across different food groups. In line with Bennett's Law, with an increase in household income, households do shift the allocation of their food budget from inexpensive to relatively expensive calorie sources. Over time, calorie-expenditure elasticities have declined in both sectors. Similar to the overall estimates, the OLS estimates were higher than the IV estimates for most food groups. As expected, all food groups exhibited positive expenditure elasticities, but cereals had the smallest magnitude. The miscellaneous foods and beverages category had the highest calorie-income elasticity in both rural and urban India. The IV estimates for cereals and cereal substitutes were almost zero in rural areas, indicative of consumption smoothing. In urban areas, the IV estimates for cereals and cereal substitutes and roots and tubers categories showed negative calorie-income elasticities. Lower elasticities for staple cereals are largely the result of consumers' shifting preferences towards a broader range of foods. This is also evidenced by the dramatic increase in the price paid per calorie over the years (Meenakshi & Viswanathan, 2017). The calorie-expenditure elasticities across different food groups were more responsive for rural households than their urban counterparts. For staple cereals, rural households had marginally higher estimates than urban households. It was only the milk and milk products category that had elastic demand with respect to household expenditure in rural areas in 1993–94 and 2004–05 as per the OLS estimates. A change in income would have changed their intake more than proportionately for such products, as was also observed by Kumar et al. (2011) in their analysis for India.

3.3. *Non-parametric estimation approach*

As previously discussed, the estimation results from the parametric specifications (OLS and IV) might not lead to unbiased estimates because it is not necessary that these can capture the true relationship between nutrient intake and expenditure. Moreover, it is crucial to investigate the complete range of nutrient-intake responses to income rather than estimating at a single point. To address this concern, a non-parametric estimation strategy is employed next for estimating nutrient-expenditure elasticities as it does not impose any kind of functional form on the data. This simple bivariate approach provides us with some direction towards understanding the nutrient-income relationship. The bivariate non-parametric Engel curves for rural India are depicted in Figure A11 of the appendix. Between 1993–94 and 2011–12, daily per

Table 3b
Nutrient-income elasticities – Parametric (IV) estimation.

Urban	Daily per capita calorie intake			Daily per capita protein intake			Daily per capita fat intake		
	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12
MPCE	0.187[a]	0.100[a]	0.130[a]	0.195[a]	0.113[a]	0.194[a]	0.517[a]	0.282[a]	0.443[a]
	(0.008)	(0.011)	(0.014)	(0.009)	(0.012)	(0.017)	(0.011)	(0.016)	(0.041)
Religion (base: Hinduism)									
Islam	0.002	−0.003	−0.005	0.038[a]	0.029[a]	0.020[a]	−0.004	−0.005	0.000
	(0.004)	(0.004)	(0.006)	(0.005)	(0.004)	(0.006)	(0.006)	(0.006)	(0.016)
Christianity	0.001	0.008	0.012	0.029[a]	0.037[a]	0.029[b]	−0.037[a]	−0.020[c]	0.075[c]
	(0.007)	(0.007)	(0.012)	(0.008)	(0.008)	(0.014)	(0.010)	(0.011)	(0.039)
Sikhism	0.008	0.066[a]	0.019	0.020[c]	0.077[a]	0.019	0.040[a]	0.079[a]	0.023
	(0.010)	(0.010)	(0.016)	(0.011)	(0.010)	(0.015)	(0.013)	(0.013)	(0.036)
Jainism	−0.030[b]	−0.021	−0.012	−0.056[a]	−0.028[c]	−0.006	0.062[a]	0.025	0.078
	(0.013)	(0.014)	(0.022)	(0.013)	(0.014)	(0.030)	(0.016)	(0.019)	(0.065)
Buddhism	−0.036[a]	0.001	−0.015	−0.024	0.004	0.032	−0.012	0.007	0.122[b]
	(0.013)	(0.014)	(0.023)	(0.016)	(0.014)	(0.024)	(0.021)	(0.018)	(0.056)
Zoroastrianism	−0.098[b]	0.026	−0.044[c]	−0.032	0.065[c]	−0.047	−0.134[a]	0.005	−0.578[a]
	(0.040)	(0.025)	(0.026)	(0.045)	(0.034)	(0.030)	(0.048)	(0.040)	(0.076)
Others	0.014	0.009	0.093[a]	0.025	0.016	0.049	−0.040	−0.013	0.087
	(0.021)	(0.020)	(0.035)	(0.025)	(0.023)	(0.031)	(0.027)	(0.037)	(0.085)
Social group (base: Scheduled tribes)									
Scheduled castes	−0.018[b]	−0.009	−0.023[b]	−0.002	−0.003	−0.031[a]	0.016	0.031[a]	−0.031
	(0.008)	(0.007)	(0.010)	(0.008)	(0.007)	(0.010)	(0.012)	(0.011)	(0.026)
Other backward classes	–	−0.000	−0.014	–	0.004	−0.019[c]	–	0.070[a]	0.006
		(0.006)	(0.009)		(0.007)	(0.010)		(0.011)	(0.025)
Others	−0.006	0.009	−0.002	−0.002	0.004	−0.013	0.083[a]	0.111[a]	0.038
	(0.007)	(0.007)	(0.009)	(0.008)	(0.007)	(0.010)	(0.011)	(0.011)	(0.026)
Age of household head	0.003[a]	0.004[a]	0.002[a]	0.008[a]	0.009[a]	0.010[a]	0.004[a]	0.009[a]	0.013[a]
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Age of household head squared	−0.000[a]	−0.000[a]	−0.000[c]	−0.000[a]	−0.000[a]	−0.000[a]	−0.000[b]	−0.000[a]	−0.000[a]
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex of household head (base: Male)									
Female	0.016[a]	0.021[a]	0.013[b]	0.009[c]	0.015[a]	0.013[b]	0.048[a]	0.035[a]	0.023
	(0.004)	(0.004)	(0.006)	(0.005)	(0.004)	(0.006)	(0.006)	(0.006)	(0.016)
Education of household head (base: Illiterate)									
Literate and literate w/o formal schooling	0.005	0.002	0.004	−0.003	−0.004	0.003	0.069[a]	0.037[a]	0.036[b]
	(0.004)	(0.005)	(0.006)	(0.005)	(0.005)	(0.007)	(0.006)	(0.007)	(0.017)
Literate: below primary	0.004	0.012[a]	0.004	−0.000	0.015[a]	0.005	0.082[a]	0.076[a]	0.048[a]
	(0.004)	(0.004)	(0.006)	(0.005)	(0.004)	(0.007)	(0.006)	(0.006)	(0.017)
Literate: primary	0.007	0.027[a]	0.007	0.007	0.034[a]	0.015[b]	0.125[a]	0.115[a]	0.096[a]
	(0.004)	(0.004)	(0.006)	(0.005)	(0.005)	(0.007)	(0.006)	(0.006)	(0.017)
Literate: middle	0.019[a]	0.040[a]	0.020[a]	0.020[a]	0.050[a]	0.033[a]	0.165[a]	0.162[a]	0.139[a]
	(0.005)	(0.006)	(0.007)	(0.006)	(0.006)	(0.008)	(0.007)	(0.008)	(0.020)
Literate: secondary and above	0.035[a]	0.071[a]	0.050[a]	0.033[a]	0.083[a]	0.061[a]	0.190[a]	0.230[a]	0.215[a]
	(0.007)	(0.008)	(0.010)	(0.007)	(0.009)	(0.011)	(0.009)	(0.012)	(0.028)
Household type (base: Self-employed)									
Regular wage/salary earning	−0.007[a]	0.003	0.007[c]	−0.014[a]	−0.005[c]	−0.003	−0.010[a]	0.007[c]	−0.005
	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.011)
Casual labor	−0.032[a]	−0.031[a]	−0.024[a]	−0.042[a]	−0.040[a]	−0.031[a]	−0.109[a]	−0.102[a]	−0.100[a]
	(0.004)	(0.004)	(0.006)	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)	(0.016)
Others	0.001	0.021[a]	0.008	−0.022[a]	0.003	−0.018[a]	−0.018[b]	0.007	−0.054[a]
	(0.005)	(0.005)	(0.006)	(0.005)	(0.005)	(0.007)	(0.007)	(0.007)	(0.017)
Males aged 0–4	−0.080[a]	−0.087[a]	−0.073[a]	−0.067[a]	−0.075[a]	−0.052[a]	−0.042[a]	−0.060[a]	0.009
	(0.002)	(0.003)	(0.005)	(0.003)	(0.003)	(0.005)	(0.003)	(0.004)	(0.012)
Females aged 0–4	−0.082[a]	−0.087[a]	−0.066[a]	−0.070[a]	−0.077[a]	−0.048[a]	−0.049[a]	−0.068[a]	0.010
	(0.003)	(0.003)	(0.005)	(0.003)	(0.003)	(0.005)	(0.003)	(0.004)	(0.012)
Males aged 5–9	−0.059[a]	−0.056[a]	−0.022[a]	−0.054[a]	−0.051[a]	−0.016[a]	−0.051[a]	−0.054[a]	0.045[a]
	(0.002)	(0.002)	(0.004)	(0.002)	(0.002)	(0.004)	(0.003)	(0.003)	(0.011)
Females aged 5–9	−0.058[a]	−0.062[a]	−0.026[a]	−0.057[a]	−0.059[a]	−0.018[a]	−0.052[a]	−0.072[a]	0.044[a]
	(0.002)	(0.002)	(0.004)	(0.002)	(0.003)	(0.004)	(0.003)	(0.003)	(0.012)
Males aged 10–14	−0.036[a]	−0.040[a]	−0.020[a]	−0.034[a]	−0.039[a]	−0.013[a]	−0.048[a]	−0.054[a]	0.027[a]
	(0.002)	(0.002)	(0.004)	(0.002)	(0.002)	(0.004)	(0.003)	(0.003)	(0.010)
Females aged 10–14	−0.039[a]	−0.042[a]	−0.016[a]	−0.039[a]	−0.042[a]	−0.014[a]	−0.042[a]	−0.062[a]	0.026[b]
	(0.002)	(0.002)	(0.004)	(0.002)	(0.002)	(0.004)	(0.003)	(0.003)	(0.011)
Males aged 15–54	−0.012[a]	−0.008[a]	−0.016[a]	−0.014[a]	−0.009[a]	−0.019[a]	−0.024[a]	−0.024[a]	−0.024[a]
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.005)
Females aged 15–54	−0.031[a]	−0.034[a]	−0.026[a]	−0.023[a]	−0.028[a]	−0.019[a]	−0.012[a]	−0.030[a]	0.010
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.006)

(continued on next page)

Table 3b (*continued*)

Urban	Daily per capita calorie intake			Daily per capita protein intake			Daily per capita fat intake		
	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12
Males aged 55 plus	0.004	0.002	−0.016[a]	0.001	−0.000	−0.019[a]	−0.013[a]	−0.015[a]	−0.056[a]
	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)	(0.013)
Females aged 55 plus	−0.031[a]	−0.043[a]	−0.042[a]	−0.018[a]	−0.036[a]	−0.034[a]	−0.005	−0.038[a]	−0.036[a]
	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)	(0.005)	(0.004)	(0.004)	(0.012)
Observations	45,384	44,400	37,787	45,408	44,443	40,434	45,543	44,520	41,470
District fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.519	0.447	0.238	0.464	0.423	0.259	0.693	0.595	0.171
Kleibergen-Paap F statistic	3687	1734	1933	3644	1748	2190	3708	1690	2312
MP Effective F statistic	3486	1871	1914	3448	1900	2213	3529	1830	2374
Endogeneity test statistic	512.4	321.1	144.4	431.8	303.3	95.73	153.5	280.2	29.89
Endogeneity test P value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Urban	Daily per capita iron intake			Daily per capita zinc intake			Daily per capita vitamin A intake			Daily per capita calcium intake		
	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12
MPCE	0.192[a]	0.098[a]	0.215[a]	0.138[a]	0.072[a]	0.286[a]	0.550[a]	0.243[a]	0.267[a]	0.506[a]	0.340[a]	0.377[a]
	(0.012)	(0.016)	(0.021)	(0.010)	(0.013)	(0.026)	(0.031)	(0.044)	(0.035)	(0.014)	(0.020)	(0.020)
Religion (base: Hinduism)												
Islam	0.047[a]	0.043[a]	0.024[a]	0.040[a]	0.024[a]	0.001	0.187[a]	0.229[a]	0.277[a]	−0.058[a]	−0.047[a]	−0.024[a]
	(0.006)	(0.006)	(0.008)	(0.005)	(0.005)	(0.010)	(0.017)	(0.016)	(0.014)	(0.009)	(0.007)	(0.008)
Christianity	0.023[b]	0.026[b]	0.054[a]	0.004	0.020[b]	0.060[b]	0.137[a]	0.154[a]	0.153[a]	−0.034[b]	−0.037[a]	0.007
	(0.011)	(0.010)	(0.019)	(0.009)	(0.009)	(0.025)	(0.026)	(0.024)	(0.024)	(0.016)	(0.013)	(0.016)
Sikhism	0.035[a]	0.082[a]	0.025	0.026[b]	0.081[a]	0.035	0.051	0.158[a]	−0.006	0.045[a]	0.112[a]	0.070[a]
	(0.012)	(0.012)	(0.017)	(0.012)	(0.011)	(0.023)	(0.036)	(0.036)	(0.036)	(0.016)	(0.017)	(0.018)
Jainism	−0.077[a]	−0.033	0.022	−0.048[b]	−0.023	0.030	−0.033	−0.030	−0.019	0.045[b]	0.076[a]	0.079[a]
	(0.021)	(0.021)	(0.038)	(0.020)	(0.017)	(0.044)	(0.046)	(0.040)	(0.040)	(0.019)	(0.024)	(0.024)
Buddhism	0.002	0.024	0.047[c]	−0.024	0.005	0.054	0.109[c]	0.098[b]	0.090[b]	−0.056[b]	−0.047[b]	0.074[b]
	(0.027)	(0.017)	(0.027)	(0.018)	(0.015)	(0.036)	(0.062)	(0.045)	(0.043)	(0.026)	(0.023)	(0.030)
Zoroastrianism	−0.090[b]	0.070	−0.209[a]	−0.165[a]	0.005	−0.434[a]	0.210	0.360[a]	0.190[a]	−0.136[a]	0.002	0.011
	(0.039)	(0.057)	(0.038)	(0.043)	(0.024)	(0.051)	(0.140)	(0.131)	(0.060)	(0.051)	(0.044)	(0.034)
Others	0.035	0.021	0.053	0.028	−0.007	0.073[c]	0.096	0.238[a]	0.298[a]	0.039	0.100[b]	0.083[b]
	(0.037)	(0.036)	(0.039)	(0.026)	(0.026)	(0.044)	(0.082)	(0.091)	(0.075)	(0.048)	(0.046)	(0.042)
Social group (base: Scheduled tribes)												
Scheduled castes	0.035[a]	0.022[b]	−0.002	0.020[b]	0.016[c]	−0.014	−0.063[b]	−0.023	−0.045[c]	−0.017	−0.013	−0.036[a]
	(0.012)	(0.010)	(0.013)	(0.010)	(0.008)	(0.016)	(0.032)	(0.025)	(0.023)	(0.016)	(0.013)	(0.013)
Other backward classes	–	0.021[b]	0.003	–	0.016[b]	0.000	–	−0.065[a]	−0.047[b]	–	0.039[a]	0.009
		(0.010)	(0.013)		(0.008)	(0.015)		(0.024)	(0.021)		(0.013)	(0.012)
Others	0.009	0.013	0.001	0.008	0.013	0.011	−0.133[a]	−0.057[b]	−0.035	0.057[a]	0.081[a]	0.038[a]
	(0.011)	(0.010)	(0.013)	(0.009)	(0.008)	(0.015)	(0.029)	(0.025)	(0.022)	(0.015)	(0.013)	(0.013)
Age of household head	0.011[a]	0.010[a]	0.009[a]	0.007[a]	0.008[a]	0.008[a]	0.043[a]	0.044[a]	0.050[a]	0.024[a]	0.024[a]	0.023[a]
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)
Age of household head squared	−0.000[a]	−0.000[a]	−0.000[a]	−0.000[a]	−0.000[a]	−0.000[a]	−0.000[a]	−0.000[a]	−0.000[a]	−0.000[a]	−0.000[a]	−0.000[a]
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex of household head (base: Male)												
Female	0.012[b]	0.022[a]	0.018[b]	0.005	0.017[a]	0.012	0.003	0.020	−0.026[b]	0.019[b]	0.031[a]	0.021[a]
	(0.006)	(0.005)	(0.008)	(0.005)	(0.004)	(0.010)	(0.015)	(0.013)	(0.013)	(0.008)	(0.007)	(0.008)
Education of household head (base: Illiterate)												
Literate and literate w/o formal schooling	−0.016[a]	−0.009	−0.007	−0.013[b]	−0.006	−0.005	0.006	−0.009	0.001	0.029[a]	0.015[c]	0.031[a]
	(0.006)	(0.007)	(0.009)	(0.005)	(0.006)	(0.011)	(0.015)	(0.015)	(0.015)	(0.008)	(0.009)	(0.009)
Literate: below primary	−0.010	0.015[a]	0.001	−0.012[b]	0.010[b]	−0.008	0.007	0.039[a]	0.024[c]	0.061[a]	0.070[a]	0.057[a]
	(0.006)	(0.005)	(0.008)	(0.005)	(0.005)	(0.010)	(0.015)	(0.014)	(0.014)	(0.008)	(0.007)	(0.009)
Literate: primary	0.000	0.034[a]	0.022[b]	−0.008	0.025[a]	0.013	0.058[a]	0.093[a]	0.064[a]	0.110[a]	0.116[a]	0.094[a]
	(0.006)	(0.006)	(0.009)	(0.005)	(0.005)	(0.011)	(0.016)	(0.016)	(0.015)	(0.008)	(0.008)	(0.009)
Literate: middle	0.008	0.058[a]	0.042[a]	0.004	0.042[a]	0.037[a]	0.088[a]	0.133[a]	0.106[a]	0.154[a]	0.182[a]	0.135[a]
	(0.007)	(0.008)	(0.010)	(0.006)	(0.007)	(0.013)	(0.018)	(0.021)	(0.017)	(0.009)	(0.010)	(0.010)
Literate: secondary and above	−0.004	0.077[a]	0.065[a]	−0.001	0.064[a]	0.069[a]	0.064[a]	0.171[a]	0.143[a]	0.198[a]	0.248[a]	0.208[a]
	(0.009)	(0.012)	(0.014)	(0.008)	(0.010)	(0.018)	(0.023)	(0.031)	(0.024)	(0.012)	(0.015)	(0.014)
Household type (base: Self-employed)												
Regular wage/salary earning	−0.012[a]	−0.002	−0.000	−0.008[b]	−0.004	−0.006	−0.016[c]	−0.010	−0.033[a]	−0.061[a]	−0.032[a]	−0.036[a]
	(0.004)	(0.003)	(0.005)	(0.003)	(0.003)	(0.007)	(0.009)	(0.009)	(0.008)	(0.005)	(0.005)	(0.005)
Casual labor	−0.041[a]	−0.048[a]	−0.041[a]	−0.047[a]	−0.038[a]	−0.034[a]	−0.050[a]	−0.081[a]	−0.048[a]	−0.095[a]	−0.114[a]	−0.097[a]
	(0.007)	(0.006)	(0.008)	(0.006)	(0.005)	(0.010)	(0.015)	(0.015)	(0.013)	(0.008)	(0.008)	(0.008)
Others	−0.028[a]	−0.003	−0.021[b]	−0.015[b]	0.007	−0.034[a]	−0.159[a]	−0.140[a]	−0.130[a]	−0.087[a]	−0.056[a]	−0.058[a]
	(0.008)	(0.006)	(0.009)	(0.006)	(0.005)	(0.011)	(0.020)	(0.017)	(0.016)	(0.010)	(0.009)	(0.009)

(*continued on next page*)

Table 3b (*continued*)

Urban	Daily per capita iron intake			Daily per capita zinc intake			Daily per capita vitamin A intake			Daily per capita calcium intake		
	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12
Males aged 0–4	−0.066[a]	−0.077[a]	−0.057[a]	−0.078[a]	−0.082[a]	−0.032[a]	0.018[b]	−0.031[a]	−0.033[a]	0.014[a]	−0.005	0.005
	(0.003)	(0.004)	(0.006)	(0.003)	(0.003)	(0.008)	(0.008)	(0.008)	(0.009)	(0.004)	(0.004)	(0.005)
Females aged 0–4	−0.070[a]	−0.080[a]	−0.049[a]	−0.078[a]	−0.086[a]	−0.030[a]	−0.010	−0.027[a]	−0.035[a]	−0.001	−0.018[a]	0.004
	(0.003)	(0.004)	(0.006)	(0.003)	(0.003)	(0.007)	(0.008)	(0.008)	(0.009)	(0.004)	(0.004)	(0.005)
Males aged 5–9	−0.054[a]	−0.051[a]	−0.012[b]	−0.054[a]	−0.051[a]	0.018[a]	−0.014[b]	−0.035[a]	−0.053[a]	−0.031[a]	−0.031[a]	−0.019[a]
	(0.003)	(0.003)	(0.005)	(0.003)	(0.003)	(0.007)	(0.007)	(0.007)	(0.008)	(0.004)	(0.004)	(0.005)
Females aged 5–9	−0.058[a]	−0.057[a]	−0.009	−0.058[a]	−0.057[a]	0.018[a]	−0.019[a]	−0.057[a]	−0.052[a]	−0.037[a]	−0.052[a]	−0.020[a]
	(0.003)	(0.003)	(0.006)	(0.003)	(0.003)	(0.007)	(0.007)	(0.008)	(0.008)	(0.004)	(0.004)	(0.005)
Males aged 10–14	−0.034[a]	−0.042[a]	−0.010[b]	−0.030[a]	−0.036[a]	0.017[a]	−0.033[a]	−0.058[a]	−0.059[a]	−0.038[a]	−0.041[a]	−0.033[a]
	(0.003)	(0.003)	(0.005)	(0.003)	(0.003)	(0.006)	(0.007)	(0.007)	(0.007)	(0.004)	(0.004)	(0.004)
Females aged 10–14	−0.039[a]	−0.042[a]	−0.009[c]	−0.038[a]	−0.037[a]	0.021[a]	−0.029[a]	−0.069[a]	−0.063[a]	−0.040[a]	−0.051[a]	−0.037[a]
	(0.003)	(0.003)	(0.005)	(0.003)	(0.003)	(0.006)	(0.007)	(0.007)	(0.008)	(0.004)	(0.004)	(0.005)
Males aged 15–54	−0.017[a]	−0.013[a]	−0.023[a]	−0.006[a]	−0.004[b]	−0.006[c]	−0.049[a]	−0.051[a]	−0.070[a]	−0.040[a]	−0.037[a]	−0.051[a]
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.004)	(0.004)	(0.004)	(0.002)	(0.002)	(0.003)
Females aged 15–54	−0.025[a]	−0.033[a]	−0.023[a]	−0.027[a]	−0.030[a]	0.001	0.042[a]	−0.002	−0.023[a]	0.009[a]	−0.010[a]	−0.020[a]
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.004)	(0.006)	(0.005)	(0.005)	(0.003)	(0.003)	(0.003)
Males aged 55 plus	−0.000	−0.003	−0.024[a]	0.007	0.005	−0.017[b]	−0.052[a]	−0.059[a]	−0.098[a]	−0.027[a]	−0.028[a]	−0.051[a]
	(0.005)	(0.005)	(0.007)	(0.004)	(0.004)	(0.008)	(0.011)	(0.010)	(0.010)	(0.006)	(0.006)	(0.006)
Females aged 55 plus	−0.013[a]	−0.042[a]	−0.049[a]	−0.023[a]	−0.041[a]	−0.025[a]	0.072[a]	−0.005	−0.013	0.033[a]	−0.011[b]	−0.026[a]
	(0.004)	(0.004)	(0.006)	(0.003)	(0.003)	(0.008)	(0.009)	(0.009)	(0.009)	(0.005)	(0.005)	(0.006)
Observations	45,679	44,746	41,372	45,583	44,689	41,041	45,580	44,557	41,658	45,277	44,546	41,607
District fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.323	0.296	0.203	0.324	0.304	0.162	0.230	0.182	0.215	0.533	0.502	0.439
Kleibergen-Paap F statistic	3750	1754	2281	3688	1747	2226	3660	1726	2270	3657	1713	2273
MP Effective F statistic	3582	1902	2342	3502	1901	2271	3590	1870	2341	3474	1852	2353
Endogeneity test statistic	195.4	185.6	60.08	338.8	240.9	26.47	8.262	36.71	51.86	66.86	119.1	88.50
Endogeneity test P value	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.000	0.000	0.000	0.000	0.000

Notes: State-region fixed effects have been employed for the 1993–94 sample. Standard errors clustered at FSU level are reported in parentheses; [a] $p < 0.01$, [b] $p < 0.05$, [c] $p < 0.1$.

Table 4

Calorie-income elasticities across food groups – Parametric (OLS and IV) estimation.

	Rural						Urban					
	1993–94		2004–05		2011–12		1993–94		2004–05		2011–12	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Cereals & cereal substitutes	0.261[a]	0.095[a]	0.179[a]	0.090[a]	0.140[a]	0.081[a]	0.143[a]	−0.095[a]	0.095[a]	−0.099[a]	0.094[a]	−0.070[a]
	(0.004)	(0.013)	(0.003)	(0.010)	(0.003)	(0.010)	(0.005)	(0.014)	(0.004)	(0.017)	(0.004)	(0.021)
Roots & tubers	0.481[a]	0.404[a]	0.386[a]	0.342[a]	0.310[a]	0.206[a]	0.360[a]	0.297[a]	0.324[a]	0.079[b]	0.254[a]	0.082[a]
	(0.006)	(0.029)	(0.005)	(0.022)	(0.006)	(0.022)	(0.006)	(0.023)	(0.005)	(0.032)	(0.006)	(0.028)
Sugar & honey	0.671[a]	0.559[a]	0.593[a]	0.468[a]	0.443[a]	0.347[a]	0.436[a]	0.325[a]	0.440[a]	0.171[a]	0.321[a]	0.079[a]
	(0.007)	(0.022)	(0.006)	(0.021)	(0.006)	(0.019)	(0.006)	(0.017)	(0.006)	(0.025)	(0.006)	(0.024)
Pulses, nuts & oilseeds	0.671[a]	0.577[a]	0.580[a]	0.554[a]	0.457[a]	0.406[a]	0.518[a]	0.410[a]	0.473[a]	0.251[a]	0.379[a]	0.225[a]
	(0.007)	(0.024)	(0.006)	(0.023)	(0.006)	(0.020)	(0.007)	(0.020)	(0.006)	(0.027)	(0.006)	(0.025)
Fruits & vegetables	0.702[a]	0.721[a]	0.630[a]	0.544[a]	0.588[a]	0.444[a]	0.627[a]	0.701[a]	0.606[a]	0.323[a]	0.555[a]	0.339[a]
	(0.008)	(0.033)	(0.006)	(0.028)	(0.007)	(0.025)	(0.008)	(0.027)	(0.007)	(0.033)	(0.007)	(0.031)
Meat, eggs & fish	0.839[a]	0.602[a]	0.777[a]	0.504[a]	0.725[a]	0.455[a]	0.774[a]	0.611[a]	0.715[a]	0.251[a]	0.652[a]	0.219[a]
	(0.012)	(0.036)	(0.010)	(0.032)	(0.011)	(0.029)	(0.012)	(0.033)	(0.011)	(0.045)	(0.011)	(0.037)
Milk & milk products	1.098[a]	0.307[a]	1.036[a]	0.411[a]	0.845[a]	0.426[a]	0.832[a]	0.651[a]	0.857[a]	0.473[a]	0.726[a]	0.346[a]
	(0.013)	(0.036)	(0.011)	(0.033)	(0.012)	(0.031)	(0.010)	(0.024)	(0.010)	(0.035)	(0.010)	(0.031)
Oils & fats	0.651[a]	0.502[a]	0.539[a]	0.376[a]	0.423[a]	0.313[a]	0.562[a]	0.507[a]	0.484[a]	0.218[a]	0.356[a]	0.111[a]
	(0.006)	(0.020)	(0.005)	(0.019)	(0.006)	(0.018)	(0.006)	(0.016)	(0.005)	(0.023)	(0.005)	(0.021)
Misc. food, food products & beverages	0.904[a]	0.894[a]	0.800[a]	0.594[a]	0.591[a]	0.448[a]	0.846[a]	0.753[a]	0.749[a]	0.390[a]	0.691[a]	0.416[a]
	(0.009)	(0.033)	(0.008)	(0.024)	(0.012)	(0.033)	(0.011)	(0.029)	(0.010)	(0.038)	(0.013)	(0.049)

Notes: Standard errors clustered at FSU level are reported in parentheses; [a] $p < 0.01$, [b] $p < 0.05$, [c] $p < 0.1$.

capita macronutrient intakes decreased as income levels increased. This decline was however less clear in the case of fat intake. As shown in Figure A11, the daily per capita intake of both calories and proteins increased sharply at lower levels of spending, but the curves flattened out at higher spending levels in rural India. The fact that these caloric curves are more or less linear in shape highlights that households are poor and even the relatively richer households are yet to reach a stage where the calories are unimportant for them. Similar milder trends are observed for calories and protein in urban areas, but fats increased an increase in 2011–12 (these curves have not been reported here for the sake of brevity).

These bivariate Engel curves indicate that the calorie and protein intakes have declined over time in rural India. This finding of declining calorie Engel curves in rural India is consistent with the findings from the seminal work of Deaton & Dreze (2009) as well as Meenakshi & Viswanathan (2017). In case of micronutrients, there was a decline in intakes for all the nutrients between 1993–94 and 2004–05, and these were largely statistically different across rounds. There has only been an increase in zinc consumption between 2004–05 and 2011–12. These declines in daily per capita intakes of nutrients are particularly stark between 1993–94 and 2004–05 in rural areas. Many alternative explanations have been proposed to explain this calorie consumption paradox in India (i.e., a decline in daily per capita calorie intake, despite an increase in the real per capita monthly spending, particularly in rural areas). Some of these include the declining calorie needs hypothesis (Deaton & Dreze, 2009; Eli & Li, 2013; Rao, 2000), changes in the relative price of food (Gaiha et al., 2013b, Gaiha et al., 2010; Patnaik, 2010), dietary diversification (Behrman & Deolalikar, 1989; Landy, 2009; Rao, 2000; Bhuyan et al., 2020), voluntary choice of consumers (Banerjee & Duflo, 2011; Jumrani, 2017), underreporting of calorie intake due to outside home consumption (Smith, 2015), a food budget squeeze (Basole & Basu, 2015; Mehta & Venkataraman, 2000; Sen, 2005), altering disease environment (Siddiqui et al., 2019) and poor sanitation facilities (Duh & Spears, 2017).

3.4. Semi-parametric estimation approach

A parametric specification may not necessarily depict an accurate picture of the relationship between nutrient intake and expenditure. A completely non-parametric strategy, on the other hand, has its drawbacks as were discussed in an earlier section. A semi-parametric approach is thus regarded as a good compromise because it allows for complete flexibility in establishing the relationship between nutrient intakes and income, while also parametrically controlling for various other confounders.[17] Figure A21 depicts the rural non-augmented semi-parametric Engel curves for all macronutrients and micronutrients considered in this study. The dotted vertical line represents the 25th percentile cutoff in terms of the natural logarithm of 1993–94 real MPCE, identifying the poorest quartile, while the second vertical depicts the 50th percentile. The semi-parametric Engel curves are steeper than the non-parametric ones shown in Figure A11. In line with the findings from Table 1, the semi-parametric Engel curves depict that as spending increases, so do daily per capita nutrient intakes. Caloric and protein intakes in rural India have declined over time, particularly between 1993–94 and 2004–05, and more so for high-income households. Similarly, consumption of all micronutrients decreased, except for vitamin A that increased between 1993–94 and 2004–05, and then decreased between 2004–05 and 2011–12.

Next, we move on to our preferred estimation strategy i.e., augmented partial linear model. This strategy permits a fully flexible characterization of the relationship between nutrient intake and income while simultaneously addressing the endogeneity concerns. The augmented semi-parametric Engel curves (Figure A31) however indicate that once endogeneity concerns are addressed, almost all nutrients in rural areas witness an increase in their consumption over time. As one would expect, this increase in intake was a bit starker among poorer households. The absence of a calorie consumption paradox is indicated by the augmented semi-parametric Engel curves. A few other recent studies have also noted this (see, for example, Pritchard et al., 2019) and discussed the turnaround of the paradox's trends after 2004–05, in line with the international experience, primarily attributing it to food-based social welfare policies. This however does not imply that India's nutrition problems have been resolved for the poor. This can also be a consequence of a preference for variety among the consumers and a likely pattern of a higher pattern of relatively more within-food group substitution than between-group substitution. However, the present study does not address either of these and these are thus potential conjectures. Similarly, there was an increase in the nutrient intakes over time in urban areas (results not reported here but available upon request), but the rise was noticeable between 1993–94 and 2004–05, and there was a greater degree of overlap across curves.

Figures 2a and 2b present the non-augmented semi-parametric nutrient-income elasticity curves across all three rounds for rural and urban areas, respectively. In these graphs, the horizontal axis plots the natural logarithm of real MPCE, while the vertical axis represents nutrient elasticities. These present the estimates from the semi-parametric estimation across the entire income distribution, and not just at the means. The patterns in these curves highlight that the constant elasticity estimates as reported in Table 2 obscure the changing dynamics between nutrient consumption and expenditure across different parts of the sample. For all the semi-parametric specifications, the null hypothesis of a linear parametric regression function is rejected against a non-parametric scale effect. This highlights that the semi-parametric estimation models are preferred to the parametric ones. These significance tests are not reported for the sake of brevity. The focus for all the elasticity curves however should be primarily on the middle part of the curves, as estimates at the tails of the expenditure distribution are likely to be imprecise, owing to fewer observations.[18] The dotted vertical line represents the 25th percentile on the natural logarithm of 1993–94 real MPCE, while the second vertical depicts the 50th percentile of the same. The elasticity curves indicate that the functional form that best represents the relationship between demand for nutrients and income is indeed non-linear and non-monotonic. In general, based on non-augmented semi-parametric curves, the relationship between nutrient intake and income seems not too far from being linear around the median income (as indicated by the second vertical line). The patterns in the calorie elasticity curves for rural India are similar to the ones noted in Subramanian & Deaton (1996) with the only difference being that their elasticity declined relatively steadily across the income distribution. The elasticities for all macronutrients have decreased over time in rural India, particularly for higher-income households. This decline, as one would expect, was not that stark for fat consumption. As expected, the estimates are higher for poorer households and more pronounced in rural areas. The estimates for vitamin A and calcium were higher than those for calories and protein, but they did not appear to differ significantly across survey rounds, particularly around the median of the expenditure distribution i.e., log (6.14) or Rs. 426. A decline in elasticities was noted for all micronutrients, barring vitamin A, among rural households with higher spending capacities. In urban areas, a decline was evident only in the case of calories and protein elasticities, and that too among the rich. A somewhat marginal decline was noted in the case of elasticity estimates for micronutrients in urban areas as well, but no clear patterns were evident.

Further, augmented semi-parametric elasticities are estimated using equation (4) and these curves are separately depicted in Figures 3a and 3b for rural and urban areas, respectively. These curves also show that the relationship between demand for nutrients and income is indeed non-linear and non-monotonic. The basic shape of augmented semi-parametric elasticity curves is the same as that of non-augmented semi-parametric curves (Figures 2a and 2b). These are, however, somewhat lower in magnitude compared to the non-augmented ones. In rural India, the augmented semi-parametric elasticity curves for macronutrients exhibited somewhat similar patterns to the non-augmented semi-parametric elasticity curves, particularly at the upper tail of the expenditure distribution. The calorie and protein elasticities declined, especially between 1993 and 94 and 2004–05. There were no clear patterns across rounds, except for vitamin A intake, which showed a decrease in elasticities. Only at the top of the rural income distribution did elasticities decline over time in the case of fat elasticity curves. As expected, the estimates for micronutrients were higher. However, no clear patterns in terms of inter-temporal changes in them were visible, except for a relatively clear pattern in rural vitamin A intake. The augmented semi-parametric elasticity estimates (Figure 3b) were not as stark in urban areas as they were in rural areas.

[17] Semi-parametric estimation has been undertaken by using the user-written Stata command plreg (Lokshin, 2006).

[18] All the graphs have been adequately trimmed with respect to the x-axis for the sake of visual clarity.

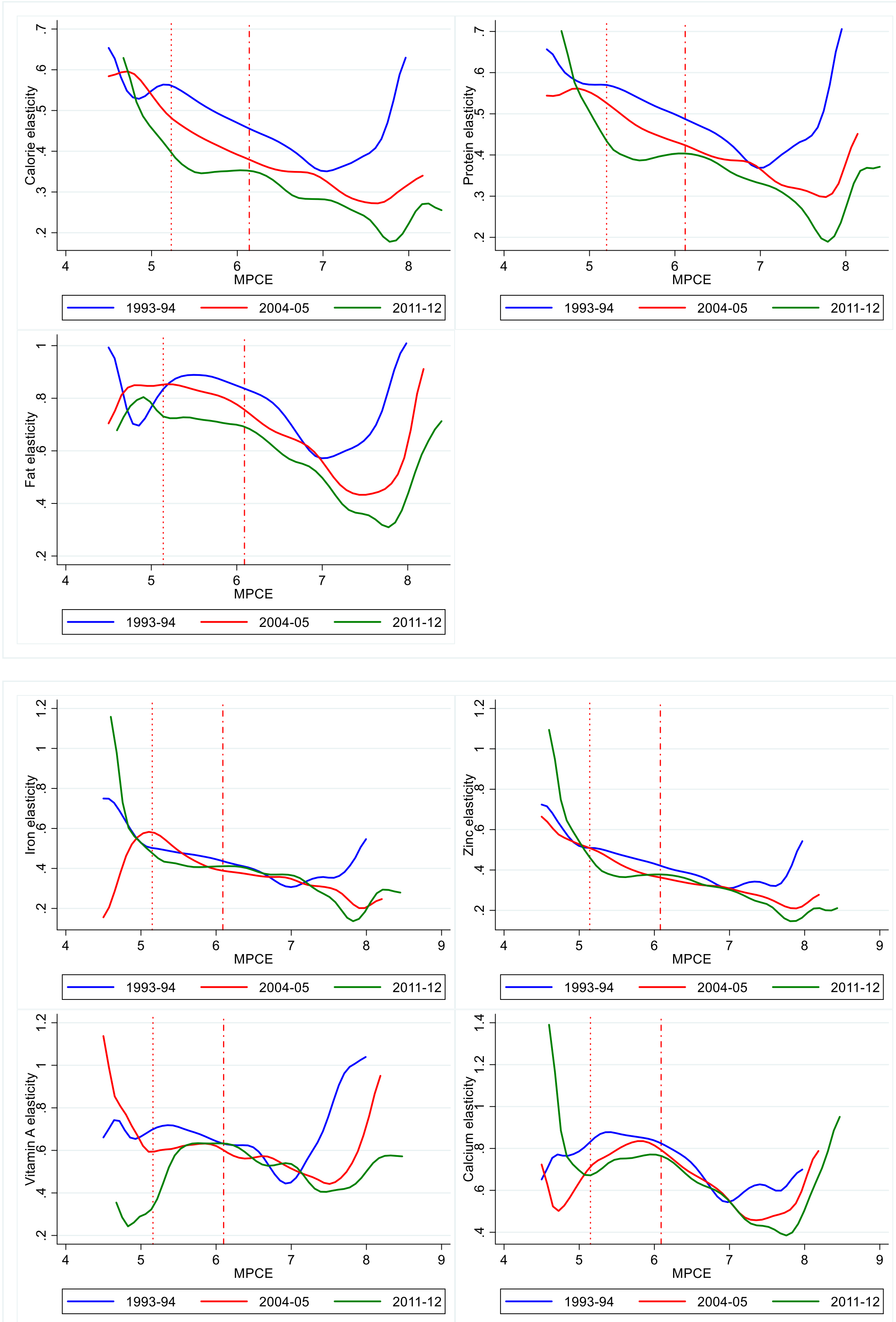

Fig. 2a. Non-augmented semi-parametric elasticity estimates for rural India.
Notes: Non-augmented semi-parametric estimates for the relationship between nutrient intakes and MPCE. All values are in natural logarithm. These slope functions have been estimated using the smooth local regression technique (Fan, 1992; Deaton, 1997). The dotted vertical line represents the 25th percentile on the natural logarithm of 1993–94 real MPCE, while the second vertical line depicts the 50th percentile.

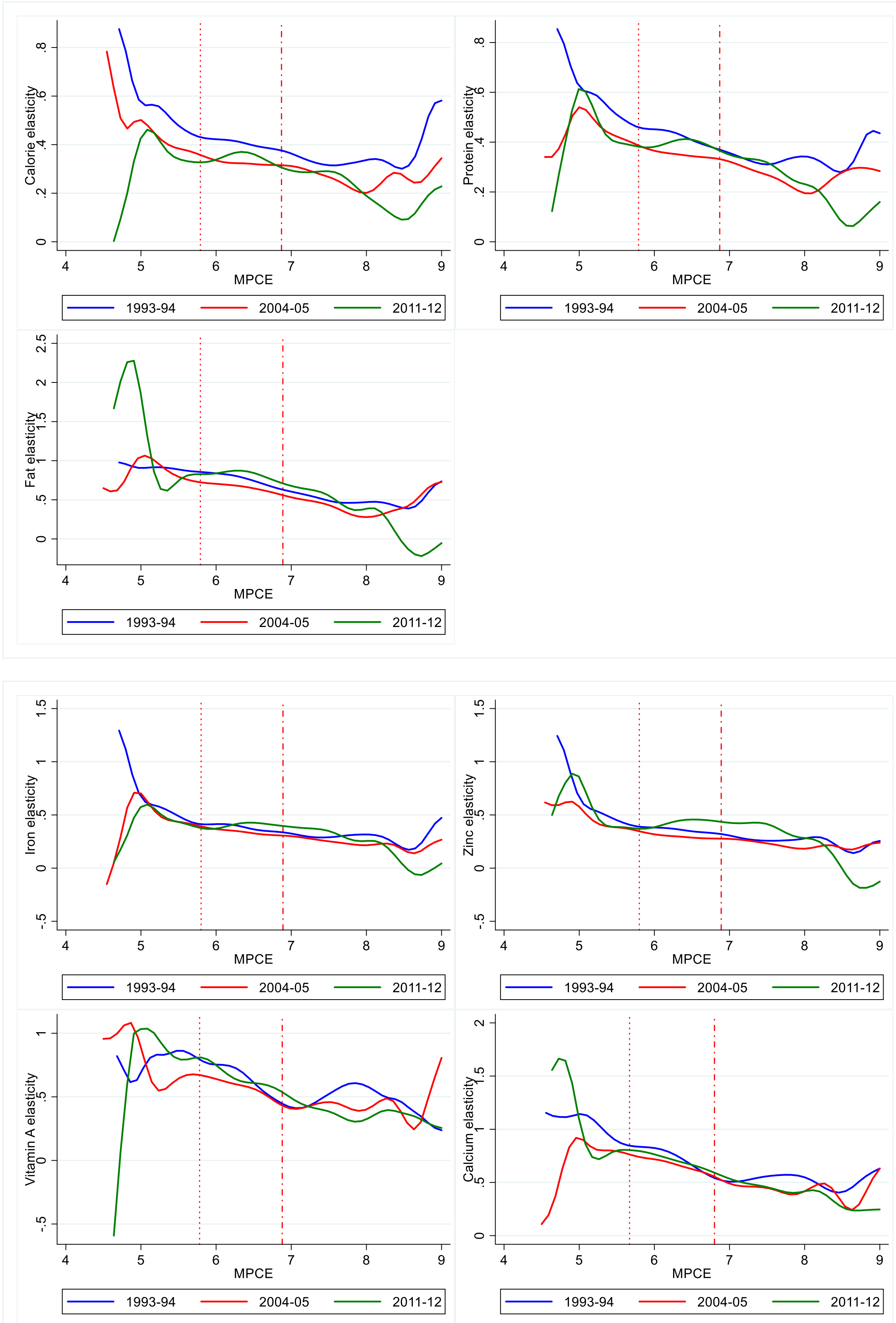

Fig. 2b. Non-augmented semi-parametric elasticity estimates for urban India.

Notes: Non-augmented semi-parametric estimates for the relationship between nutrient intakes and MPCE. All values are in natural logarithm. These slope functions have been estimated using the smooth local regression technique (Fan, 1992; Deaton, 1997). The dotted vertical line represents the 25th percentile on the natural logarithm of 1993–94 real MPCE, while the second vertical line depicts the 50th percentile.

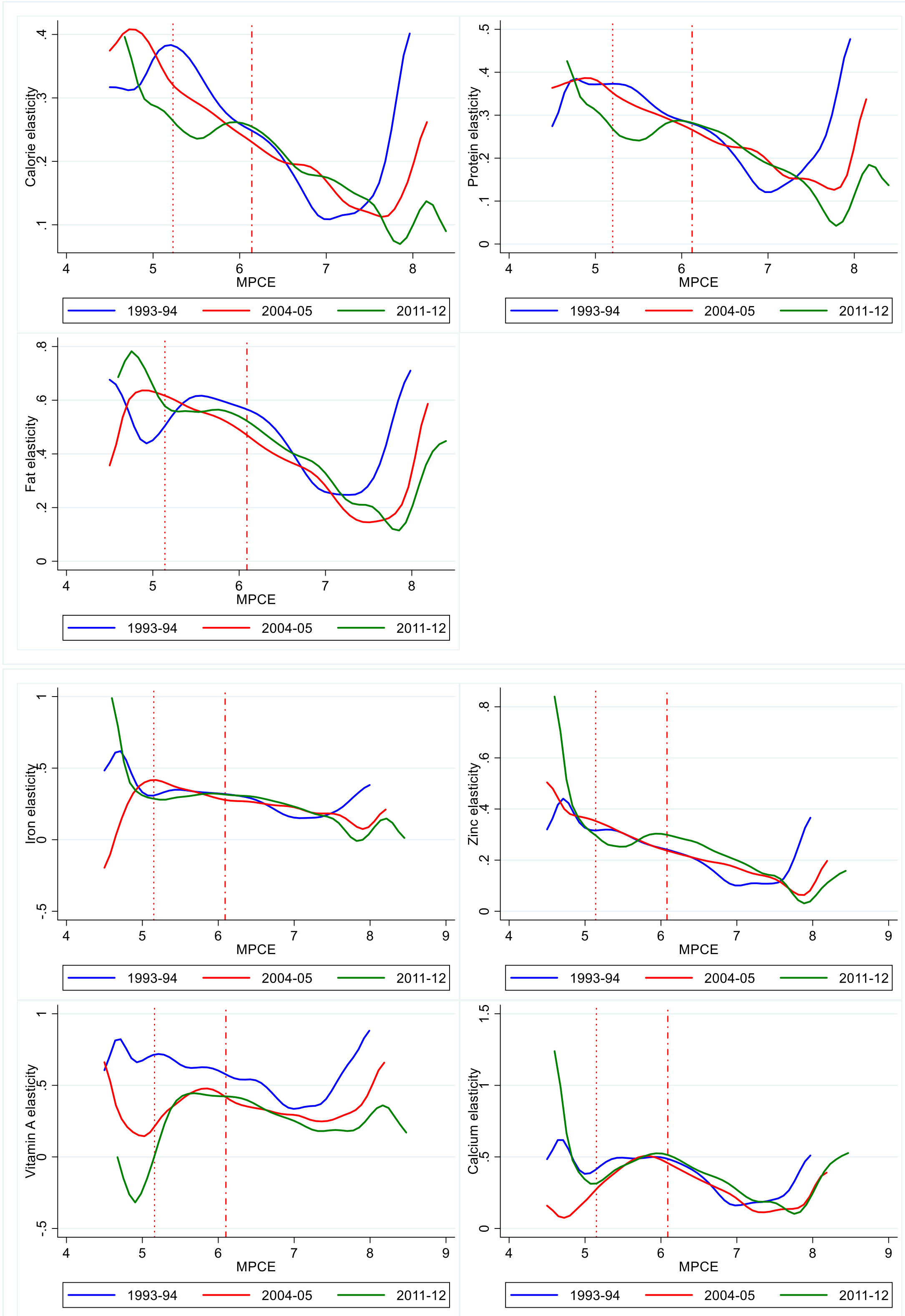

Fig. 3a. Augmented semi-parametric elasticity estimates for rural India.

Notes: Augmented semi-parametric estimates for the relationship between nutrient intakes and MPCE. All values are in natural logarithm. These slope functions have been estimated using the smooth local regression technique (Fan, 1992; Deaton, 1997). The dotted vertical line represents the 25th percentile on the natural logarithm of 1993–94 real MPCE, while the second vertical line depicts the 50th percentile.

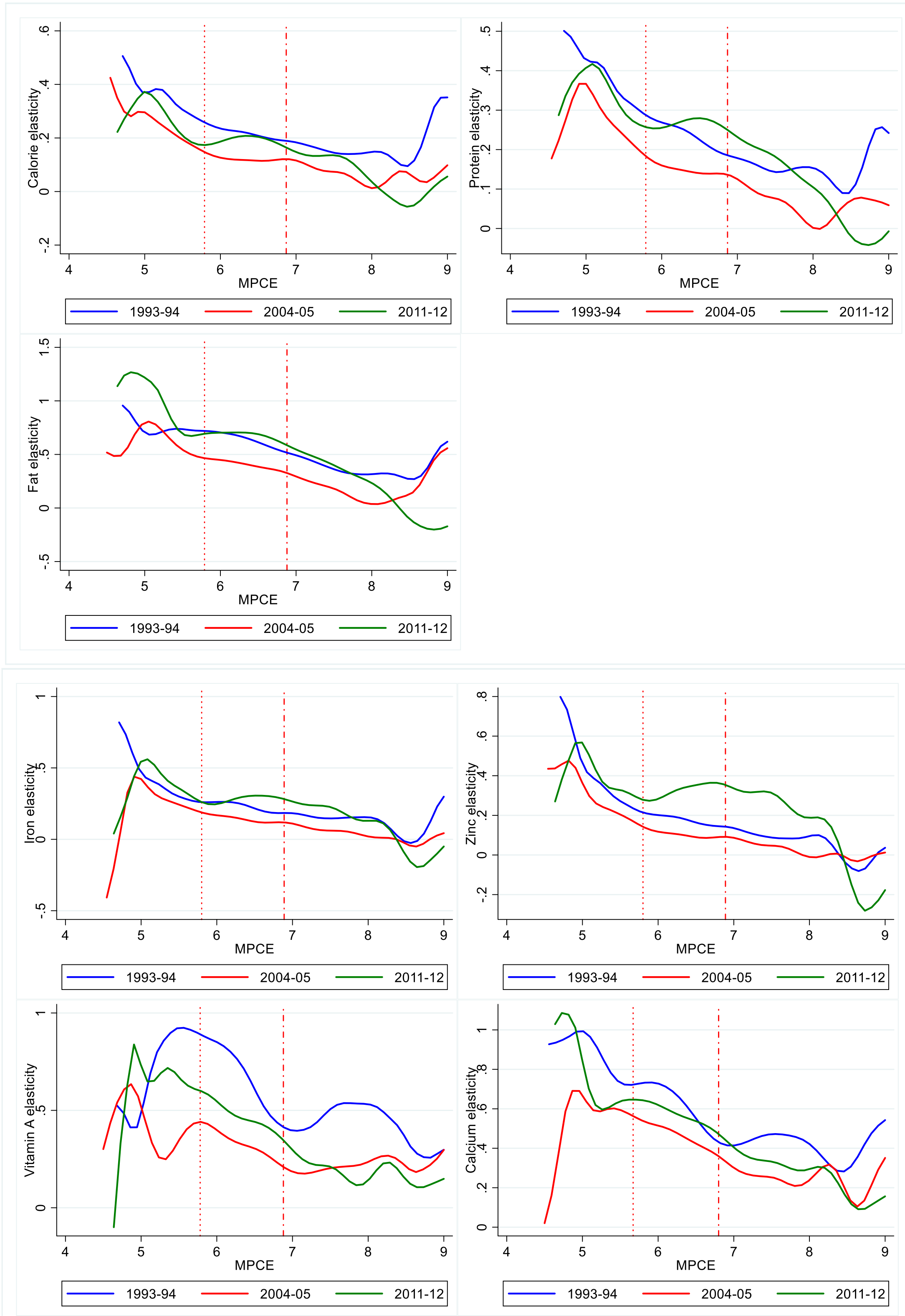

Fig. 3b. Augmented semi-parametric elasticity estimates for urban India.
Notes: Augmented semi-parametric estimates for the relationship between nutrient intakes and MPCE. All values are in natural logarithm. These slope functions have been estimated using the smooth local regression technique (Fan, 1992; Deaton, 1997). The dotted vertical line represents the 25th percentile on the natural logarithm of 1993–94 real MPCE, while the second vertical line depicts the 50th percentile.

These curves present the estimates from the semi-parametric estimation at each point in the entire income distribution, and not just at the means. The augmented semi-parametric elasticity estimates for these nutrients suggest that the relationship between nutrient intake and expenditure is non-linear and significantly different (and greater) than zero. The semi-parametric estimation results from this analysis are consistent with those from previous studies for other countries (Gibson & Rozelle, 2002; Meng et al., 2009; Skoufias et al., 2009), which found the relationship to be non-linear and far greater than zero. To evaluate if these augmented semi-parametric elasticities differ significantly across survey rounds, I also plot separate graphs containing the clustered bootstrapped standard error bands[19] associated with each of these elasticity values in rural India in Figure A41. These highlight that the calorie elasticity was statistically higher for 2011–12, followed by 2004–05 than those in the 1993–94 sample, especially for low-income households. Similarly, for protein and fat consumption, elasticities were marginally higher for 2004–05 and 2011–12 than 1993–94. The patterns were not that clear for micronutrients, except for iron and vitamin A where the elasticities for poor households were statistically different between 1993–94 and 2011–12.

4. Robustness checks and sensitivity analysis

4.1. Adult equivalence scales

As discussed in an earlier section, the study accounts for household structure by employing the count of different family members in a household belonging to different age-sex groups as covariates in the OLS and IV estimation approaches. To rule out the possibility of any kind of selection bias resulting from this choice, I undertook the analysis again only for the IV estimation method by adjusting the intakes for consumer units rather than the traditional per-person basis. Each of the daily nutrient intakes considered in this analysis has been adjusted for a consumer unit using the adult equivalence scales. The standard consumer units' approach as utilized in the CES reports has been used here. A consumer unit is a normative rate of equivalence of a given age-sex specific person in relation to a 'standard' male person aged 20–39 years and doing sedentary work who is taken to be equivalent to one consumer unit (or norm) and all the other coefficients are expressed as a ratio to this norm based on caloric requirements. For the sake of brevity, these coefficients are not reported here, but they are available in the published reports (see statement 2, NSS report no. 513, pp 13).

The results for the consumer units adjusted IV estimation are set out in Tables A21 and A22. The locality median non-food expenditure and its squared term are employed as instruments here as well, and these were strongly correlated with the endogenous regressor i.e., real MPCE. This finding is also supported by the high magnitudes obtained for MP effective F statistics in both rural and urban India. These effective F statistics were significantly higher than the rule-of-thumb value of 10, as well as the MP reported critical values for the various proportion values of worst-case bias.[20] MPCE can be considered as an endogenous regressor in both sectors for all outcomes as validated by the rejection of the null hypothesis of exogeneity of the specified endogenous regressor. Table A21 indicates that there has been an inter-temporal decline in macronutrient elasticities in rural India. Here too, fat has been the most responsive among macronutrients. The direction and magnitudes of these elasticities were similar to those reported from the IV estimation in Table 3a. Except for zinc, micronutrient elasticities have also declined over time in rural India. They were also quite close in magnitude to the IV estimates. Similarly, urban estimates follow the same pattern as the IV estimation as reported in Table 3b. The fact that the magnitudes and directions obtained from this IV estimation on an adult equivalence scale basis are quite similar to our preferred IV estimation specification lends credence to the robustness of our main findings.

4.2. Other instrumental variables

The analysis also employs a few other instrumental variables to evaluate the robustness of these estimates, such as the count of types of durable assets owned by a household and the type of primary sources of cooking and lighting in a household. To arrive at a count of the different types of household assets possessed, only a set of key durable assets such as a car, radio, television, mobile phone, refrigerator, electric fan, washing machine, etc. were considered. Similar to the earlier case, a natural logarithm of this variable has been considered. In another set, I employ a linear combination of a household's primary energy sources for cooking and lighting. Cooking sources have been categorized as clean, dirty and others, while lighting sources have been bifurcated into kerosene-based and all others. For the sake of brevity, only the elasticity estimates for each nutrient, as well as the relevant tests in terms of instrument strength, are provided in Tables A31 and A32. Table A31 presents the elasticity estimates derived from the IV estimation using the natural logarithm of a count of different asset types. The relevant test for a just-identified model in non-homoscedastic settings, i.e., the Anderson-Rubin (AR) test statistic is highly significant across all nutrients in both rural and urban India, thus rejecting the null hypothesis that the coefficient associated with the endogenous regressor is equal to zero. Except for iron intakes in rural areas, all other nutrients follow the same pattern as observed in the IV estimation results as reported earlier in Tables 3a and 3b. However, some differences have been observed in urban areas. All macronutrient elasticities increased over time in urban areas, rather than decreasing, as predicted by the benchmark IV estimation.

In another over-identified model, a linear combination of cooking and lighting sources in a household has been used as instruments (Table A32). The strength of these instruments, as reflected in their respective F statistics, was higher than that obtained from the above-discussed instrument but was lower than that arrived at from the instruments used in benchmark IV specification. Except for rural iron and zinc estimates and urban protein estimates, these estimates followed a similar pattern to the benchmark IV estimation (Tables 3a and 3b). Across both the sets of instruments employed additionally, the magnitudes for the elasticity estimates were slightly higher across all nutrients.

4.3. Winsorized variables

To rule out the possibility of any selection bias due to the choice of selection of outliers and dataset trimming, I redo the IV estimation exercise with respect to the winsorized variables[21] i.e., all the outcomes and endogenous covariate in this case. The locality median non-food expenditure and its squared term are again utilized as the instruments. Unlike trimming, winsorizing replaces the data at both extreme ends. Table A4 only shows the second-stage results of this estimation for rural India. All the outcome variables have been winsorized at the default values of the 1st and 99th percentile. The results of this estimation are broadly consistent with the IV estimates reported in Tables 3a and 3b. Except for rural caloric estimates, all macronutrient estimates have declined over time. In terms of minerals and vitamins, all nutrients in rural areas followed the benchmark IV estimation findings of a decline in iron, vitamin A and calcium elasticities, and an increase in zinc elasticity over time. Similarly, all IV estimation results hold through in urban

[19] Following Deaton (1997), confidence bands were computed by bootstrapping the locally weighted regressions 50 times for each of the 100 evenly grid points of expenditure used in the regression, and these have been plotted using Lowess with no weighting.

[20] These MP critical values have not been reported for the sake of brevity.

[21] Variables were winsorized using the user-written Stata command winsor2 (Lian, 2014).

areas, except for calorie elasticities that showed an inter-temporal increase (results not reported but available on request). All the nutrients had similar magnitudes as derived from the benchmark IV estimation results reported in Tables 3a and 3b. To test the sensitivity of these findings, another set of cutoff values at the 5th and 95th percentiles was employed. These cutoffs, however, imply that about 10 percent of the sample contains outliers, which is slightly on the higher side. Over time, these estimations depict an increase in rural calorie elasticities as well as urban calorie and protein estimates. All the other nutrients follow the same patterns as observed in the benchmark IV estimation. These results have not been reported here but are available upon request. The somewhat unanticipated finding of increasing rural calorie elasticities over time suggests that there were indeed some absurd extreme values for caloric intakes and MPCE, which required some form of trimming as has been done in the benchmark specification.

4.4. Plausible exclusion restrictions

Given that it is difficult to rule out the possibility that the instruments employed in this analysis are invalid (even after controlling for different covariates), I attempt to conduct a sensitivity analysis to empirically assess their validity and thus demonstrate that the causal inferences[22] made are credible. To accomplish this, I employ-two bounds approaches proposed by Conley et al. (2012).[23] Clarke & Matta (2018) reasonably discuss the practical considerations to be borne in mind while employing the techniques that allow for the construction of bounds estimates based on IVs, even when the instruments are invalid. These permit us to draw inferences even when the IV may violate the exogeneity restriction. The first method is the union of confidence intervals (UCI) approach, which allows for the examination of findings' robustness to the presence of a direct effect (γ) between the IV and the outcome, regardless of the channels through which this may occur. Conley's UCI method permits us to relax the strict assumption of no direct effect and then check for the significance of our main findings. The UCI approach assumes that the direct effect has a specific support interval, which can be either asymmetric or symmetric. The second method of Conley et al. (2012) is known as the local to zero (LTZ) approximation bounds approach. It relaxes the exclusion restriction by allowing for some uncertainty in one's prior about the direct relationship between the instrument and outcome.

Due to space considerations, I restrict the estimation to the rural areas of the 2011–12 sample[24] for the purposes of this analysis. Furthermore, since the analysis employs two instruments in the benchmark specification, it becomes difficult to handle all combinations of possible deviations of these instruments. The presence of more than two instruments also prevents us from visualizing the results, which is an otherwise attractive feature of these methods. In the UCI approach, I assume γ to have a support of $[0, 2\gamma]$, whereas in the LTZ approach, γ is assumed to be normally distributed with mean γ^2 and variance $\gamma^2/12$. For the LTZ approach, I only evaluate one plausible deviation combination i.e., one in which both the instruments do not satisfy the exclusion restriction and move in the same direction as the specified deviation parameter γ. The results from this estimation exercise are set out in Table A5. The findings from the UCI approach indicate that the union will contain the true parameter values as reported in the benchmark IV specification (Table 3a) at least 95 percent of the time. Similarly, in case of the LTZ approach, the bounds include all the true parameter values, except for one outcome relating to caloric intake. In both approaches, I cannot quantify the degree of permissible deviation so as to not overturn the results due to a lack of visualization capabilities with more than one IV. These methods rely heavily on the existence of correctly specified priors, which are often theoretically motivated, and are thus regarded as a complementary approach to the standard IV estimation. There also does exist a tradeoff between the strength and plausibility of instruments (Conley et al., 2012). As a result, in this analysis, I choose a set of 'strong' instruments that may be 'plausibly' exogenous yet preferred.

5. Concluding remarks and policy considerations

This paper investigates the relationship between nutrient intake and income using large-scale household-level data from India. The expenditure elasticity estimates for three macronutrients i.e., calories, protein and fat and four essential micronutrients i.e., iron, zinc, vitamin A and calcium, have been estimated for the 1993–94 (50th), 2004–05 (61st), and 2011–12 (68th) CES rounds of the NSSO using different estimation approaches. The prevailing patterns and trends in overall food consumption and across food groups were also evaluated. Fruits and vegetables account for only 2–3 percent of total caloric intake, and this proportion has been declining between 1993–94 and 2011–12, besides the expected decline in cereals and their substitutes, and a marginal increase in the share of milk and milk products. Rural areas have seen a greater jump in the consumption of oils and fats and relatively unhealthier food groups such as miscellaneous foods and beverages than urban areas over time.

This paper extends the literature by undertaking a comprehensive assessment of the nutrient-income elasticities by employing different estimation techniques. It goes beyond calories and estimates the elasticities for other important constituents (i.e., protein and fat) as well, and four essential vitamins and minerals. Unlike most of the previous studies that mainly focus on parametric specifications (mostly linear), this study permits a fully flexible characterization of the relationship between nutrient intake and income while also simultaneously accounting for endogeneity concerns. The findings indicate that, on average, nutrient-income elasticities are positive and statistically significant across food groups. These are also particularly starker among rural than urban poor households. In line with expectations, food items that are part of basic staple diets, which are often calorie dense, had relatively lower income elasticities than those for more luxurious and aspirational food items. This highlights that people tend to smoothen their consumption and shift towards relatively expensive calorie sources. Three approaches, i.e., parametric, non-parametric and semi-parametric estimation, have been employed to obtain more recent and robust elasticity estimates. There is considerable heterogeneity in the income elasticities for the demand for nutrients. Even though the semi-parametric models are our preferred models, I first present the findings from the parametric and non-parametric estimation approaches for comparison purposes. Parametric (OLS) estimation results suggest that the income-elasticity estimates for all nutrients assessed in this study have declined in rural areas. In urban areas, all the nutrient elasticities declined over time, except for those of iron and zinc.

Parametric (IV) elasticity estimates, which address the endogeneity concerns, are lower than the estimates obtained from the OLS approach for all macronutrients. Like OLS estimates, IV elasticities for macronutrients have declined over time in rural areas. Fat consumption is more responsive to changes in income than the consumption of calories and protein in both sectors. In terms of micronutrient-income elasticities, all

[22] Despite the fact that the estimation is dealing with observational data (and not experimental data), one can be safe to assume that the inferences drawn are causal in nature due to the magnitude of the sample size being exploited here.

[23] These two methods have been implemented using the user-written Stata command plausexog (Clarke, 2014). The author(s) are thankful to Damian Clarke for his valuable suggestions regarding the implementation of the code.

[24] This particular estimation exercise has resorted to the Frisch-Waugh-Lovell theorem and concentrated out all the fixed effects prior to running the estimation. Given that I have sufficient sample size, it is expected that any kind of degrees of freedom correction would be quite minor, if anything. Similar strategy was also adopted in Table A32 to compute the effective F statistics.

the estimates are positive and statistically highly significant in both rural and urban India. In both sectors, calcium and vitamin A have been relatively more responsive to income changes followed by iron and zinc. Rural households had higher elasticities than urban households for most micronutrients. Barring rural zinc and urban iron estimates, all other elasticity estimates have declined across survey rounds, mirroring the trend observed in the OLS estimation. A comparison of the OLS and IV estimates indicates that the former estimates are misleading due to the likely outweighing of the correlated measurement errors over the standard downward attenuation bias, and the IV estimates are thus likely a lower bound. Even then, these IV estimates are positive and statistically significant with micronutrients having higher magnitudes than macronutrients.

In line with Bennett's Law, with an increase in household income, households do change the allocation of their food budget from inexpensive to relatively expensive calorie sources, as is evident from the calorie-expenditure elasticities obtained from parametric estimation across food groups. The calorie-expenditure elasticities were more responsive for rural than urban households. Income growth can thus lead to a more diversified diet, which might not necessarily be nutritionally superior and healthier. Fat elasticities are higher than those obtained for the other nutrients studied here, and these have been declining over time. Given the link between excessive fat and processed food consumption to cardiovascular diseases and metabolic disorders, both of which are on the rise in the country, it is imperative to pay attention to these dietary habits and the resulting nutritional imbalances, particularly among vulnerable populations. All future policies should consider adopting a more nuanced strategy rather than a one-size-fits-all approach.

As discussed earlier, both parametric and non-parametric estimation approaches might not be able to capture the true and complex relationship between nutrient intake and income due to their respective drawbacks. To address these, this study employed Yatchew's partial linear model based on differencing, which provides full flexibility to income effects while also parametrically controlling for other additional covariates. Semi-parametric Engel curves have a higher slope than non-parametric Engel curves. The non-augmented and augmented semi-parametric elasticity curves both show that the functional form best representing the relationship between nutrient demand and income is indeed non-linear and non-monotonic. These curves provide a more detailed expose of the elasticity and depict the estimates at every point in the entire income distribution, and not just an average elasticity. The semi-parametric estimation highlights that assuming constant elasticity across the income distribution is not apt as the elasticities do vary with income levels. The augmented semi-parametric estimates reveal that the nutrient-income elasticities are positive and statistically significant for all macronutrients and key micronutrients. The estimates were statistically different across survey rounds, particularly for macronutrients. The micronutrient elasticities are generally higher than those obtained for macronutrients, and most Indians are deficient in these considered essential vitamins and minerals. In general, the lower a household's expenditure, the higher its estimated elasticity, and this suggests that the nutritional status of these households shall be thus more prone to income fluctuations. Fats are more sensitive to changes in income than calories and proteins. Furthermore, due to proportionately higher consumption of cereals, almost stagnant legume consumption, and a lack of a diet rich in animal products and certain seafood, iron and zinc elasticities largely mirror caloric patterns. Micronutrients such as iron and zinc may necessitate certain non-economic measures such as food fortification, supplementation policies, etc.

This study, like most empirical studies, has certain limitations. Apart from not capturing the differences in food quality between items, the analysis made no distinction between gross intake and net absorption of nutrients. A proper accounting of food wasted and consumed outside the home remains a challenge. These would be more problematic if there exists a significant disparity in the quantity of food wasted by the rich and poor, with the rich wasting more food. Further, it is not necessary for the nutrients derived from meals consumed outside to be the same as those obtained at home. Since the models for estimating a differencing-based partial linear model are not yet well developed, the study is unable to account for situations in which the non-parametric term is endogenous. This is something that will be studied in future research. Due to the lack of individual-level consumption data, these findings do not permit us to determine how these income changes translate in terms of intra-household food allocation (and thereby nutrients), particularly for the vulnerable population groups.

Lending credence to the conventional wisdom camp and displaying consistency with some of the previous work, this comprehensive assessment of nutrient-income elasticities provides evidence that these estimates are positive and statistically significant, regardless of the estimation approach utilized. Even when the elasticities are small, they are always more pronounced and significantly above zero for the poor, who are the most vulnerable to malnutrition. The findings reveal that income growth still remains as one of the key pathways to eradicating undernutrition, especially among the poor in low- and middle-income countries like India. Nonetheless, non-economic mediation strategies (particularly for the less-responsive nutrients) such as those concerned with raising nutritional awareness about healthy dietary behavior, food fortification, and hygiene and disease prevention are equally important.

Given the current landscape of India's nutrition economy, it is imperative to evaluate the impact of income across the entire income distribution and not just at the means. The findings from this study will be useful for designing apt nutritional and health-related policies, not only in India but also in other emerging economies aiming to reduce, and even eliminate, diseases caused by malnutrition.

CRediT authorship contribution statement

Jaya Jumrani: Conceptualization, Methodology, Software, Visualization, Writing – original draft, Writing – review & editing.

Declaration of Competing Interest

I declare that I have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A

See Figures A11, A21, A31, A41.

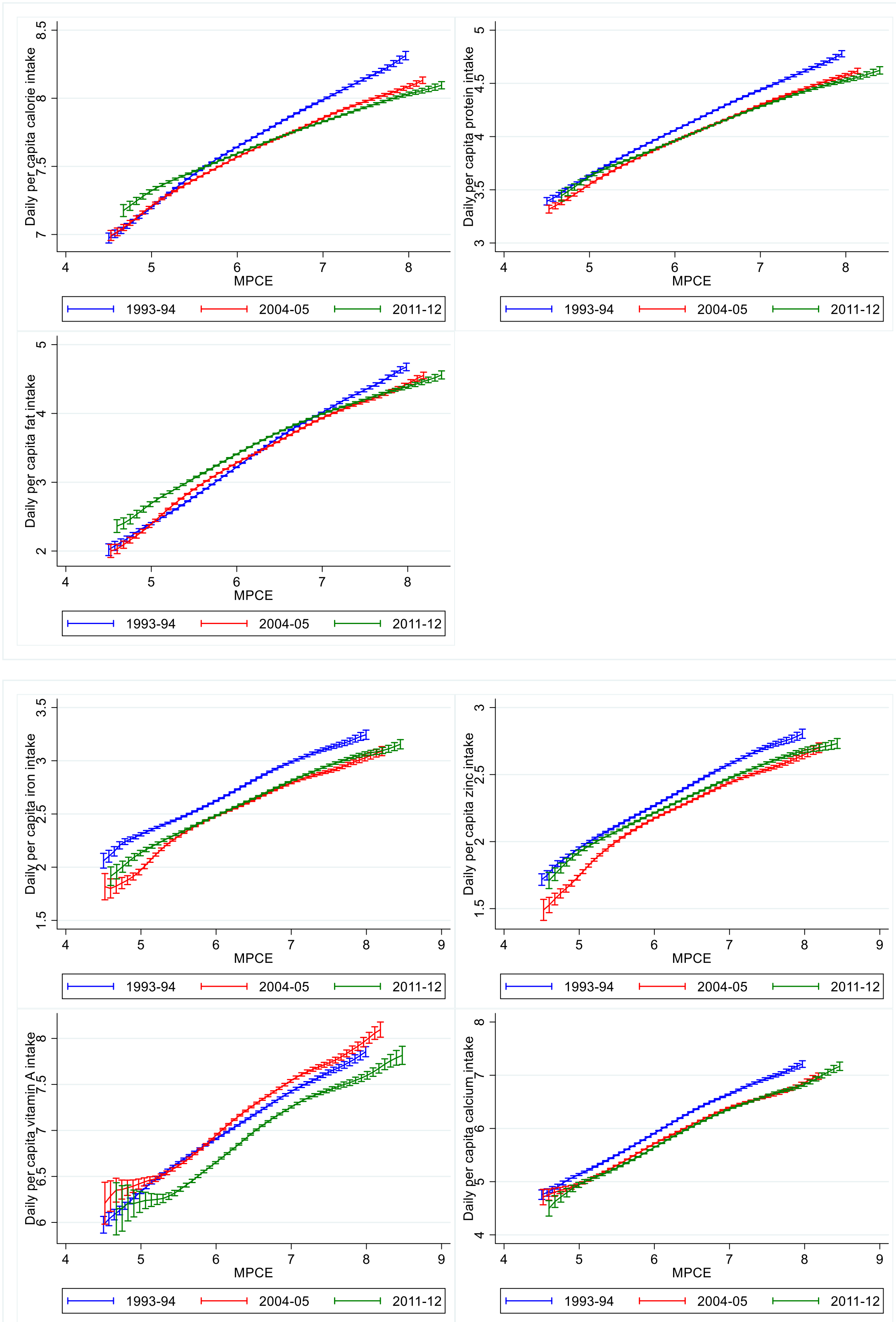

Fig. A11. Non-augmented non-parametric Engel curves for rural India.

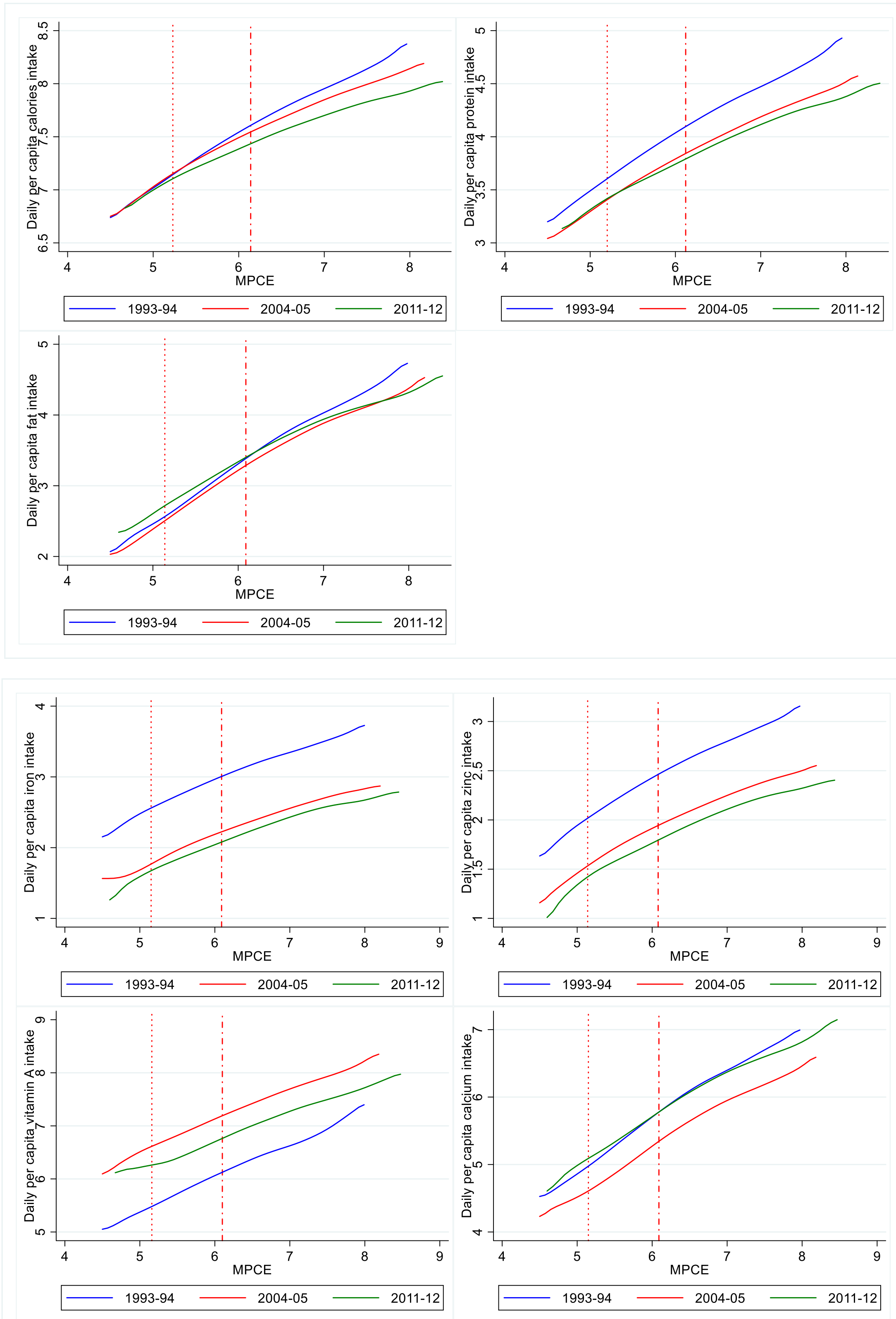

Fig. A21. Non-augmented semi-parametric Engel curves for rural India.
Notes: All values are in natural logarithm. These regression functions have been estimated using the smooth local regression technique (Fan, 1992; Deaton, 1997). The dotted vertical line represents the 25th percentile on the natural logarithm of 1993–94 real MPCE, while the second vertical line depicts the 50th percentile.

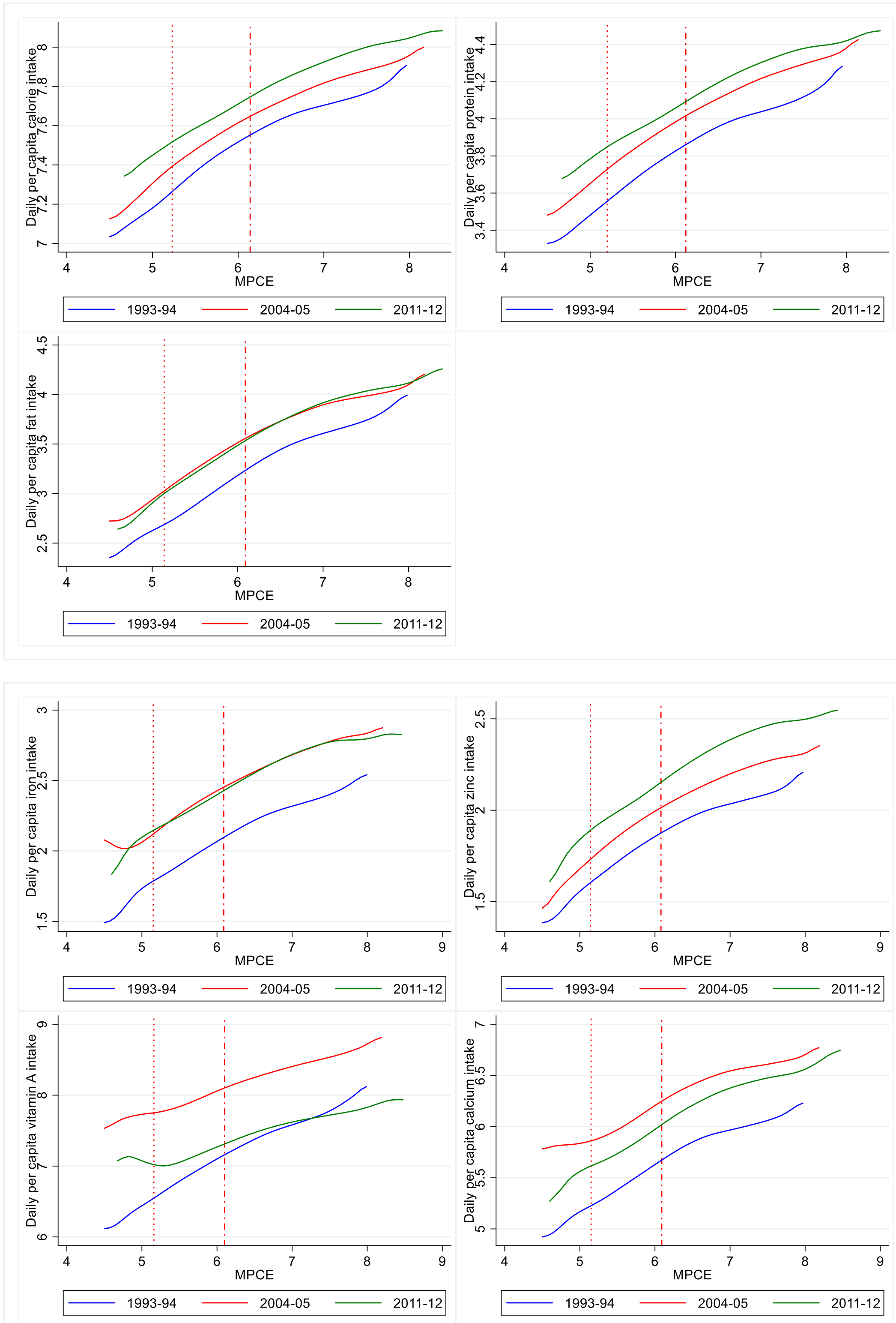

Fig. A31. Augmented semi-parametric Engel curves for rural India.
Notes: All values are in natural logarithm. These regression functions have been estimated using the smooth local regression technique (Fan, 1992; Deaton, 1997). The dotted vertical line represents the 25th percentile on the natural logarithm of 1993–94 real MPCE, while the second vertical line depicts the 50th percentile.

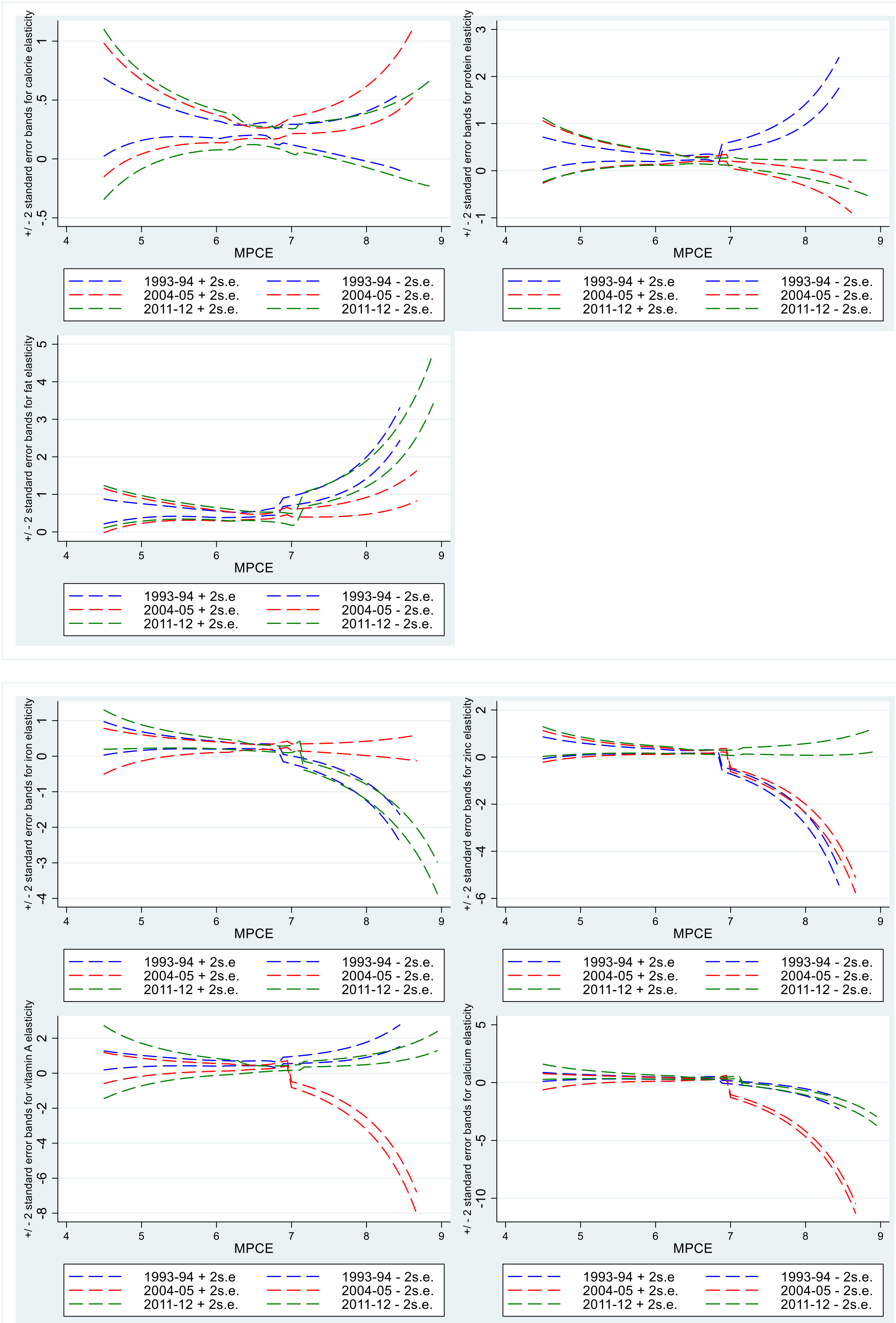

Fig. A41. Augmented semi-parametric standard error bands around nutrient-expenditure elasticities for rural India.

See Tables A11, A12, A21, A22, A31, A32, A4, A5 and A6.

Table A11
First-stage regression estimation.

	Daily per capita calorie intake			Daily per capita protein intake			Daily per capita fat intake		
Rural	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12
MPCE									
Locality median non-food expenditure	0.327[a]	0.278[a]	0.254[a]	0.321[a]	0.279[a]	0.273[a]	0.323[a]	0.245[a]	0.257[a]
	(0.056)	(0.060)	(0.067)	(0.056)	(0.062)	(0.067)	(0.056)	(0.061)	(0.070)
Locality median non-food expenditure squared	0.009	0.013[b]	0.019[a]	0.009[c]	0.013[b]	0.017[a]	0.009[c]	0.017[a]	0.018[a]
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Religion (base: Hinduism)									
Islam	0.008	0.000	0.037[a]	0.009	0.000	0.038[a]	0.009	−0.000	0.038[a]
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.007)	(0.006)	(0.006)
Christianity	0.019[c]	0.040[a]	0.013	0.018	0.037[a]	0.012	0.021[c]	0.035[a]	0.011
	(0.011)	(0.010)	(0.011)	(0.011)	(0.010)	(0.011)	(0.011)	(0.010)	(0.012)
Sikhism	0.114[a]	0.082[a]	0.106[a]	0.111[a]	0.083[a]	0.105[a]	0.113[a]	0.078[a]	0.108[a]
	(0.017)	(0.015)	(0.017)	(0.017)	(0.015)	(0.017)	(0.017)	(0.015)	(0.018)
Jainism	0.179[a]	0.142[a]	0.081[c]	0.176[a]	0.143[a]	0.091[c]	0.171[a]	0.162[a]	0.080
	(0.034)	(0.036)	(0.049)	(0.033)	(0.036)	(0.052)	(0.033)	(0.041)	(0.050)
Buddhism	0.008	−0.001	0.034[c]	0.009	0.000	0.031[c]	0.007	−0.008	0.032[c]
	(0.018)	(0.016)	(0.018)	(0.018)	(0.017)	(0.017)	(0.018)	(0.016)	(0.018)
Zoroastrianism	0.406[a]	0.160	0.011	0.407[a]	0.160	0.022	0.407[a]	0.161	0.013
	(0.039)	(0.100)	(0.047)	(0.039)	(0.101)	(0.064)	(0.039)	(0.102)	(0.047)
Others	0.035[c]	0.057[a]	0.039[c]	0.036[c]	0.056[a]	0.033	0.041[c]	0.059[a]	0.061[b]
	(0.021)	(0.018)	(0.023)	(0.021)	(0.018)	(0.022)	(0.021)	(0.018)	(0.025)
Social group (base: Scheduled tribes)									
Scheduled castes	0.006	−0.009	−0.014[c]	0.006	−0.011[c]	−0.015[b]	0.006	−0.009	−0.013[c]
	(0.007)	(0.006)	(0.007)	(0.007)	(0.006)	(0.007)	(0.007)	(0.006)	(0.007)
Other backward classes	–	0.067[a]	0.055[a]	–	0.065[a]	0.054[a]	–	0.067[a]	0.056[a]
		(0.006)	(0.007)		(0.006)	(0.007)		(0.006)	(0.007)
Others	0.088[a]	0.127[a]	0.101[a]	0.088[a]	0.125[a]	0.102[a]	0.089[a]	0.127[a]	0.102[a]
	(0.006)	(0.006)	(0.007)	(0.006)	(0.006)	(0.007)	(0.007)	(0.006)	(0.007)
Age of household head	0.001[c]	0.003[a]	0.003[a]	0.001[c]	0.004[a]	0.003[a]	0.001[b]	0.004[a]	0.003[a]
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Age of household head squared	0.000	−0.000[c]	−0.000	0.000	−0.000[b]	−0.000	0.000	−0.000[a]	−0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex of household head (base: Male)									
Female	0.025[a]	0.025[a]	0.018[a]	0.025[a]	0.024[a]	0.019[a]	0.024[a]	0.025[a]	0.019[a]
	(0.006)	(0.005)	(0.006)	(0.006)	(0.005)	(0.006)	(0.006)	(0.005)	(0.006)
Education of household head (base: Illiterate)									
Literate and literate w/o formal schooling	0.085[a]	0.053[a]	0.062[a]	0.086[a]	0.053[a]	0.062[a]	0.087[a]	0.053[a]	0.063[a]
	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.005)
Literate: below primary	0.116[a]	0.099[a]	0.094[a]	0.117[a]	0.100[a]	0.093[a]	0.118[a]	0.100[a]	0.094[a]
	(0.005)	(0.004)	(0.005)	(0.005)	(0.004)	(0.005)	(0.005)	(0.004)	(0.005)
Literate: primary	0.178[a]	0.157[a]	0.144[a]	0.178[a]	0.157[a]	0.146[a]	0.181[a]	0.158[a]	0.144[a]
	(0.005)	(0.004)	(0.005)	(0.005)	(0.004)	(0.005)	(0.005)	(0.004)	(0.005)
Literate: middle	0.294[a]	0.239[a]	0.221[a]	0.295[a]	0.241[a]	0.220[a]	0.299[a]	0.243[a]	0.221[a]
	(0.007)	(0.005)	(0.006)	(0.007)	(0.005)	(0.005)	(0.007)	(0.005)	(0.006)
Literate: secondary and above	0.422[a]	0.384[a]	0.345[a]	0.420[a]	0.381[a]	0.346[a]	0.428[a]	0.387[a]	0.348[a]
	(0.008)	(0.006)	(0.006)	(0.008)	(0.006)	(0.006)	(0.008)	(0.006)	(0.006)
Household type (base: Self-employed in non-agriculture)									
Agricultural labor (Regular wage/salary earning for 2011–12)	−0.170[a]	−0.187[a]	0.079[a]	−0.170[a]	−0.188[a]	0.077[a]	−0.170[a]	−0.187[a]	0.080[a]
	(0.005)	(0.004)	(0.005)	(0.005)	(0.004)	(0.005)	(0.005)	(0.004)	(0.005)
Other labor (Casual labor in agriculture and non-agriculture for 2011–12)	−0.116[a]	−0.111[a]	−0.141[a]	−0.118[a]	−0.112[a]	−0.144[a]	−0.115[a]	−0.111[a]	−0.142[a]
	(0.007)	(0.005)	(0.004)	(0.007)	(0.005)	(0.004)	(0.007)	(0.005)	(0.004)
Self-employed in agriculture	0.065[a]	0.051[a]	0.054[a]	0.064[a]	0.051[a]	0.051[a]	0.065[a]	0.054[a]	0.056[a]
	(0.005)	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)
Others	0.033[a]	0.076[a]	−0.005	0.032[a]	0.075[a]	−0.003	0.031[a]	0.076[a]	−0.008
	(0.006)	(0.005)	(0.009)	(0.006)	(0.005)	(0.009)	(0.006)	(0.005)	(0.009)
Males aged 0–4	−0.091[a]	−0.084[a]	−0.085[a]	−0.091[a]	−0.084[a]	−0.086[a]	−0.091[a]	−0.084[a]	−0.085[a]
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)
Females aged 0–4	−0.093[a]	−0.092[a]	−0.093[a]	−0.094[a]	−0.092[a]	−0.093[a]	−0.094[a]	−0.093[a]	−0.093[a]
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)
Males aged 5–9	−0.069[a]	−0.068[a]	−0.070[a]	−0.069[a]	−0.067[a]	−0.070[a]	−0.069[a]	−0.068[a]	−0.071[a]
	(0.003)	(0.002)	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)	(0.002)	(0.003)
Females aged 5–9	−0.074[a]	−0.073[a]	−0.068[a]	−0.074[a]	−0.073[a]	−0.067[a]	−0.075[a]	−0.073[a]	−0.068[a]
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)
Males aged 10–14	−0.063[a]	−0.058[a]	−0.063[a]	−0.062[a]	−0.058[a]	−0.062[a]	−0.063[a]	−0.060[a]	−0.063[a]
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)

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Table A11 (*continued*)

Rural	Daily per capita calorie intake			Daily per capita protein intake			Daily per capita fat intake		
	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12
Females aged 10–14	−0.061[a]	−0.065[a]	−0.073[a]	−0.060[a]	−0.065[a]	−0.073[a]	−0.060[a]	−0.066[a]	−0.074[a]
	(0.003)	(0.002)	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)	(0.002)	(0.003)
Males aged 15–54	0.005[b]	−0.002	−0.026[a]	0.004[b]	−0.002	−0.026[a]	0.004[c]	−0.003	−0.027[a]
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Females aged 15–54	−0.023[a]	−0.026[a]	−0.042[a]	−0.022[a]	−0.026[a]	−0.040[a]	−0.023[a]	−0.027[a]	−0.042[a]
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Males aged 55 plus	0.007	0.012[a]	−0.018[a]	0.006	0.011[a]	−0.018[a]	0.006	0.010[b]	−0.018[a]
	(0.005)	(0.004)	(0.005)	(0.005)	(0.004)	(0.005)	(0.005)	(0.004)	(0.005)
Females aged 55 plus	−0.041[a]	−0.052[a]	−0.073[a]	−0.041[a]	−0.052[a]	−0.072[a]	−0.041[a]	−0.051[a]	−0.075[a]
	(0.004)	(0.003)	(0.004)	(0.004)	(0.003)	(0.004)	(0.004)	(0.003)	(0.004)
Observations	68,094	77,725	55,055	68,163	77,774	57,475	68,431	77,914	54,349
District fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Rural	Daily per capita iron intake			Daily per capita zinc intake			Daily per capita vitamin A intake			Daily per capita calcium intake		
	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12
MPCE												
Locality median non-food expenditure	0.307[a]	0.224[a]	0.266[a]	0.309[a]	0.235[a]	0.251[a]	0.305[a]	0.219[a]	0.228[a]	0.321[a]	0.246[a]	0.262[a]
	(0.055)	(0.062)	(0.063)	(0.055)	(0.062)	(0.066)	(0.055)	(0.062)	(0.062)	(0.056)	(0.061)	(0.064)
Locality median non-food expenditure squared	0.011[b]	0.019[a]	0.018[a]	0.011[b]	0.018[a]	0.019[a]	0.011[b]	0.019[a]	0.021[a]	0.010[c]	0.017[a]	0.018[a]
	(0.005)	(0.006)	(0.005)	(0.005)	(0.006)	(0.006)	(0.005)	(0.006)	(0.005)	(0.006)	(0.006)	(0.006)
Religion (base: Hinduism)												
Islam	0.009	−0.000	0.042[a]	0.009	0.000	0.039[a]	0.009	0.001	0.040[a]	0.008	−0.001	0.040[a]
	(0.007)	(0.006)	(0.006)	(0.007)	(0.006)	(0.006)	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Christianity	0.022[c]	0.039[a]	0.015	0.019	0.039[a]	0.011	0.023[b]	0.035[a]	0.021[c]	0.023[b]	0.038[a]	0.021[c]
	(0.011)	(0.010)	(0.011)	(0.011)	(0.010)	(0.011)	(0.011)	(0.010)	(0.011)	(0.011)	(0.010)	(0.011)
Sikhism	0.111[a]	0.078[a]	0.112[a]	0.110[a]	0.077[a]	0.104[a]	0.113[a]	0.072[a]	0.111[a]	0.106[a]	0.078[a]	0.116[a]
	(0.017)	(0.015)	(0.017)	(0.017)	(0.015)	(0.017)	(0.017)	(0.016)	(0.017)	(0.017)	(0.016)	(0.018)
Jainism	0.172[a]	0.164[a]	0.125[b]	0.172[a]	0.166[a]	0.092[c]	0.172[a]	0.147[a]	0.126[b]	0.174[a]	0.166[a]	0.128[b]
	(0.033)	(0.040)	(0.064)	(0.033)	(0.041)	(0.052)	(0.033)	(0.037)	(0.063)	(0.033)	(0.040)	(0.063)
Buddhism	0.008	−0.006	0.028[c]	0.009	−0.006	0.032[c]	0.010	−0.004	0.033[c]	0.007	−0.003	0.027
	(0.018)	(0.017)	(0.017)	(0.018)	(0.017)	(0.018)	(0.018)	(0.017)	(0.017)	(0.018)	(0.017)	(0.016)
Zoroastrianism	0.403[a]	0.162	0.029	0.406[a]	0.163	0.019	0.406[a]	0.159	0.029	0.408[a]	0.160	0.034
	(0.039)	(0.102)	(0.064)	(0.039)	(0.102)	(0.064)	(0.039)	(0.102)	(0.064)	(0.039)	(0.103)	(0.064)
Others	0.039[c]	0.062[a]	0.038[c]	0.037[c]	0.062[a]	0.032	0.038[c]	0.058[a]	0.034	0.040[c]	0.059[a]	0.043[b]
	(0.021)	(0.018)	(0.022)	(0.021)	(0.018)	(0.023)	(0.021)	(0.018)	(0.022)	(0.021)	(0.018)	(0.022)
Social group (base: Scheduled tribes)												
Scheduled castes	0.007	−0.009	−0.013[c]	0.005	−0.008	−0.013[c]	0.005	−0.011[c]	−0.014[c]	0.006	−0.011[c]	−0.012[c]
	(0.007)	(0.006)	(0.007)	(0.007)	(0.006)	(0.007)	(0.007)	(0.006)	(0.007)	(0.007)	(0.006)	(0.007)
Other backward classes	–	0.067[a]	0.057[a]	–	0.066[a]	0.056[a]	–	0.065[a]	0.058[a]	–	0.066[a]	0.057[a]
		(0.006)	(0.007)		(0.006)	(0.007)		(0.006)	(0.007)		(0.006)	(0.007)
Others	0.090[a]	0.127[a]	0.104[a]	0.088[a]	0.126[a]	0.104[a]	0.089[a]	0.124[a]	0.105[a]	0.089[a]	0.125[a]	0.106[a]
	(0.007)	(0.006)	(0.007)	(0.007)	(0.006)	(0.007)	(0.007)	(0.006)	(0.007)	(0.007)	(0.006)	(0.007)
Age of household head	0.001[b]	0.004[a]	0.003[a]	0.001[c]	0.004[a]	0.003[a]	0.002[b]	0.005[a]	0.004[a]	0.002[b]	0.005[a]	0.003[a]
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Age of household head squared	0.000	−0.000[b]	−0.000	0.000	−0.000[b]	−0.000	0.000	−0.000[a]	−0.000	0.000	−0.000[a]	−0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex of household head (base: Male)												
Female	0.025[a]	0.024[a]	0.020[a]	0.025[a]	0.024[a]	0.019[a]	0.025[a]	0.025[a]	0.021[a]	0.025[a]	0.024[a]	0.020[a]
	(0.006)	(0.005)	(0.006)	(0.006)	(0.005)	(0.006)	(0.006)	(0.005)	(0.006)	(0.006)	(0.005)	(0.006)
Education of household head (base: Illiterate)												
Literate and literate w/o formal schooling	0.087[a]	0.053[a]	0.064[a]	0.086[a]	0.054[a]	0.065[a]	0.087[a]	0.054[a]	0.063[a]	0.087[a]	0.052[a]	0.062[a]
	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.005)
Literate: below primary	0.118[a]	0.101[a]	0.094[a]	0.118[a]	0.101[a]	0.095[a]	0.118[a]	0.101[a]	0.093[a]	0.117[a]	0.100[a]	0.093[a]
	(0.005)	(0.004)	(0.005)	(0.005)	(0.004)	(0.005)	(0.005)	(0.004)	(0.005)	(0.005)	(0.004)	(0.005)
Literate: primary	0.180[a]	0.158[a]	0.148[a]	0.180[a]	0.158[a]	0.145[a]	0.180[a]	0.158[a]	0.149[a]	0.179[a]	0.158[a]	0.148[a]
	(0.005)	(0.004)	(0.005)	(0.005)	(0.004)	(0.005)	(0.005)	(0.004)	(0.005)	(0.005)	(0.004)	(0.005)
Literate: middle	0.299[a]	0.242[a]	0.224[a]	0.298[a]	0.242[a]	0.222[a]	0.300[a]	0.242[a]	0.225[a]	0.295[a]	0.242[a]	0.223[a]
	(0.007)	(0.005)	(0.005)	(0.007)	(0.005)	(0.006)	(0.007)	(0.005)	(0.005)	(0.007)	(0.005)	(0.005)
Literate: secondary and above	0.429[a]	0.390[a]	0.352[a]	0.426[a]	0.390[a]	0.348[a]	0.429[a]	0.386[a]	0.355[a]	0.425[a]	0.386[a]	0.354[a]
	(0.008)	(0.006)	(0.006)	(0.008)	(0.006)	(0.006)	(0.008)	(0.006)	(0.006)	(0.008)	(0.006)	(0.006)

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Table A11 (*continued*)

Rural	Daily per capita iron intake			Daily per capita zinc intake			Daily per capita vitamin A intake			Daily per capita calcium intake		
	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12
Household type (base: Self-employed in non-agriculture)												
Agricultural labor (Regular wage/salary earning for 2011–12)	−0.170[a]	−0.188[a]	0.076[a]	−0.171[a]	−0.188[a]	0.078[a]	−0.171[a]	−0.188[a]	0.074[a]	−0.169[a]	−0.188[a]	0.072[a]
	(0.005)	(0.004)	(0.005)	(0.005)	(0.004)	(0.005)	(0.005)	(0.004)	(0.005)	(0.005)	(0.004)	(0.005)
Other labor (Casual labor in agriculture and non-agriculture for 2011–12)	−0.116[a]	−0.112[a]	−0.146[a]	−0.116[a]	−0.113[a]	−0.143[a]	−0.117[a]	−0.114[a]	−0.146[a]	−0.116[a]	−0.112[a]	−0.148[a]
	(0.007)	(0.005)	(0.004)	(0.007)	(0.005)	(0.004)	(0.007)	(0.005)	(0.004)	(0.007)	(0.005)	(0.004)
Self-employed in agriculture	0.065[a]	0.052[a]	0.052[a]	0.064[a]	0.051[a]	0.053[a]	0.064[a]	0.051[a]	0.052[a]	0.066[a]	0.052[a]	0.051[a]
	(0.005)	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)
Others	0.033[a]	0.075[a]	−0.003	0.033[a]	0.075[a]	−0.005	0.032[a]	0.073[a]	−0.001	0.033[a]	0.074[a]	−0.004
	(0.006)	(0.005)	(0.009)	(0.006)	(0.005)	(0.009)	(0.006)	(0.005)	(0.009)	(0.006)	(0.005)	(0.009)
Males aged 0–4	−0.091[a]	−0.084[a]	−0.087[a]	−0.091[a]	−0.084[a]	−0.086[a]	−0.091[a]	−0.083[a]	−0.086[a]	−0.091[a]	−0.084[a]	−0.086[a]
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)
Females aged 0–4	−0.094[a]	−0.092[a]	−0.093[a]	−0.094[a]	−0.092[a]	−0.093[a]	−0.094[a]	−0.092[a]	−0.092[a]	−0.094[a]	−0.092[a]	−0.093[a]
	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)
Males aged 5–9	−0.069[a]	−0.067[a]	−0.071[a]	−0.069[a]	−0.068[a]	−0.071[a]	−0.070[a]	−0.066[a]	−0.070[a]	−0.068[a]	−0.067[a]	−0.070[a]
	(0.003)	(0.002)	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)	(0.002)	(0.003)
Females aged 5–9	−0.075[a]	−0.074[a]	−0.068[a]	−0.075[a]	−0.074[a]	−0.068[a]	−0.075[a]	−0.073[a]	−0.067[a]	−0.074[a]	−0.074[a]	−0.068[a]
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)
Males aged 10–14	−0.064[a]	−0.059[a]	−0.062[a]	−0.063[a]	−0.059[a]	−0.062[a]	−0.064[a]	−0.059[a]	−0.062[a]	−0.063[a]	−0.059[a]	−0.061[a]
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)
Females aged 10–14	−0.060[a]	−0.066[a]	−0.073[a]	−0.060[a]	−0.065[a]	−0.073[a]	−0.060[a]	−0.065[a]	−0.073[a]	−0.059[a]	−0.066[a]	−0.073[a]
	(0.003)	(0.002)	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)	(0.002)	(0.003)
Males aged 15–54	0.004[c]	−0.003[c]	−0.026[a]	0.004[c]	−0.002	−0.026[a]	0.004[c]	−0.003[b]	−0.027[a]	0.004[c]	−0.003[b]	−0.027[a]
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Females aged 15–54	−0.023[a]	−0.027[a]	−0.040[a]	−0.023[a]	−0.026[a]	−0.040[a]	−0.023[a]	−0.025[a]	−0.040[a]	−0.022[a]	−0.026[a]	−0.040[a]
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Males aged 55 plus	0.006	0.009[b]	−0.017[a]	0.006	0.009[b]	−0.017[a]	0.005	0.009[b]	−0.017[a]	0.006	0.008[b]	−0.017[a]
	(0.005)	(0.004)	(0.005)	(0.005)	(0.004)	(0.005)	(0.005)	(0.004)	(0.005)	(0.005)	(0.004)	(0.005)
Females aged 55 plus	−0.041[a]	−0.050[a]	−0.073[a]	−0.041[a]	−0.050[a]	−0.072[a]	−0.042[a]	−0.050[a]	−0.073[a]	−0.041[a]	−0.050[a]	−0.075[a]
	(0.004)	(0.003)	(0.004)	(0.004)	(0.003)	(0.004)	(0.004)	(0.003)	(0.004)	(0.004)	(0.003)	(0.004)
Observations	68,640	78,469	58,784	68,487	78,351	57,248	68,603	78,259	59,076	68,418	78,266	59,074
District fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: State-region fixed effects have been employed for the 1993–94 sample. Standard errors clustered at FSU level are reported in parentheses; [a] $p < 0.01$, [b] $p < 0.05$, [c] $p < 0.1$.

Table A12
First-stage regression estimation.

Urban	Daily per capita calorie intake			Daily per capita protein intake			Daily per capita fat intake		
	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12
MPCE									
Locality median non-food expenditure	0.055	−0.420[a]	−0.596[a]	0.053	−0.420[a]	−0.586[a]	0.039	−0.418[a]	−0.583[a]
	(0.054)	(0.057)	(0.074)	(0.054)	(0.057)	(0.069)	(0.053)	(0.057)	(0.067)
Locality median non-food expenditure squared	0.029[a]	0.060[a]	0.076[a]	0.029[a]	0.060[a]	0.075[a]	0.031[a]	0.060[a]	0.075[a]
	(0.005)	(0.005)	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Religion (base: Hinduism)									
Islam	0.038[a]	0.007	0.041[a]	0.036[a]	0.007	0.042[a]	0.037[a]	0.005	0.043[a]
	(0.007)	(0.007)	(0.008)	(0.007)	(0.007)	(0.008)	(0.007)	(0.007)	(0.008)
Christianity	0.068[a]	0.050[a]	0.045[a]	0.068[a]	0.048[a]	0.052[a]	0.068[a]	0.054[a]	0.056[a]
	(0.013)	(0.013)	(0.016)	(0.013)	(0.013)	(0.015)	(0.013)	(0.013)	(0.015)
Sikhism	0.060[a]	0.152[a]	0.120[a]	0.060[a]	0.149[a]	0.116[a]	0.065[a]	0.150[a]	0.115[a]
	(0.016)	(0.019)	(0.021)	(0.016)	(0.019)	(0.020)	(0.016)	(0.019)	(0.020)
Jainism	0.094[a]	0.102[a]	0.069[b]	0.091[a]	0.101[a]	0.092[a]	0.101[a]	0.100[a]	0.088[a]
	(0.021)	(0.028)	(0.033)	(0.021)	(0.028)	(0.032)	(0.021)	(0.028)	(0.032)
Buddhism	0.030	0.066[a]	0.033	0.031	0.065[b]	0.027	0.026	0.065[b]	0.036
	(0.023)	(0.025)	(0.025)	(0.023)	(0.025)	(0.025)	(0.022)	(0.025)	(0.025)
Zoroastrianism	0.089	0.068	0.909[a]	0.071	0.083	0.915[a]	0.088	0.091	0.900[a]
	(0.070)	(0.099)	(0.024)	(0.065)	(0.095)	(0.022)	(0.071)	(0.097)	(0.021)
Others	0.058[b]	0.090[b]	0.055[c]	0.052[c]	0.085[b]	0.064[b]	0.050[c]	0.084[c]	0.060[b]
	(0.027)	(0.043)	(0.030)	(0.027)	(0.042)	(0.030)	(0.027)	(0.044)	(0.029)
Social group (base: Scheduled tribes)									
Scheduled castes	−0.017	−0.022	−0.040[a]	−0.016	−0.022	−0.038[a]	−0.013	−0.025[c]	−0.036[a]
	(0.013)	(0.014)	(0.013)	(0.013)	(0.014)	(0.013)	(0.013)	(0.014)	(0.013)
Other backward classes	–	0.025[c]	0.006	–	0.025[c]	0.006	–	0.024[c]	0.007
		(0.013)	(0.013)		(0.013)	(0.012)		(0.013)	(0.012)
Others	0.048[a]	0.118[a]	0.072[a]	0.050[a]	0.118[a]	0.075[a]	0.051[a]	0.117[a]	0.077[a]
	(0.012)	(0.013)	(0.013)	(0.012)	(0.013)	(0.012)	(0.012)	(0.013)	(0.012)

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Table A12 (*continued*)

Urban	Daily per capita calorie intake 1993–94	2004–05	2011–12	Daily per capita protein intake 1993–94	2004–05	2011–12	Daily per capita fat intake 1993–94	2004–05	2011–12
Age of household head	0.004[a]	0.007[a]	0.005[a]	0.004[a]	0.007[a]	0.005[a]	0.005[a]	0.008[a]	0.005[a]
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Age of household head squared	−0.000	−0.000[a]	−0.000	−0.000[c]	−0.000[a]	−0.000[c]	−0.000[b]	−0.000[a]	−0.000[c]
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex of household head (base: Male)									
Female	0.003	0.018[b]	0.011	0.003	0.013	0.017[b]	0.004	0.013	0.020[b]
	(0.008)	(0.008)	(0.009)	(0.008)	(0.008)	(0.009)	(0.008)	(0.008)	(0.009)
Education of household head (base: Illiterate)									
Literate and literate w/o formal schooling	0.072[a]	0.069[a]	0.064[a]	0.072[a]	0.067[a]	0.068[a]	0.072[a]	0.067[a]	0.068[a]
	(0.007)	(0.009)	(0.010)	(0.007)	(0.009)	(0.010)	(0.007)	(0.009)	(0.010)
Literate: below primary	0.103[a]	0.117[a]	0.108[a]	0.103[a]	0.115[a]	0.107[a]	0.103[a]	0.114[a]	0.108[a]
	(0.007)	(0.007)	(0.009)	(0.007)	(0.007)	(0.009)	(0.007)	(0.007)	(0.009)
Literate: primary	0.152[a]	0.213[a]	0.172[a]	0.152[a]	0.212[a]	0.177[a]	0.154[a]	0.213[a]	0.178[a]
	(0.007)	(0.007)	(0.009)	(0.007)	(0.007)	(0.008)	(0.007)	(0.007)	(0.008)
Literate: middle	0.283[a]	0.343[a]	0.282[a]	0.281[a]	0.342[a]	0.289[a]	0.284[a]	0.345[a]	0.291[a]
	(0.008)	(0.008)	(0.009)	(0.008)	(0.008)	(0.009)	(0.008)	(0.008)	(0.009)
Literate: secondary and above	0.484[a]	0.603[a]	0.514[a]	0.483[a]	0.600[a]	0.518[a]	0.483[a]	0.603[a]	0.524[a]
	(0.008)	(0.008)	(0.009)	(0.008)	(0.008)	(0.009)	(0.008)	(0.008)	(0.009)
Household type (base: Self-employed)									
Regular wage/salary earning	−0.010[b]	0.027[a]	0.031[a]	−0.009[c]	0.026[a]	0.030[a]	−0.013[b]	0.024[a]	0.028[a]
	(0.005)	(0.005)	(0.006)	(0.005)	(0.005)	(0.006)	(0.005)	(0.005)	(0.006)
Casual labor	−0.184[a]	−0.201[a]	−0.175[a]	−0.184[a]	−0.201[a]	−0.179[a]	−0.186[a]	−0.200[a]	−0.181[a]
	(0.007)	(0.007)	(0.008)	(0.007)	(0.007)	(0.008)	(0.007)	(0.007)	(0.008)
Others	−0.044[a]	0.045[a]	0.019[c]	−0.043[a]	0.044[a]	0.017[c]	−0.044[a]	0.041[a]	0.016
	(0.009)	(0.010)	(0.010)	(0.009)	(0.010)	(0.010)	(0.009)	(0.010)	(0.010)
Males aged 0–4	−0.121[a]	−0.119[a]	−0.126[a]	−0.120[a]	−0.119[a]	−0.124[a]	−0.120[a]	−0.119[a]	−0.125[a]
	(0.004)	(0.005)	(0.006)	(0.004)	(0.005)	(0.006)	(0.004)	(0.005)	(0.005)
Females aged 0–4	−0.129[a]	−0.121[a]	−0.122[a]	−0.129[a]	−0.121[a]	−0.120[a]	−0.129[a]	−0.122[a]	−0.120[a]
	(0.004)	(0.005)	(0.006)	(0.004)	(0.005)	(0.006)	(0.004)	(0.005)	(0.006)
Males aged 5–9	−0.113[a]	−0.105[a]	−0.117[a]	−0.112[a]	−0.105[a]	−0.116[a]	−0.113[a]	−0.105[a]	−0.115[a]
	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.005)
Females aged 5–9	−0.109[a]	−0.118[a]	−0.123[a]	−0.110[a]	−0.119[a]	−0.121[a]	−0.110[a]	−0.118[a]	−0.122[a]
	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.005)
Males aged 10–14	−0.104[a]	−0.103[a]	−0.102[a]	−0.104[a]	−0.104[a]	−0.100[a]	−0.104[a]	−0.104[a]	−0.101[a]
	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Females aged 10–14	−0.112[a]	−0.108[a]	−0.115[a]	−0.112[a]	−0.107[a]	−0.116[a]	−0.112[a]	−0.109[a]	−0.115[a]
	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.005)
Males aged 15–54	−0.049[a]	−0.043[a]	−0.052[a]	−0.049[a]	−0.042[a]	−0.052[a]	−0.049[a]	−0.044[a]	−0.053[a]
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Females aged 15–54	−0.087[a]	−0.078[a]	−0.083[a]	−0.086[a]	−0.078[a]	−0.081[a]	−0.086[a]	−0.078[a]	−0.081[a]
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Males aged 55 plus	−0.041[a]	−0.027[a]	−0.040[a]	−0.041[a]	−0.027[a]	−0.039[a]	−0.041[a]	−0.030[a]	−0.038[a]
	(0.007)	(0.008)	(0.008)	(0.007)	(0.008)	(0.008)	(0.007)	(0.008)	(0.008)
Females aged 55 plus	−0.099[a]	−0.109[a]	−0.120[a]	−0.099[a]	−0.107[a]	−0.121[a]	−0.098[a]	−0.106[a]	−0.121[a]
	(0.005)	(0.006)	(0.006)	(0.005)	(0.006)	(0.006)	(0.005)	(0.006)	(0.006)
Observations	45,384	44,400	37,787	45,408	44,443	40,434	45,543	44,520	41,470
District fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Urban	Daily per capita iron intake 1993–94	2004–05	2011–12	Daily per capita zinc intake 1993–94	2004–05	2011–12	Daily per capita vitamin A intake 1993–94	2004–05	2011–12	Daily per capita calcium intake 1993–94	2004–05	2011–12
MPCE												
Locality median non-food expenditure	0.036	−0.423[a]	−0.588[a]	0.042	−0.430[a]	−0.582[a]	0.045	−0.430[a]	−0.597[a]	0.062	−0.414[a]	−0.572[a]
	(0.053)	(0.057)	(0.067)	(0.054)	(0.057)	(0.068)	(0.052)	(0.057)	(0.066)	(0.054)	(0.057)	(0.066)
Locality median non-food expenditure squared	0.031[a]	0.061[a]	0.076[a]	0.030[a]	0.061[a]	0.075[a]	0.030[a]	0.061[a]	0.076[a]	0.029[a]	0.060[a]	0.074[a]
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Religion (base: Hinduism)												
Islam	0.037[a]	0.005	0.043[a]	0.038[a]	0.007	0.042[a]	0.036[a]	0.006	0.044[a]	0.036[a]	0.007	0.044[a]
	(0.007)	(0.007)	(0.008)	(0.007)	(0.007)	(0.008)	(0.007)	(0.007)	(0.008)	(0.007)	(0.007)	(0.008)
Christianity	0.071[a]	0.052[a]	0.056[a]	0.070[a]	0.053[a]	0.053[a]	0.067[a]	0.054[a]	0.052[a]	0.073[a]	0.054[a]	0.054[a]
	(0.013)	(0.014)	(0.015)	(0.013)	(0.013)	(0.015)	(0.013)	(0.014)	(0.015)	(0.013)	(0.013)	(0.015)
Sikhism	0.058[a]	0.149[a]	0.114[a]	0.058[a]	0.149[a]	0.113[a]	0.060[a]	0.151[a]	0.116[a]	0.063[a]	0.152[a]	0.117[a]
	(0.016)	(0.019)	(0.020)	(0.016)	(0.019)	(0.020)	(0.016)	(0.019)	(0.020)	(0.016)	(0.019)	(0.020)
Jainism	0.096[a]	0.098[a]	0.085[a]	0.098[a]	0.098[a]	0.086[a]	0.100[a]	0.100[a]	0.090[a]	0.096[a]	0.102[a]	0.089[a]
	(0.021)	(0.028)	(0.032)	(0.021)	(0.028)	(0.032)	(0.021)	(0.028)	(0.032)	(0.022)	(0.028)	(0.032)
Buddhism	0.030	0.064[b]	0.024	0.029	0.064[b]	0.025	0.032	0.071[a]	0.038	0.027	0.066[a]	0.037
	(0.023)	(0.026)	(0.025)	(0.023)	(0.026)	(0.025)	(0.023)	(0.026)	(0.026)	(0.022)	(0.026)	(0.025)
Zoroastrianism	0.082	0.082	0.901[a]	0.083	0.066	0.908[a]	0.107	0.099	0.901[a]	0.095	0.113	0.907[a]
	(0.071)	(0.088)	(0.021)	(0.071)	(0.091)	(0.022)	(0.069)	(0.096)	(0.021)	(0.070)	(0.092)	(0.021)
Others	0.055[b]	0.090[b]	0.063[b]	0.055[b]	0.086[c]	0.063[b]	0.054[b]	0.089[b]	0.056[c]	0.046[c]	0.100[b]	0.066[b]
	(0.027)	(0.044)	(0.030)	(0.027)	(0.044)	(0.030)	(0.027)	(0.043)	(0.029)	(0.027)	(0.044)	(0.029)

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Table A12 (*continued*)

Urban	Daily per capita iron intake 1993–94	Daily per capita iron intake 2004–05	Daily per capita iron intake 2011–12	Daily per capita zinc intake 1993–94	Daily per capita zinc intake 2004–05	Daily per capita zinc intake 2011–12	Daily per capita vitamin A intake 1993–94	Daily per capita vitamin A intake 2004–05	Daily per capita vitamin A intake 2011–12	Daily per capita calcium intake 1993–94	Daily per capita calcium intake 2004–05	Daily per capita calcium intake 2011–12
Social group (base: Scheduled tribes)												
Scheduled castes	−0.013	−0.022	−0.036[a]	−0.011	−0.020	−0.039[a]	−0.015	−0.020	−0.033[b]	−0.012	−0.022	−0.035[a]
	(0.013)	(0.014)	(0.013)	(0.013)	(0.014)	(0.013)	(0.013)	(0.014)	(0.013)	(0.013)	(0.014)	(0.013)
Other backward classes	–	0.027[b]	0.008	–	0.027[b]	0.006	–	0.027[b]	0.009	–	0.026[c]	0.007
		(0.013)	(0.012)		(0.013)	(0.012)		(0.013)	(0.012)		(0.013)	(0.012)
Others	0.051[a]	0.121[a]	0.078[a]	0.052[a]	0.120[a]	0.075[a]	0.051[a]	0.119[a]	0.077[a]	0.052[a]	0.119[a]	0.078[a]
	(0.012)	(0.013)	(0.012)	(0.012)	(0.013)	(0.012)	(0.012)	(0.013)	(0.012)	(0.012)	(0.013)	(0.012)
Age of household head	0.005[a]	0.007[a]	0.005[a]	0.005[a]	0.007[a]	0.005[a]	0.006[a]	0.010[a]	0.006[a]	0.005[a]	0.009[a]	0.005[a]
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Age of household head squared	−0.000[b]	−0.000[a]	−0.000[c]	−0.000[c]	−0.000[a]	−0.000[c]	−0.000[a]	−0.000[a]	−0.000[b]	−0.000[b]	−0.000[a]	−0.000[b]
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex of household head (base: Male)												
Female	0.002	0.016[c]	0.019[b]	0.003	0.016[c]	0.018[b]	0.003	0.014[c]	0.020[b]	0.004	0.014[c]	0.022[b]
	(0.008)	(0.008)	(0.009)	(0.008)	(0.008)	(0.009)	(0.008)	(0.008)	(0.009)	(0.008)	(0.008)	(0.009)
Education of household head (base: Illiterate)												
Literate and literate w/o formal schooling	0.069[a]	0.072[a]	0.068[a]	0.071[a]	0.071[a]	0.068[a]	0.070[a]	0.072[a]	0.066[a]	0.070[a]	0.068[a]	0.065[a]
	(0.007)	(0.009)	(0.010)	(0.007)	(0.009)	(0.010)	(0.007)	(0.009)	(0.010)	(0.007)	(0.009)	(0.010)
Literate: below primary	0.102[a]	0.116[a]	0.109[a]	0.103[a]	0.116[a]	0.107[a]	0.100[a]	0.117[a]	0.107[a]	0.102[a]	0.116[a]	0.107[a]
	(0.007)	(0.007)	(0.009)	(0.007)	(0.007)	(0.009)	(0.007)	(0.007)	(0.009)	(0.007)	(0.007)	(0.009)
Literate: primary	0.153[a]	0.213[a]	0.178[a]	0.153[a]	0.213[a]	0.178[a]	0.153[a]	0.216[a]	0.178[a]	0.152[a]	0.215[a]	0.178[a]
	(0.007)	(0.007)	(0.008)	(0.007)	(0.007)	(0.008)	(0.007)	(0.007)	(0.008)	(0.007)	(0.007)	(0.008)
Literate: middle	0.282[a]	0.344[a]	0.290[a]	0.283[a]	0.344[a]	0.289[a]	0.281[a]	0.345[a]	0.292[a]	0.283[a]	0.345[a]	0.292[a]
	(0.008)	(0.008)	(0.009)	(0.008)	(0.008)	(0.009)	(0.008)	(0.008)	(0.009)	(0.008)	(0.008)	(0.009)
Literate: secondary and above	0.485[a]	0.604[a]	0.523[a]	0.486[a]	0.604[a]	0.520[a]	0.483[a]	0.602[a]	0.525[a]	0.482[a]	0.601[a]	0.524[a]
	(0.008)	(0.008)	(0.009)	(0.008)	(0.008)	(0.009)	(0.008)	(0.008)	(0.009)	(0.008)	(0.008)	(0.009)
Household type (base: Self-employed)												
Regular wage/salary earning	−0.012[b]	0.024[a]	0.028[a]	−0.011[b]	0.025[a]	0.029[a]	−0.011[b]	0.023[a]	0.027[a]	−0.012[b]	0.025[a]	0.027[a]
	(0.005)	(0.006)	(0.006)	(0.005)	(0.005)	(0.006)	(0.005)	(0.005)	(0.006)	(0.005)	(0.005)	(0.006)
Casual labor	−0.187[a]	−0.202[a]	−0.181[a]	−0.187[a]	−0.202[a]	−0.180[a]	−0.185[a]	−0.199[a]	−0.184[a]	−0.185[a]	−0.201[a]	−0.182[a]
	(0.007)	(0.007)	(0.008)	(0.007)	(0.007)	(0.008)	(0.007)	(0.007)	(0.008)	(0.007)	(0.007)	(0.007)
Others	−0.042[a]	0.044[a]	0.016	−0.043[a]	0.045[a]	0.017[c]	−0.042[a]	0.034[a]	0.015	−0.044[a]	0.036[a]	0.014
	(0.009)	(0.010)	(0.010)	(0.009)	(0.010)	(0.010)	(0.009)	(0.010)	(0.010)	(0.009)	(0.010)	(0.010)
Males aged 0–4	−0.121[a]	−0.119[a]	−0.125[a]	−0.121[a]	−0.118[a]	−0.125[a]	−0.120[a]	−0.116[a]	−0.125[a]	−0.119[a]	−0.117[a]	−0.125[a]
	(0.004)	(0.005)	(0.005)	(0.004)	(0.005)	(0.005)	(0.004)	(0.005)	(0.005)	(0.004)	(0.005)	(0.005)
Females aged 0–4	−0.130[a]	−0.122[a]	−0.121[a]	−0.130[a]	−0.121[a]	−0.120[a]	−0.129[a]	−0.118[a]	−0.120[a]	−0.128[a]	−0.121[a]	−0.119[a]
	(0.004)	(0.005)	(0.006)	(0.004)	(0.005)	(0.006)	(0.004)	(0.005)	(0.006)	(0.004)	(0.005)	(0.006)
Males aged 5–9	−0.113[a]	−0.105[a]	−0.115[a]	−0.113[a]	−0.105[a]	−0.115[a]	−0.113[a]	−0.104[a]	−0.115[a]	−0.112[a]	−0.104[a]	−0.114[a]
	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.005)
Females aged 5–9	−0.109[a]	−0.118[a]	−0.122[a]	−0.110[a]	−0.118[a]	−0.122[a]	−0.109[a]	−0.117[a]	−0.121[a]	−0.108[a]	−0.117[a]	−0.122[a]
	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.005)
Males aged 10–14	−0.104[a]	−0.104[a]	−0.100[a]	−0.104[a]	−0.104[a]	−0.100[a]	−0.105[a]	−0.104[a]	−0.101[a]	−0.103[a]	−0.103[a]	−0.100[a]
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Females aged 10–14	−0.113[a]	−0.108[a]	−0.115[a]	−0.113[a]	−0.108[a]	−0.115[a]	−0.112[a]	−0.109[a]	−0.116[a]	−0.112[a]	−0.109[a]	−0.117[a]
	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.005)
Males aged 15–54	−0.050[a]	−0.043[a]	−0.053[a]	−0.050[a]	−0.043[a]	−0.052[a]	−0.050[a]	−0.045[a]	−0.053[a]	−0.050[a]	−0.044[a]	−0.053[a]
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Females aged 15–54	−0.087[a]	−0.078[a]	−0.081[a]	−0.087[a]	−0.078[a]	−0.081[a]	−0.085[a]	−0.075[a]	−0.081[a]	−0.083[a]	−0.076[a]	−0.081[a]
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Males aged 55 plus	−0.040[a]	−0.027[a]	−0.040[a]	−0.041[a]	−0.026[a]	−0.038[a]	−0.041[a]	−0.030[a]	−0.039[a]	−0.039[a]	−0.028[a]	−0.039[a]
	(0.007)	(0.008)	(0.008)	(0.007)	(0.008)	(0.008)	(0.007)	(0.008)	(0.008)	(0.007)	(0.008)	(0.008)
Females aged 55 plus	−0.100[a]	−0.106[a]	−0.121[a]	−0.099[a]	−0.107[a]	−0.121[a]	−0.097[a]	−0.103[a]	−0.122[a]	−0.097[a]	−0.103[a]	−0.121[a]
	(0.005)	(0.006)	(0.006)	(0.005)	(0.006)	(0.006)	(0.005)	(0.006)	(0.006)	(0.005)	(0.006)	(0.006)
Observations	45,679	44,746	41,372	45,583	44,689	41,041	45,580	44,557	41,658	45,277	44,546	41,607
District fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: State-region fixed effects have been employed for the 1993–94 sample. Standard errors clustered at FSU level are reported in parentheses; [a] $p < 0.01$, [b] $p < 0.05$, [c] $p < 0.1$.

Table A21
Nutrient-income elasticities – Parametric (IV) estimation.

	Daily per consumer unit calorie intake			Daily per consumer unit protein intake			Daily per consumer unit fat intake		
Rural	1993-94	2004-05	2011-12	1993-94	2004-05	2011-12	1993-94	2004–05	2011–12
MPCE	0.245[a]	0.224[a]	0.226[a]	0.267[a]	0.256[a]	0.246[a]	0.513[a]	0.427[a]	0.446[a]
	(0.010)	(0.008)	(0.009)	(0.010)	(0.008)	(0.010)	(0.015)	(0.012)	(0.017)
Religion (base: Hinduism)									
Islam	−0.030[a]	−0.030[a]	−0.025[a]	−0.013[a]	−0.013[a]	−0.006	−0.048[a]	−0.056[a]	−0.036[a]
	(0.005)	(0.004)	(0.005)	(0.005)	(0.004)	(0.005)	(0.007)	(0.006)	(0.009)
Christianity	−0.008	0.005	0.002	0.007	0.023[a]	0.008	0.029[b]	−0.020[c]	−0.046[b]
	(0.008)	(0.007)	(0.009)	(0.008)	(0.007)	(0.010)	(0.013)	(0.011)	(0.018)
Sikhism	0.050[a]	0.034[a]	0.033[b]	0.060[a]	0.041[a]	0.041[a]	0.053[a]	0.043[a]	0.064[a]
	(0.011)	(0.009)	(0.014)	(0.012)	(0.009)	(0.014)	(0.016)	(0.012)	(0.023)
Jainism	0.014	0.036	0.051	−0.035	−0.005	0.049	0.080[c]	0.112[b]	0.046
	(0.029)	(0.032)	(0.039)	(0.035)	(0.030)	(0.039)	(0.046)	(0.044)	(0.066)
Buddhism	0.009	0.002	0.002	0.010	0.009	0.009	0.014	0.008	−0.004
	(0.012)	(0.012)	(0.015)	(0.013)	(0.012)	(0.015)	(0.034)	(0.021)	(0.026)
Zoroastrianism	−0.051[b]	−0.027	0.440[a]	0.039	−0.033	0.391[a]	0.049	0.144	0.426[a]
	(0.026)	(0.112)	(0.082)	(0.029)	(0.064)	(0.063)	(0.046)	(0.126)	(0.075)
Others	0.058[a]	0.011	0.020	0.060[a]	0.013	0.027	−0.113[a]	−0.097[a]	0.055
	(0.020)	(0.015)	(0.025)	(0.019)	(0.015)	(0.024)	(0.040)	(0.029)	(0.047)
Social group (base: Scheduled tribes)									
Scheduled castes	0.010[c]	−0.005	−0.001	0.010[c]	−0.008[c]	−0.004	0.031[a]	0.023[a]	0.034[a]
	(0.006)	(0.004)	(0.005)	(0.006)	(0.005)	(0.006)	(0.009)	(0.007)	(0.010)
Other backward classes	–	0.008[c]	0.007	–	0.006	0.009[c]	–	0.082[a]	0.072[a]
		(0.004)	(0.005)		(0.004)	(0.005)		(0.007)	(0.009)
Others	0.035[a]	0.020[a]	0.012[b]	0.032[a]	0.013[a]	0.014[b]	0.108[a]	0.125[a]	0.091[a]
	(0.006)	(0.005)	(0.006)	(0.006)	(0.005)	(0.006)	(0.008)	(0.008)	(0.010)
Age of household head	−0.006[a]	−0.004[a]	−0.003[a]	−0.005[a]	−0.003[a]	−0.002[a]	−0.012[a]	−0.010[a]	−0.006[a]
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Age of household head squared	0.000[a]	0.000[a]	0.000[a]	0.000[a]	0.000[a]	0.000[a]	0.000[a]	0.000[a]	0.000[a]
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex of household head (base: Male)									
Female	0.112[a]	0.109[a]	0.100[a]	0.112[a]	0.110[a]	0.103[a]	0.171[a]	0.164[a]	0.120[a]
	(0.004)	(0.003)	(0.004)	(0.004)	(0.003)	(0.004)	(0.006)	(0.004)	(0.007)
Education of household head (base: Illiterate)									
Literate and literate w/o formal schooling	0.004	0.003	0.005	0.001	0.001	0.006[c]	0.044[a]	0.025[a]	0.020[a]
	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)	(0.004)	(0.005)	(0.004)	(0.006)
Literate: below primary	0.008[b]	0.009[a]	0.000	0.004	0.009[a]	0.003	0.062[a]	0.051[a]	0.016[b]
	(0.003)	(0.002)	(0.004)	(0.003)	(0.003)	(0.004)	(0.005)	(0.004)	(0.007)
Literate: primary	0.018[a]	0.013[a]	0.007[c]	0.015[a]	0.016[a]	0.018[a]	0.109[a]	0.085[a]	0.052[a]
	(0.004)	(0.003)	(0.004)	(0.004)	(0.003)	(0.004)	(0.006)	(0.004)	(0.007)
Literate: middle	0.036[a]	0.012[a]	0.011[b]	0.034[a]	0.017[a]	0.019[a]	0.172[a]	0.110[a]	0.067[a]
	(0.005)	(0.003)	(0.005)	(0.005)	(0.004)	(0.005)	(0.008)	(0.005)	(0.008)
Literate: secondary and above	0.036[a]	0.022[a]	0.012[b]	0.037[a]	0.032[a]	0.032[a]	0.220[a]	0.164[a]	0.098[a]
	(0.006)	(0.004)	(0.006)	(0.007)	(0.005)	(0.006)	(0.010)	(0.007)	(0.010)
Household type (base: Self-employed in non-agriculture)									
Agricultural labor (Regular wage/salary earning for 2011–12)	0.009[b]	−0.005[c]	−0.005	0.006	−0.009[a]	−0.001	−0.091[a]	−0.068[a]	0.007
	(0.004)	(0.003)	(0.004)	(0.004)	(0.003)	(0.004)	(0.006)	(0.004)	(0.007)
Other labor (Casual labor in agriculture and non-agriculture for 2011–12)	−0.017[a]	−0.018[a]	0.000	−0.024[a]	−0.023[a]	−0.010[a]	−0.072[a]	−0.068[a]	−0.040[a]
	(0.005)	(0.003)	(0.003)	(0.005)	(0.003)	(0.004)	(0.007)	(0.005)	(0.006)
Self-employed in agriculture	0.075[a]	0.045[a]	0.026[a]	0.077[a]	0.048[a]	0.030[a]	0.087[a]	0.065[a]	0.030[a]
	(0.003)	(0.002)	(0.003)	(0.003)	(0.002)	(0.003)	(0.005)	(0.003)	(0.005)
Others	0.027[a]	0.020[a]	0.067[a]	0.021[a]	0.015[a]	0.062[a]	0.041[a]	0.055[a]	0.062[a]
	(0.004)	(0.003)	(0.006)	(0.004)	(0.003)	(0.006)	(0.006)	(0.005)	(0.010)
Observations	68,113	77,683	55,708	68,195	77,759	57,700	68,453	78,015	55,434
District fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.421	0.415	0.257	0.428	0.436	0.285	0.565	0.529	0.290

(*continued on next page*)

Table A21 (*continued*)

Rural	Daily per consumer unit calorie intake			Daily per consumer unit protein intake			Daily per consumer unit fat intake		
	1993-94	2004-05	2011-12	1993-94	2004-05	2011-12	1993-94	2004–05	2011–12
Kleibergen-Paap F statistic	5042	5306	5733	5131	5301	5999	5062	5436	5673
MP Effective F statistic	4295	4240	5337	4384	4151	5611	4551	4286	5015
Endogeneity test statistic	552.1	431.8	113.5	511.7	423.3	161.4	373.9	443.1	60.60
Endogeneity test P value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Rural	Daily per consumer unit iron intake			Daily per consumer unit zinc intake			Daily per consumer unit vitamin A intake			Daily per consumer unit calcium intake		
	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12
MPCE	0.296[a]	0.280[a]	0.278[a]	0.229[a]	0.227[a]	0.246[a]	0.558[a]	0.392[a]	0.369[a]	0.421[a]	0.379[a]	0.389[a]
	(0.016)	(0.012)	(0.013)	(0.012)	(0.009)	(0.012)	(0.040)	(0.032)	(0.028)	(0.019)	(0.017)	(0.015)
Religion (base: Hinduism)												
Islam	−0.019[b]	−0.003	0.004	−0.015[b]	−0.014[a]	−0.009	0.128[a]	0.190[a]	0.193[a]	−0.093[a]	−0.103[a]	−0.082[a]
	(0.007)	(0.005)	(0.007)	(0.006)	(0.005)	(0.007)	(0.022)	(0.015)	(0.014)	(0.009)	(0.008)	(0.008)
Christianity	0.020[c]	0.030[a]	0.019	−0.001	0.014[c]	0.013	0.104[a]	0.199[a]	0.127[a]	0.012	0.003	−0.004
	(0.012)	(0.011)	(0.016)	(0.009)	(0.008)	(0.014)	(0.036)	(0.026)	(0.022)	(0.017)	(0.015)	(0.016)
Sikhism	0.017	0.018	0.015	0.032[b]	0.028[a]	0.034[c]	0.105[c]	0.114[a]	0.126[a]	0.156[a]	0.088[a]	0.072[a]
	(0.017)	(0.012)	(0.016)	(0.014)	(0.010)	(0.018)	(0.056)	(0.040)	(0.042)	(0.023)	(0.016)	(0.018)
Jainism	−0.143[b]	−0.046	0.058	−0.064	−0.008	0.047	0.106	0.100	0.146[c]	0.122[b]	0.115[b]	0.082
	(0.056)	(0.040)	(0.040)	(0.044)	(0.033)	(0.048)	(0.109)	(0.086)	(0.081)	(0.061)	(0.052)	(0.051)
Buddhism	−0.006	−0.006	−0.002	−0.013	0.006	−0.019	0.096[c]	−0.033	0.113[a]	−0.000	−0.053[c]	0.002
	(0.026)	(0.019)	(0.021)	(0.016)	(0.014)	(0.019)	(0.052)	(0.042)	(0.038)	(0.027)	(0.027)	(0.025)
Zoroastrianism	0.230[a]	−0.022	0.540[a]	0.135[a]	−0.058	0.439[a]	0.095	0.217[a]	0.576[c]	−0.061	0.089	0.376[a]
	(0.053)	(0.061)	(0.080)	(0.038)	(0.105)	(0.066)	(0.106)	(0.067)	(0.319)	(0.069)	(0.274)	(0.068)
Others	0.067[c]	−0.007	0.025	0.060[a]	−0.007	0.041	0.244[a]	0.191[a]	0.101	0.059	−0.006	−0.020
	(0.034)	(0.024)	(0.033)	(0.023)	(0.016)	(0.030)	(0.070)	(0.054)	(0.063)	(0.041)	(0.032)	(0.038)
Social group (base: Scheduled tribes)												
Scheduled castes	0.034[a]	0.008	0.008	0.031[a]	0.003	0.006	−0.140[a]	−0.051[a]	−0.067[a]	−0.025[b]	−0.044[a]	−0.015[c]
	(0.010)	(0.007)	(0.007)	(0.007)	(0.005)	(0.007)	(0.025)	(0.017)	(0.016)	(0.012)	(0.010)	(0.009)
Other backward classes	–	0.007	0.009	–	0.008[c]	0.014[b]	–	−0.060[a]	−0.078[a]		0.051[a]	0.061[a]
		(0.007)	(0.007)		(0.005)	(0.007)		(0.016)	(0.015)		(0.010)	(0.008)
Others	0.033[a]	0.004	0.005	0.043[a]	0.010[c]	0.015[c]	−0.181[a]	−0.057[a]	−0.064[a]	0.075[a]	0.105[a]	0.096[a]
	(0.010)	(0.007)	(0.008)	(0.007)	(0.005)	(0.008)	(0.024)	(0.018)	(0.016)	(0.012)	(0.010)	(0.009)
Age of household head	−0.007[a]	−0.006[a]	−0.004[a]	−0.005[a]	−0.003[a]	−0.002[a]	−0.007[a]	−0.007[a]	0.000	−0.008[a]	−0.006[a]	−0.006[a]
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
Age of household head squared	0.000[a]	0.000[a]	0.000[a]	0.000[a]	0.000[a]	0.000[a]	0.000[a]	0.000[a]	0.000	0.000[a]	0.000[a]	0.000[a]
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex of household head (base: Male)												
Female	0.144[a]	0.139[a]	0.123[a]	0.115[a]	0.115[a]	0.095[a]	0.227[a]	0.192[a]	0.150[a]	0.163[a]	0.159[a]	0.145[a]
	(0.006)	(0.004)	(0.006)	(0.004)	(0.003)	(0.005)	(0.014)	(0.009)	(0.010)	(0.007)	(0.006)	(0.007)
Education of household head (base: Illiterate)												
Literate and literate w/o formal schooling	−0.012[a]	−0.010[b]	0.002	−0.005	−0.001	0.001	−0.008	−0.021[b]	0.009	0.031[a]	0.011[b]	0.034[a]
	(0.005)	(0.004)	(0.005)	(0.004)	(0.003)	(0.005)	(0.012)	(0.010)	(0.010)	(0.006)	(0.005)	(0.006)
Literate: below primary	−0.015[a]	−0.000	0.001	−0.005	0.005[c]	−0.003	−0.016	−0.010	0.016	0.042[a]	0.049[a]	0.040[a]
	(0.005)	(0.003)	(0.005)	(0.004)	(0.003)	(0.005)	(0.013)	(0.009)	(0.010)	(0.007)	(0.005)	(0.006)
Literate: primary	−0.006	0.005	0.015[a]	0.008[c]	0.010[a]	0.011[b]	−0.014	0.011	0.027[a]	0.074[a]	0.084[a]	0.082[a]
	(0.006)	(0.004)	(0.005)	(0.005)	(0.003)	(0.005)	(0.014)	(0.010)	(0.010)	(0.008)	(0.005)	(0.006)
Literate: middle	−0.004	0.001	0.016[b]	0.022[a]	0.007[c]	0.014[b]	0.040[b]	0.038[a]	0.039[a]	0.134[a]	0.124[a]	0.112[a]
	(0.007)	(0.005)	(0.006)	(0.006)	(0.004)	(0.006)	(0.019)	(0.012)	(0.012)	(0.010)	(0.007)	(0.007)
Literate: secondary and above	−0.013	0.008	0.026[a]	0.015[b]	0.014[a]	0.028[a]	0.047[c]	0.072[a]	0.073[a]	0.193[a]	0.193[a]	0.165[a]
	(0.010)	(0.007)	(0.008)	(0.008)	(0.005)	(0.007)	(0.024)	(0.017)	(0.015)	(0.012)	(0.009)	(0.009)
Household type (base: Self-employed in non-agriculture)												
Agricultural labor (Regular wage/salary earning for 2011–12)	0.026[a]	−0.002	0.005	0.010[b]	−0.004	−0.001	0.016	−0.026[b]	0.003	−0.028[a]	−0.076[a]	0.013[b]
	(0.006)	(0.004)	(0.005)	(0.005)	(0.003)	(0.005)	(0.015)	(0.010)	(0.008)	(0.008)	(0.006)	(0.005)
Other labor (Casual labor in agriculture and non-agriculture for 2011–12)	0.002	−0.019[a]	−0.012[b]	−0.008	−0.015[a]	−0.011[b]	−0.037[b]	−0.070[a]	−0.014	−0.088[a]	−0.092[a]	−0.064[a]
	(0.007)	(0.004)	(0.005)	(0.006)	(0.003)	(0.005)	(0.019)	(0.011)	(0.009)	(0.010)	(0.006)	(0.005)
Self-employed in agriculture	0.060[a]	0.025[a]	−0.001	0.068[a]	0.035[a]	0.012[a]	0.015	0.012[c]	0.011	0.148[a]	0.118[a]	0.088[a]
	(0.005)	(0.003)	(0.004)	(0.004)	(0.002)	(0.004)	(0.012)	(0.007)	(0.007)	(0.007)	(0.004)	(0.005)

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Table A22
Nutrient-income elasticities – Parametric (IV) estimation.

	Daily per consumer unit calorie intake			Daily per consumer unit protein intake			Daily per consumer unit fat intake		
Urban	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12
MPCE	0.215[a]	0.124[a]	0.186[a]	0.216[a]	0.135[a]	0.200[a]	0.532[a]	0.308[a]	0.430[a]
	(0.008)	(0.011)	(0.018)	(0.008)	(0.012)	(0.017)	(0.010)	(0.015)	(0.039)
Religion (base: Hinduism)									
Islam	−0.027[a]	−0.036[a]	−0.020[a]	0.011[b]	−0.002	0.001	−0.029[a]	−0.040[a]	0.005
	(0.005)	(0.004)	(0.008)	(0.005)	(0.005)	(0.007)	(0.006)	(0.006)	(0.016)
Christianity	−0.002	0.006	0.015	0.028[a]	0.030[a]	0.036[b]	−0.037[a]	−0.025[b]	0.071[c]
	(0.008)	(0.008)	(0.016)	(0.009)	(0.009)	(0.015)	(0.010)	(0.012)	(0.039)
Sikhism	0.012	0.064[a]	0.014	0.026[b]	0.073[a]	0.020	0.046[a]	0.080[a]	0.031
	(0.010)	(0.010)	(0.019)	(0.011)	(0.011)	(0.016)	(0.013)	(0.014)	(0.036)
Jainism	−0.027[c]	−0.016	0.001	−0.051[a]	−0.021	−0.010	0.070[a]	0.025	0.079
	(0.014)	(0.015)	(0.036)	(0.016)	(0.016)	(0.031)	(0.017)	(0.020)	(0.067)
Buddhism	−0.040[a]	−0.008	0.031	−0.024	0.001	0.049[b]	−0.010	−0.009	0.129[b]
	(0.014)	(0.014)	(0.029)	(0.017)	(0.015)	(0.025)	(0.021)	(0.021)	(0.055)
Zoroastrianism	−0.037	0.072[b]	0.024	0.028	0.127[a]	0.138[a]	−0.070	0.069	−0.386[a]
	(0.049)	(0.031)	(0.033)	(0.052)	(0.049)	(0.030)	(0.055)	(0.053)	(0.072)
Others	0.018	0.002	0.078[b]	0.036	0.000	0.041	−0.030	−0.011	0.079
	(0.020)	(0.023)	(0.039)	(0.023)	(0.028)	(0.032)	(0.027)	(0.038)	(0.088)
Social group (base: Scheduled tribes)									
Scheduled castes	−0.017[b]	−0.008	−0.029[b]	−0.002	−0.005	−0.028[a]	0.017	0.032[a]	−0.022
	(0.008)	(0.007)	(0.013)	(0.009)	(0.008)	(0.011)	(0.012)	(0.012)	(0.026)
Other backward classes	–	−0.001	−0.019	–	0.002	−0.017[c]	–	0.069[a]	0.002
		(0.007)	(0.012)		(0.008)	(0.010)		(0.011)	(0.025)
Others	−0.000	0.016[b]	0.003	0.003	0.008	−0.004	0.087[a]	0.118[a]	0.039
	(0.008)	(0.007)	(0.012)	(0.008)	(0.008)	(0.011)	(0.011)	(0.012)	(0.026)
Age of household head	−0.006[a]	−0.003[a]	0.003[a]	−0.000	0.003[a]	0.007[a]	−0.006[a]	−0.000	0.013[a]
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Age of household head squared	0.000[a]	0.000[a]	−0.000	0.000[a]	0.000[b]	−0.000[a]	0.000[a]	0.000[a]	−0.000[a]
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex of household head (base: Male)									
Female	0.106[a]	0.090[a]	0.100[a]	0.104[a]	0.093[a]	0.102[a]	0.164[a]	0.130[a]	0.121[a]
	(0.005)	(0.004)	(0.007)	(0.005)	(0.004)	(0.006)	(0.006)	(0.006)	(0.014)
Education of household head (base: Illiterate)									
Literate and literate w/o formal schooling	−0.010[b]	−0.003	0.003	−0.018[a]	−0.010[c]	−0.001	0.053[a]	0.031[a]	0.027
	(0.004)	(0.005)	(0.008)	(0.005)	(0.005)	(0.007)	(0.006)	(0.007)	(0.017)
Literate: below primary	−0.009[b]	0.010[b]	0.003	−0.013[a]	0.010[b]	0.004	0.069[a]	0.070[a]	0.041[b]
	(0.004)	(0.004)	(0.008)	(0.005)	(0.005)	(0.007)	(0.006)	(0.006)	(0.017)
Literate: primary	−0.004	0.029[a]	0.017[b]	−0.001	0.035[a]	0.025[a]	0.116[a]	0.116[a]	0.096[a]
	(0.004)	(0.005)	(0.008)	(0.005)	(0.005)	(0.007)	(0.006)	(0.007)	(0.018)
Literate: middle	0.014[a]	0.047[a]	0.035[a]	0.018[a]	0.056[a]	0.044[a]	0.165[a]	0.168[a]	0.139[a]
	(0.005)	(0.006)	(0.010)	(0.006)	(0.006)	(0.009)	(0.007)	(0.009)	(0.021)
Literate: secondary and above	0.038[a]	0.087[a]	0.067[a]	0.040[a]	0.097[a]	0.080[a]	0.201[a]	0.249[a]	0.218[a]
	(0.007)	(0.009)	(0.013)	(0.007)	(0.009)	(0.012)	(0.009)	(0.013)	(0.029)
Household type (base: Self-employed)									
Regular wage/salary earning	−0.004	0.010[a]	−0.000	−0.013[a]	0.002	−0.001	−0.012[a]	0.015[a]	−0.015
	(0.003)	(0.003)	(0.005)	(0.003)	(0.003)	(0.005)	(0.004)	(0.004)	(0.011)
Casual labor	−0.010[b]	−0.018[a]	−0.026[a]	−0.022[a]	−0.028[a]	−0.025[a]	−0.092[a]	−0.087[a]	−0.099[a]
	(0.004)	(0.004)	(0.007)	(0.005)	(0.005)	(0.007)	(0.006)	(0.006)	(0.015)
Others	0.043[a]	0.093[a]	0.049[a]	0.016[a]	0.070[a]	0.049[a]	0.012	0.085[a]	−0.032[c]
	(0.005)	(0.005)	(0.008)	(0.006)	(0.006)	(0.008)	(0.007)	(0.008)	(0.018)
Observations	45,351	44,341	39,455	45,363	44,413	40,736	45,578	44,554	41,478
District fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.437	0.364	0.175	0.390	0.355	0.234	0.646	0.551	0.161
Kleibergen-Paap F statistic	4100	1919	2251	4156	1944	2329	4113	1898	2438
MP Effective F statistic	3722	2116	2308	3750	2146	2386	3719	2079	2534
Endogeneity test statistic	482.3	332.6	63.29	380.4	296.5	86.62	139.8	266.1	18.06
Endogeneity test P value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

	Daily per consumer unit iron intake			Daily per consumer unit zinc intake			Daily per consumer unit vitamin A intake			Daily per consumer unit calcium intake		
Urban	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12
MPCE	0.211[a]	0.122[a]	0.224[a]	0.160[a]	0.093[a]	0.282[a]	0.545[a]	0.269[a]	0.288[a]	0.508[a]	0.362[a]	0.390[a]
	(0.011)	(0.015)	(0.020)	(0.010)	(0.013)	(0.025)	(0.029)	(0.041)	(0.034)	(0.014)	(0.019)	(0.019)
Religion (base: Hinduism)												
Islam	0.020[a]	0.011[c]	0.006	0.013[b]	−0.006	0.001	0.182[a]	0.201[a]	0.239[a]	−0.070[a]	−0.066[a]	−0.045[a]
	(0.007)	(0.006)	(0.008)	(0.006)	(0.005)	(0.010)	(0.018)	(0.016)	(0.014)	(0.009)	(0.008)	(0.008)

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Table A22 (*continued*)

Urban	Daily per consumer unit iron intake			Daily per consumer unit zinc intake			Daily per consumer unit vitamin A intake			Daily per consumer unit calcium intake		
	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12
Christianity	0.022^{b}	0.022^{c}	0.057^{a}	0.002	0.015^{c}	0.060^{b}	0.151^{a}	0.150^{a}	0.160^{a}	−0.028^{c}	−0.039^{a}	0.011
	(0.011)	(0.011)	(0.020)	(0.010)	(0.009)	(0.025)	(0.027)	(0.024)	(0.024)	(0.017)	(0.014)	(0.017)
Sikhism	0.041^{a}	0.082^{a}	0.028	0.031^{b}	0.078^{a}	0.045^{c}	0.068^{c}	0.157^{a}	−0.009	0.059^{a}	0.110^{a}	0.070^{a}
	(0.013)	(0.012)	(0.018)	(0.012)	(0.011)	(0.023)	(0.037)	(0.036)	(0.036)	(0.018)	(0.018)	(0.018)
Jainism	−0.068^{a}	−0.031	0.009	−0.043^{b}	−0.016	0.027	−0.021	−0.026	−0.024	0.047^{b}	0.073^{a}	0.075^{a}
	(0.022)	(0.021)	(0.038)	(0.022)	(0.018)	(0.045)	(0.047)	(0.039)	(0.042)	(0.021)	(0.025)	(0.026)
Buddhism	0.002	0.015	0.046^{c}	−0.024	−0.000	0.061^{c}	0.123^{b}	0.099^{b}	0.089^{b}	−0.051^{c}	−0.059^{b}	0.078^{b}
	(0.027)	(0.019)	(0.027)	(0.019)	(0.016)	(0.036)	(0.063)	(0.045)	(0.044)	(0.026)	(0.025)	(0.031)
Zoroastrianism	−0.025	0.127^{b}	−0.036	−0.109^{b}	0.062^{c}	−0.254^{a}	0.278^{c}	0.420^{a}	0.426^{a}	−0.072	0.048	0.217^{a}
	(0.046)	(0.049)	(0.036)	(0.050)	(0.034)	(0.048)	(0.146)	(0.147)	(0.057)	(0.058)	(0.060)	(0.032)
Others	0.046	0.013	0.043	0.031	−0.034	0.069	0.106	0.228^{b}	0.279^{a}	0.041	0.093^{b}	0.075^{c}
	(0.034)	(0.038)	(0.040)	(0.024)	(0.028)	(0.045)	(0.085)	(0.091)	(0.075)	(0.044)	(0.047)	(0.042)
Social group (base: Scheduled tribes)												
Scheduled castes	0.036^{a}	0.016	0.002	0.018^{c}	0.010	−0.006	−0.064^{b}	−0.028	−0.046^{b}	−0.015	−0.019	−0.038^{a}
	(0.012)	(0.011)	(0.013)	(0.010)	(0.009)	(0.017)	(0.032)	(0.026)	(0.023)	(0.016)	(0.014)	(0.013)
Other backward classes	–	0.016	0.004	–	0.012	0.002	–	−0.069^{a}	−0.049^{b}	–	0.034^{b}	0.007
		(0.010)	(0.013)		(0.008)	(0.016)		(0.025)	(0.021)		(0.013)	(0.012)
Others	0.010	0.008	0.000	0.007	0.008	0.006	−0.129^{a}	−0.055^{b}	−0.033	0.060^{a}	0.079^{a}	0.038^{a}
	(0.011)	(0.011)	(0.013)	(0.009)	(0.009)	(0.016)	(0.030)	(0.026)	(0.021)	(0.015)	(0.014)	(0.013)
Age of household head	0.013^{a}	0.014^{a}	0.007^{a}	0.009^{a}	0.011^{a}	0.007^{a}	0.046^{a}	0.051^{a}	0.052^{a}	0.028^{a}	0.030^{a}	0.024^{a}
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)
Age of household head squared	−0.000^{a}	−0.000^{a}	−0.000^{a}	−0.000^{a}	−0.000^{a}	−0.000^{a}	−0.000^{a}	−0.000^{a}	−0.000^{a}	−0.000^{a}	−0.000^{a}	−0.000^{a}
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex of household head (base: Male)												
Female	0.116^{a}	0.108^{a}	0.107^{a}	0.099^{a}	0.091^{a}	0.090^{a}	0.149^{a}	0.145^{a}	0.125^{a}	0.139^{a}	0.136^{a}	0.136^{a}
	(0.006)	(0.006)	(0.008)	(0.006)	(0.005)	(0.009)	(0.015)	(0.012)	(0.012)	(0.009)	(0.007)	(0.008)
Education of household head (base: Illiterate)												
Literate and literate w/o formal schooling	−0.030^{a}	−0.016^{b}	−0.014	−0.027^{a}	−0.012^{b}	−0.012	−0.008	−0.017	−0.004	0.013	0.004	0.020^{b}
	(0.006)	(0.007)	(0.009)	(0.005)	(0.006)	(0.011)	(0.016)	(0.016)	(0.015)	(0.009)	(0.009)	(0.009)
Literate: below primary	−0.023^{a}	0.011^{b}	−0.006	−0.024^{a}	0.007	−0.010	−0.004	0.031^{b}	0.021	0.046^{a}	0.058^{a}	0.048^{a}
	(0.006)	(0.006)	(0.009)	(0.005)	(0.005)	(0.011)	(0.015)	(0.014)	(0.014)	(0.008)	(0.008)	(0.009)
Literate: primary	−0.008	0.035^{a}	0.025^{a}	−0.015^{a}	0.029^{a}	0.017	0.054^{a}	0.091^{a}	0.068^{a}	0.098^{a}	0.114^{a}	0.093^{a}
	(0.006)	(0.006)	(0.009)	(0.005)	(0.005)	(0.011)	(0.016)	(0.016)	(0.015)	(0.009)	(0.009)	(0.009)
Literate: middle	0.007	0.063^{a}	0.046^{a}	0.004	0.049^{a}	0.037^{a}	0.093^{a}	0.135^{a}	0.115^{a}	0.152^{a}	0.180^{a}	0.136^{a}
	(0.007)	(0.008)	(0.011)	(0.006)	(0.007)	(0.013)	(0.018)	(0.021)	(0.017)	(0.010)	(0.011)	(0.011)
Literate: secondary and above	0.005	0.092^{a}	0.076^{a}	0.008	0.080^{a}	0.078^{a}	0.085^{a}	0.189^{a}	0.163^{a}	0.206^{a}	0.259^{a}	0.215^{a}
	(0.009)	(0.012)	(0.015)	(0.008)	(0.010)	(0.018)	(0.023)	(0.031)	(0.025)	(0.012)	(0.016)	(0.015)
Household type (base: Self-employed)												
Regular wage/salary earning	−0.011^{a}	0.005	0.001	−0.008^{b}	0.003	−0.014^{c}	−0.028^{a}	−0.005	−0.025^{a}	−0.067^{a}	−0.033^{a}	−0.036^{a}
	(0.004)	(0.004)	(0.006)	(0.003)	(0.003)	(0.007)	(0.009)	(0.009)	(0.009)	(0.005)	(0.005)	(0.006)
Casual labor	−0.021^{a}	−0.032^{a}	−0.029^{a}	−0.028^{a}	−0.025^{a}	−0.029^{a}	−0.049^{a}	−0.067^{a}	−0.031^{b}	−0.088^{a}	−0.102^{a}	−0.084^{a}
	(0.007)	(0.006)	(0.008)	(0.006)	(0.005)	(0.010)	(0.015)	(0.015)	(0.014)	(0.008)	(0.008)	(0.008)
Others	0.011	0.071^{a}	0.047^{a}	0.020^{a}	0.074^{a}	−0.004	−0.155^{a}	−0.067^{a}	−0.034^{b}	−0.070^{a}	0.003	0.014
	(0.008)	(0.008)	(0.010)	(0.007)	(0.006)	(0.011)	(0.022)	(0.019)	(0.017)	(0.011)	(0.010)	(0.010)
Observations	45,650	44,751	41,392	45,570	44,665	41,097	45,555	44,488	41,645	45,223	44,509	41,614
District fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.265	0.247	0.190	0.259	0.245	0.152	0.210	0.173	0.202	0.486	0.471	0.412
Kleibergen-Paap F statistic	4194	1978	2441	4166	1952	2378	4126	1936	2398	4047	1879	2420
MP Effective F statistic	3822	2192	2530	3797	2160	2451	3852	2132	2519	3671	2069	2547
Endogeneity test statistic	190.1	184.7	51.51	323	245.5	16.76	2.906	33.90	49.41	42.35	91.20	63.84
Endogeneity test P value	0.000	0.000	0.000	0.000	0.000	0.000	0.088	0.000	0.000	0.000	0.000	0.000

Notes: State-region fixed effects have been employed for the 1993–94 sample. Standard errors clustered at FSU level are reported in parentheses; ^{a} $p < 0.01$, ^{b} $p < 0.05$, ^{c} $p < 0.1$.

Table A31
Nutrient-income elasticities – Parametric (IV) estimation.

Rural	Daily per capita calorie intake			Daily per capita protein intake			Daily per capita fat intake		
	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12
Instrument: Count of asset types									
MPCE	0.347^{a}	0.288^{a}	0.250^{a}	0.357^{a}	0.326^{a}	0.325^{a}	0.703^{a}	0.644^{a}	0.553^{a}
	(0.015)	(0.008)	(0.011)	(0.016)	(0.009)	(0.012)	(0.024)	(0.014)	(0.018)
Observations	24,065	38,790	37,989	24,083	38,815	39,807	24,221	38,946	37,551

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Table A31 (*continued*)

Rural	Daily per capita calorie intake			Daily per capita protein intake			Daily per capita fat intake		
	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12
R-squared	0.583	0.566	0.340	0.573	0.577	0.355	0.660	0.650	0.398
Kleibergen-Paap F statistic	866	2394	2614	8523	2366	2777	858	2396	2579
AR test statistic	305.2	697.2	402.5	285.5	729	564.9	441.6	1174	677.4
AR P value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Rural	Daily per capita iron intake			Daily per capita zinc intake			Daily per capita vitamin A intake			Daily per capita calcium intake		
	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12
MPCE	0.297[a]	0.303[a]	0.345[a]	0.283[a]	0.262[a]	0.308[a]	0.590[a]	0.577[a]	0.540[a]	0.700[a]	0.691[a]	0.671[a]
	(0.020)	(0.012)	(0.015)	(0.018)	(0.010)	(0.016)	(0.044)	(0.024)	(0.025)	(0.030)	(0.017)	(0.017)
Observations	24,281	39,162	40,773	24,227	39,104	39,628	24,306	39,119	41,055	24,228	39,093	41,015
R-squared	0.380	0.420	0.243	0.424	0.456	0.196	0.240	0.281	0.246	0.539	0.560	0.466
Kleibergen-Paap F statistic	863	2380	2887	865	2378	2791	871	2406	2952	848	2373	2948
AR test statistic	171.7	511.6	432.2	181.2	503.8	330.2	150.1	457.1	400.6	332.4	1041	1114
AR P value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Urban	Daily per capita calorie intake			Daily per capita protein intake			Daily per capita fat intake		
	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12
Instrument: Count of asset types									
MPCE	0.271[a]	0.258[a]	0.303[a]	0.290[a]	0.282[a]	0.384[a]	0.676[a]	0.594[a]	0.853[a]
	(0.018)	(0.009)	(0.015)	(0.020)	(0.009)	(0.016)	(0.026)	(0.014)	(0.041)
Observations	18,474	23,736	26,210	18,498	23,752	28,385	18,528	23,775	29,169
R-squared	0.575	0.589	0.303	0.533	0.573	0.293	0.658	0.693	0.162
Kleibergen-Paap F statistic	549	1771	1655	551	1763	1838	555	1799	1918
AR test statistic	136.2	538.7	343.7	142.4	575.1	486.8	364.2	1096	401.1
AR P value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Urban	Daily per capita iron intake			Daily per capita zinc intake			Daily per capita vitamin A intake			Daily per capita calcium intake		
	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12
MPCE	0.238[a]	0.258[a]	0.401[a]	0.176[a]	0.216[a]	0.498[a]	0.668[a]	0.611[a]	0.620[a]	0.662[a]	0.614[a]	0.660[a]
	(0.024)	(0.012)	(0.020)	(0.022)	(0.010)	(0.026)	(0.047)	(0.025)	(0.025)	(0.029)	(0.016)	(0.018)
Observations	18,612	23,907	29,103	18,582	23,880	28,829	18,601	23,857	29,347	18,505	23,835	29,263
R-squared	0.389	0.435	0.224	0.375	0.442	0.159	0.304	0.334	0.286	0.565	0.599	0.474
Kleibergen-Paap F statistic	550	1761	1916	544	1759	1891	547	1777	1940	547	1798	1949
AR test statistic	79.59	364.9	364.9	50.41	329.2	338	164.4	523.3	544.4	304.8	948.9	983.8
AR P value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Notes: Standard errors clustered at FSU level are reported in parentheses; [a] $p < 0.01$, [b] $p < 0.05$, [c] $p < 0.1$.

Table A32
Nutrient-income elasticities – Parametric (IV) estimation.

Rural	Daily per capita calorie intake			Daily per capita protein intake			Daily per capita fat intake		
	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12
Instrument: primary cooking and lighting sources									
MPCE	0.353[a]	0.244[a]	0.207[a]	0.391[a]	0.295[a]	0.302[a]	0.962[a]	0.706[a]	0.644[a]
	(0.009)	(0.006)	(0.011)	(0.010)	(0.007)	(0.012)	(0.015)	(0.010)	(0.018)
Observations	68,092	77,733	55,031	68,161	77,782	57,473	68,427	77,922	54,314
R-squared	0.594	0.540	0.327	0.594	0.556	0.353	0.659	0.641	0.390
Kleibergen-Paap F statistic	966	1786	830	959	1803	896	962	1804	833
MP effective F stat	829	1451	692	851	1526	757	813	1489	692

Rural	Daily per capita iron intake			Daily per capita zinc intake			Daily per capita vitamin A intake			Daily per capita calcium intake		
	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12
MPCE	0.318[a]	0.266[a]	0.325[a]	0.316[a]	0.228[a]	0.306[a]	0.706[a]	0.554[a]	0.678[a]	0.873[a]	0.731[a]	0.742[a]
	(0.013)	(0.009)	(0.016)	(0.011)	(0.007)	(0.016)	(0.029)	(0.019)	(0.027)	(0.018)	(0.013)	(0.018)
Observations	68,638	78,479	58,784	68,485	78,361	57,245	68,601	78,268	59,076	68,415	78,275	59,074
R-squared	0.391	0.408	0.244	0.457	0.440	0.200	0.205	0.248	0.228	0.510	0.536	0.442
Kleibergen-Paap F statistic	959	1762	916	963	1767	881	972	1815	951	974	1826	942
MP Effective F statistic	823	1425	752	833	1447	727	831	1598	833	862	1572	826

Urban	Daily per capita calorie intake			Daily per capita protein intake			Daily per capita fat intake		
	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12
Instrument: primary cooking and lighting sources									
MPCE	0.323[a]	0.287[a]	0.295[a]	0.289[a]	0.288[a]	0.302[a]	0.928[a]	0.730[a]	0.837[a]
	(0.008)	(0.007)	(0.013)	(0.010)	(0.007)	(0.014)	(0.014)	(0.010)	(0.034)
Observations	45,384	44,398	37,770	45,408	44,441	40,433	45,543	44,518	41,468
R-squared	0.593	0.593	0.318	0.527	0.569	0.313	0.602	0.665	0.180
Kleibergen-Paap F statistic	929	1186	645	912	1187	686	906	1188	681
MP Effective F statistic	829	968	559	829	983	605	824	981	603

Urban	Daily per capita iron intake			Daily per capita zinc intake			Daily per capita vitamin A intake			Daily per capita calcium intake		
	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12
MPCE	0.224[a]	0.266[a]	0.339[a]	0.220[a]	0.230[a]	0.383[a]	0.446[a]	0.455[a]	0.328[a]	0.778[a]	0.721[a]	0.656[a]
	(0.013)	(0.010)	(0.018)	(0.011)	(0.008)	(0.022)	(0.030)	(0.022)	(0.030)	(0.017)	(0.013)	(0.019)
Observations	45,679	44,745	41,370	45,583	44,688	41,039	45,580	44,556	41,656	45,276	44,545	41,605
R-squared	0.374	0.432	0.244	0.401	0.448	0.179	0.231	0.260	0.265	0.484	0.537	0.465
Kleibergen-Paap F statistic	901	1180	691	920	1179	686	904	1193	685	916	1199	690
MP Effective F statistic	809	963	606	819	967	602	826	1008	608	871	1034	618

Notes: Standard errors clustered at FSU level are reported in parentheses; [a] $p < 0.01$, [b] $p < 0.05$, [c] $p < 0.1$.

Table A4
Nutrient-income elasticities – Parametric (IV) estimation with winsorized variables.

	Daily per capita calorie intake			Daily per capita protein intake			Daily per capita fat intake		
Rural	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12
MPCE	0.240[a]	0.217[a]	0.262[a]	0.260[a]	0.242[a]	0.248[a]	0.490[a]	0.404[a]	0.473[a]
	(0.010)	(0.008)	(0.016)	(0.010)	(0.008)	(0.012)	(0.016)	(0.013)	(0.028)
Religion (base: Hinduism)									
Islam	−0.018[a]	−0.011[a]	−0.007	−0.001	0.006	0.011[c]	−0.035[a]	−0.035[a]	−0.021
	(0.005)	(0.004)	(0.008)	(0.005)	(0.004)	(0.006)	(0.007)	(0.006)	(0.014)
Christianity	−0.006	−0.000	0.019	0.008	0.020[a]	0.021	0.026[c]	−0.029[b]	−0.008
	(0.008)	(0.007)	(0.021)	(0.008)	(0.007)	(0.014)	(0.013)	(0.011)	(0.034)
Sikhism	0.046[a]	0.033[a]	0.014	0.055[a]	0.039[a]	0.028[c]	0.046[a]	0.039[a]	0.028
	(0.011)	(0.009)	(0.022)	(0.012)	(0.009)	(0.015)	(0.017)	(0.012)	(0.035)
Jainism	−0.038	−0.005	0.092	−0.065[b]	−0.049[c]	0.050	0.067	0.041	0.106
	(0.027)	(0.030)	(0.064)	(0.029)	(0.029)	(0.044)	(0.044)	(0.043)	(0.096)
Buddhism	0.007	−0.006	−0.032	0.011	0.008	−0.005	0.021	0.007	−0.070
	(0.012)	(0.011)	(0.025)	(0.013)	(0.012)	(0.019)	(0.033)	(0.021)	(0.044)
Zoroastrianism	0.035	−0.001	0.279[a]	0.129[a]	−0.009	0.303[a]	0.193[a]	0.152	0.128
	(0.025)	(0.121)	(0.091)	(0.029)	(0.071)	(0.074)	(0.048)	(0.105)	(0.116)
Others	0.057[a]	0.010	0.032	0.060[a]	0.013	0.022	−0.119[a]	−0.106[a]	0.088
	(0.021)	(0.015)	(0.031)	(0.020)	(0.015)	(0.025)	(0.040)	(0.032)	(0.057)
Social group (base: Scheduled tribes)									
Scheduled castes	0.011[c]	−0.004	−0.000	0.010[c]	−0.008[c]	−0.002	0.030[a]	0.023[a]	0.035[b]
	(0.006)	(0.004)	(0.008)	(0.006)	(0.004)	(0.006)	(0.009)	(0.007)	(0.014)
Other backward classes	–	0.012[a]	0.009	–	0.009[b]	0.009	–	0.088[a]	0.076[a]
		(0.004)	(0.008)		(0.004)	(0.006)		(0.007)	(0.014)
Others	0.038[a]	0.018[a]	0.020[b]	0.034[a]	0.011[b]	0.016[b]	0.114[a]	0.125[a]	0.108[a]
	(0.006)	(0.004)	(0.009)	(0.006)	(0.005)	(0.007)	(0.008)	(0.008)	(0.015)
Age of household head	0.004[a]	0.007[a]	0.006[a]	0.005[a]	0.008[a]	0.007[a]	0.000	0.005[a]	0.005[a]
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Age of household head squared	−0.000[a]	−0.000[a]	−0.000[a]	−0.000[a]	−0.000[a]	−0.000[a]	0.000[b]	−0.000[a]	−0.000[a]
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex of household head (base: Male)									
Female	0.010[a]	0.021[a]	0.034[a]	0.007[c]	0.018[a]	0.027[a]	0.049[a]	0.054[a]	0.044[a]
	(0.004)	(0.003)	(0.008)	(0.004)	(0.003)	(0.006)	(0.006)	(0.004)	(0.013)
Education of household head (base: Illiterate)									
Literate and literate w/o formal schooling	0.014[a]	0.012[a]	0.005	0.011[a]	0.011[a]	0.006	0.057[a]	0.037[a]	0.022[b]
	(0.003)	(0.003)	(0.006)	(0.003)	(0.003)	(0.004)	(0.005)	(0.004)	(0.010)
Literate: below primary	0.017[a]	0.014[a]	0.007	0.013[a]	0.016[a]	0.010[b]	0.077[a]	0.060[a]	0.030[a]
	(0.003)	(0.002)	(0.006)	(0.003)	(0.002)	(0.005)	(0.005)	(0.004)	(0.011)
Literate: primary	0.024[a]	0.018[a]	0.025[a]	0.022[a]	0.021[a]	0.024[a]	0.123[a]	0.094[a]	0.084[a]
	(0.004)	(0.003)	(0.006)	(0.004)	(0.003)	(0.005)	(0.006)	(0.004)	(0.011)
Literate: middle	0.043[a]	0.015[a]	0.019[b]	0.040[a]	0.021[a]	0.024[a]	0.187[a]	0.120[a]	0.085[a]
	(0.005)	(0.003)	(0.008)	(0.005)	(0.004)	(0.006)	(0.008)	(0.005)	(0.013)
Literate: secondary and above	0.042[a]	0.022[a]	0.037[a]	0.040[a]	0.032[a]	0.037[a]	0.234[a]	0.171[a]	0.137[a]
	(0.006)	(0.004)	(0.009)	(0.007)	(0.005)	(0.007)	(0.010)	(0.007)	(0.016)
Household type (base: Self-employed in non-agriculture)									
Agricultural labor (Regular wage/salary earning for 2011–12)	−0.002	−0.012[a]	0.003	−0.004	−0.017[a]	0.002	−0.105[a]	−0.079[a]	0.021[c]
	(0.004)	(0.003)	(0.007)	(0.004)	(0.003)	(0.005)	(0.006)	(0.004)	(0.011)
Other labor (Casual labor in agriculture and non-agriculture for 2011–12)	−0.020[a]	−0.020[a]	−0.031[a]	−0.026[a]	−0.025[a]	−0.025[a]	−0.076[a]	−0.073[a]	−0.087[a]
	(0.005)	(0.003)	(0.006)	(0.005)	(0.003)	(0.004)	(0.007)	(0.005)	(0.010)
Self-employed in agriculture	0.079[a]	0.048[a]	0.016[a]	0.083[a]	0.053[a]	0.030[a]	0.095[a]	0.069[a]	0.009
	(0.003)	(0.002)	(0.005)	(0.003)	(0.002)	(0.004)	(0.005)	(0.003)	(0.008)

(continued on next page)

Table A4 (*continued*)

Rural	Daily per capita calorie intake			Daily per capita protein intake			Daily per capita fat intake		
	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12
Others	0.015[a]	−0.004	−0.008	0.010[b]	−0.010[a]	−0.010	0.030[a]	0.023[a]	−0.017
	(0.004)	(0.003)	(0.011)	(0.004)	(0.003)	(0.008)	(0.006)	(0.005)	(0.017)
Males aged 0–4	−0.062[a]	−0.061[a]	−0.048[a]	−0.060[a]	−0.057[a]	−0.055[a]	−0.050[a]	−0.043[a]	−0.008
	(0.002)	(0.002)	(0.004)	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)	(0.007)
Females aged 0–4	−0.060[a]	−0.065[a]	−0.040[a]	−0.058[a]	−0.061[a]	−0.048[a]	−0.048[a]	−0.053[a]	−0.003
	(0.002)	(0.002)	(0.004)	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)	(0.007)
Males aged 5–9	−0.032[a]	−0.033[a]	0.010[a]	−0.032[a]	−0.032[a]	−0.006[b]	−0.040[a]	−0.041[a]	0.030[a]
	(0.002)	(0.001)	(0.004)	(0.002)	(0.001)	(0.003)	(0.003)	(0.002)	(0.006)
Females aged 5–9	−0.034[a]	−0.033[a]	0.009[b]	−0.034[a]	−0.032[a]	−0.006[b]	−0.042[a]	−0.044[a]	0.023[a]
	(0.002)	(0.001)	(0.004)	(0.002)	(0.001)	(0.003)	(0.003)	(0.002)	(0.007)
Males aged 10–14	−0.019[a]	−0.018[a]	0.007[b]	−0.020[a]	−0.019[a]	−0.008[a]	−0.035[a]	−0.038[a]	0.015[b]
	(0.002)	(0.001)	(0.003)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.006)
Females aged 10–14	−0.020[a]	−0.020[a]	0.005	−0.023[a]	−0.021[a]	−0.009[a]	−0.039[a]	−0.039[a]	0.008
	(0.002)	(0.001)	(0.004)	(0.002)	(0.001)	(0.003)	(0.002)	(0.002)	(0.006)
Males aged 15–54	0.006[a]	0.001	−0.019[a]	0.005[a]	−0.000	−0.019[a]	−0.006[a]	−0.008[a]	−0.030[a]
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.004)
Females aged 15–54	−0.007[a]	−0.008[a]	−0.013[a]	−0.006[a]	−0.008[a]	−0.018[a]	−0.012[a]	−0.015[a]	−0.007[c]
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.004)
Males aged 55 plus	0.007[b]	0.005[b]	−0.002	0.005[c]	0.004[c]	−0.006	−0.000	0.003	−0.009
	(0.003)	(0.002)	(0.006)	(0.003)	(0.002)	(0.004)	(0.004)	(0.003)	(0.009)
Females aged 55 plus	−0.005[b]	−0.009[a]	−0.025[a]	−0.004[c]	−0.008[a]	−0.028[a]	−0.023[a]	−0.021[a]	−0.027[a]
	(0.002)	(0.002)	(0.005)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.008)
Observations	69,101	79,175	59,672	69,100	79,175	59,672	69,100	79,174	59,671
District fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.476	0.473	0.147	0.482	0.481	0.247	0.587	0.539	0.158
Kleibergen-Paap F statistic	4891	4849	5529	4888	4849	5529	4890	4848	5529
MP Effective F statistic	4000	3903	5755	3998	3903	5755	4002	3902	5755
Endogeneity test statistic	481.7	333.8	52.83	432.9	318	102.8	265.4	322.8	23.54
Endogeneity test P value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Rural	Daily per capita iron intake			Daily per capita zinc intake			Daily per capita vitamin A intake			Daily per capita calcium intake		
	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12
MPCE	0.289[a]	0.267[a]	0.272[a]	0.227[a]	0.219[a]	0.276[a]	0.528[a]	0.364[a]	0.313[a]	0.400[a]	0.353[a]	0.354[a]
	(0.016)	(0.012)	(0.015)	(0.012)	(0.009)	(0.017)	(0.039)	(0.033)	(0.028)	(0.019)	(0.017)	(0.015)
Religion (base: Hinduism)												
Islam	−0.006	0.016[a]	0.020[a]	−0.003	0.004	0.005	0.141[a]	0.218[a]	0.231[a]	−0.081[a]	−0.080[a]	−0.061[a]
	(0.007)	(0.005)	(0.007)	(0.006)	(0.004)	(0.009)	(0.022)	(0.015)	(0.014)	(0.009)	(0.007)	(0.008)
Christianity	0.019	0.027[a]	0.028	0.000	0.011	0.028	0.104[a]	0.202[a]	0.131[a]	0.012	−0.003	−0.012
	(0.012)	(0.010)	(0.017)	(0.009)	(0.008)	(0.022)	(0.034)	(0.025)	(0.021)	(0.017)	(0.014)	(0.016)
Sikhism	0.014	0.016	0.001	0.025[c]	0.026[a]	0.023	0.110[b]	0.120[a]	0.120[a]	0.147[a]	0.077[a]	0.072[a]
	(0.016)	(0.011)	(0.016)	(0.013)	(0.010)	(0.022)	(0.054)	(0.041)	(0.041)	(0.022)	(0.015)	(0.017)
Jainism	−0.156[a]	−0.092[b]	0.035	−0.094[b]	−0.051	0.076	0.093	0.034	0.104	0.108[b]	0.059	0.063
	(0.049)	(0.038)	(0.040)	(0.040)	(0.032)	(0.063)	(0.106)	(0.086)	(0.074)	(0.051)	(0.051)	(0.048)
Buddhism	−0.009	−0.012	−0.012	−0.016	0.000	−0.033	0.130[a]	−0.014	0.114[a]	0.006	−0.046[c]	−0.016
	(0.026)	(0.018)	(0.022)	(0.016)	(0.013)	(0.027)	(0.050)	(0.042)	(0.037)	(0.027)	(0.027)	(0.024)
Zoroastrianism	0.338[a]	0.001	0.443[a]	0.213[a]	−0.030	0.356[a]	0.317[a]	0.202[a]	0.424	0.098	0.083	0.213[a]
	(0.054)	(0.063)	(0.090)	(0.039)	(0.107)	(0.078)	(0.110)	(0.066)	(0.316)	(0.072)	(0.249)	(0.074)
Others	0.057[c]	−0.004	0.021	0.055[b]	−0.008	0.038	0.202[a]	0.195[a]	0.093	0.059	0.003	−0.011
	(0.034)	(0.022)	(0.031)	(0.023)	(0.016)	(0.034)	(0.063)	(0.052)	(0.063)	(0.041)	(0.031)	(0.035)
Social group (base: Scheduled tribes)												
Scheduled castes	0.033[a]	0.007	0.009	0.030[a]	0.004	0.008	−0.137[a]	−0.052[a]	−0.066[a]	−0.026[b]	−0.047[a]	−0.017[b]
	(0.010)	(0.007)	(0.008)	(0.007)	(0.005)	(0.009)	(0.024)	(0.016)	(0.016)	(0.012)	(0.010)	(0.009)
Other backward classes	–	0.010	0.008	–	0.011[b]	0.012	–	−0.056[a]	−0.072[a]	–	0.052[a]	0.061[a]
		(0.006)	(0.007)		(0.005)	(0.008)		(0.016)	(0.015)		(0.009)	(0.008)
Others	0.036[a]	0.001	0.008	0.044[a]	0.008	0.018[b]	−0.168[a]	−0.063[a]	−0.062[a]	0.077[a]	0.097[a]	0.096[a]
	(0.010)	(0.007)	(0.008)	(0.007)	(0.005)	(0.009)	(0.023)	(0.018)	(0.016)	(0.012)	(0.010)	(0.009)
Age of household head	0.004[a]	0.007[a]	0.007[a]	0.005[a]	0.008[a]	0.007[a]	0.010[a]	0.015[a]	0.017[a]	0.006[a]	0.011[a]	0.009[a]
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)
Age of household head squared	−0.000[a]	−0.000[a]	−0.000[a]	−0.000[a]	−0.000[a]	−0.000[a]	−0.000[a]	−0.000[a]	−0.000[a]	−0.000[a]	−0.000[a]	−0.000[a]
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex of household head (base: Male)												
Female	0.026[a]	0.026[a]	0.033[a]	0.009[b]	0.015[a]	0.030[a]	0.063[a]	0.048[a]	0.019[c]	0.034[a]	0.040[a]	0.039[a]
	(0.005)	(0.004)	(0.007)	(0.004)	(0.003)	(0.008)	(0.014)	(0.009)	(0.010)	(0.007)	(0.006)	(0.007)
Education of household head (base: Illiterate)												
Literate and literate w/o formal schooling	−0.001	0.001	0.001	0.004	0.006[b]	0.001	0.015	−0.003	0.017[c]	0.046[a]	0.025[a]	0.038[a]
	(0.005)	(0.004)	(0.005)	(0.004)	(0.003)	(0.006)	(0.012)	(0.010)	(0.009)	(0.006)	(0.005)	(0.006)

(*continued on next page*)

Table A4 (*continued*)

	Daily per capita iron intake			Daily per capita zinc intake			Daily per capita vitamin A intake			Daily per capita calcium intake		
Rural	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12	1993–94	2004–05	2011–12
Literate: below primary	−0.004	0.007[b]	0.007	0.004	0.011[a]	0.003	0.006	0.005	0.026[a]	0.057[a]	0.059[a]	0.049[a]
	(0.005)	(0.003)	(0.005)	(0.004)	(0.003)	(0.006)	(0.012)	(0.008)	(0.010)	(0.007)	(0.005)	(0.006)
Literate: primary	0.003	0.012[a]	0.019[a]	0.013[a]	0.013[a]	0.022[a]	0.007	0.024[b]	0.036[a]	0.086[a]	0.093[a]	0.087[a]
	(0.006)	(0.004)	(0.006)	(0.005)	(0.003)	(0.007)	(0.014)	(0.010)	(0.010)	(0.008)	(0.005)	(0.006)
Literate: middle	0.004	0.010[b]	0.017[a]	0.025[a]	0.010[a]	0.019[b]	0.065[a]	0.049[a]	0.050[a]	0.145[a]	0.133[a]	0.115[a]
	(0.007)	(0.005)	(0.007)	(0.006)	(0.004)	(0.008)	(0.019)	(0.012)	(0.012)	(0.010)	(0.007)	(0.007)
Literate: secondary and above	−0.004	0.014[b]	0.026[a]	0.019[b]	0.015[a]	0.038[a]	0.069[a]	0.072[a]	0.072[a]	0.204[a]	0.193[a]	0.161[a]
Household type (base: Self-employed in non-agriculture)												
Agricultural labor (Regular wage/salary earning for 2011–12)	0.014[b]	−0.012[a]	0.008	0.001	−0.011[a]	0.006	−0.005	−0.041[a]	0.003	−0.042[a]	−0.088[a]	0.016[a]
	(0.006)	(0.004)	(0.005)	(0.005)	(0.003)	(0.007)	(0.016)	(0.010)	(0.008)	(0.008)	(0.006)	(0.005)
Other labor (Casual labor in agriculture and non-agriculture for 2011–12)	−0.002	−0.020[a]	−0.025[a]	−0.009[c]	−0.015[a]	−0.031[a]	−0.046[b]	−0.079[a]	−0.035[a]	−0.097[a]	−0.096[a]	−0.076[a]
	(0.007)	(0.004)	(0.005)	(0.006)	(0.003)	(0.006)	(0.019)	(0.011)	(0.009)	(0.010)	(0.006)	(0.005)
Self-employed in agriculture	0.066[a]	0.030[a]	0.005	0.072[a]	0.038[a]	0.007	0.032[a]	0.027[a]	0.020[a]	0.157[a]	0.122[a]	0.095[a]
	(0.005)	(0.003)	(0.004)	(0.004)	(0.002)	(0.005)	(0.012)	(0.007)	(0.007)	(0.006)	(0.004)	(0.004)
Others	0.007	−0.015[a]	−0.006	0.008[c]	−0.012[a]	−0.011	−0.092[a]	−0.035[a]	−0.079[a]	0.013	0.010[c]	−0.023[b]
	(0.006)	(0.004)	(0.009)	(0.005)	(0.003)	(0.011)	(0.015)	(0.009)	(0.016)	(0.008)	(0.005)	(0.009)
Males aged 0–4	−0.057[a]	−0.056[a]	−0.052[a]	−0.060[a]	−0.059[a]	−0.045[a]	−0.045[a]	−0.045[a]	−0.053[a]	−0.044[a]	−0.030[a]	−0.030[a]
	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)	(0.004)	(0.007)	(0.005)	(0.006)	(0.003)	(0.003)	(0.004)
Females aged 0–4	−0.056[a]	−0.060[a]	−0.047[a]	−0.060[a]	−0.064[a]	−0.039[a]	−0.040[a]	−0.059[a]	−0.062[a]	−0.042[a]	−0.045[a]	−0.024[a]
	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)	(0.004)	(0.007)	(0.005)	(0.006)	(0.004)	(0.003)	(0.004)
Males aged 5–9	−0.032[a]	−0.032[a]	−0.005[c]	−0.029[a]	−0.031[a]	0.009[b]	−0.046[a]	−0.048[a]	−0.052[a]	−0.046[a]	−0.043[a]	−0.028[a]
	(0.003)	(0.002)	(0.003)	(0.002)	(0.001)	(0.004)	(0.006)	(0.005)	(0.005)	(0.003)	(0.003)	(0.003)
Females aged 5–9	−0.031[a]	−0.031[a]	−0.006[c]	−0.031[a]	−0.029[a]	0.009[b]	−0.052[a]	−0.049[a]	−0.058[a]	−0.044[a]	−0.048[a]	−0.036[a]
	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)	(0.004)	(0.006)	(0.005)	(0.005)	(0.003)	(0.003)	(0.003)
Males aged 10–14	−0.024[a]	−0.023[a]	−0.009[a]	−0.016[a]	−0.015[a]	0.008[b]	−0.058[a]	−0.059[a]	−0.061[a]	−0.040[a]	−0.041[a]	−0.037[a]
	(0.002)	(0.002)	(0.003)	(0.002)	(0.001)	(0.004)	(0.006)	(0.004)	(0.005)	(0.003)	(0.003)	(0.003)
Females aged 10–14	−0.026[a]	−0.023[a]	−0.009[a]	−0.019[a]	−0.017[a]	0.005	−0.053[a]	−0.055[a]	−0.061[a]	−0.048[a]	−0.047[a]	−0.038[a]
	(0.003)	(0.002)	(0.003)	(0.002)	(0.001)	(0.004)	(0.006)	(0.005)	(0.005)	(0.003)	(0.003)	(0.003)
Males aged 15–54	−0.001	−0.008[a]	−0.026[a]	0.008[a]	0.002[c]	−0.017[a]	−0.043[a]	−0.038[a]	−0.053[a]	−0.016[a]	−0.019[a]	−0.037[a]
	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.004)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)
Females aged 15–54	−0.013[a]	−0.016[a]	−0.026[a]	−0.007[a]	−0.008[a]	−0.011[a]	−0.011[b]	−0.022[a]	−0.043[a]	−0.008[a]	−0.013[a]	−0.027[a]
	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)	(0.003)	(0.005)	(0.003)	(0.004)	(0.003)	(0.002)	(0.002)
Males aged 55 plus	−0.001	−0.006[b]	−0.013[a]	0.008[b]	0.004[c]	−0.002	−0.043[a]	−0.044[a]	−0.050[a]	−0.010[c]	−0.011[b]	−0.022[a]
	(0.004)	(0.003)	(0.005)	(0.003)	(0.002)	(0.006)	(0.010)	(0.007)	(0.008)	(0.006)	(0.004)	(0.005)
Females aged 55 plus	−0.007[b]	−0.012[a]	−0.035[a]	−0.002	−0.006[a]	−0.024[a]	−0.027[a]	−0.027[a]	−0.049[a]	−0.014[a]	−0.012[a]	−0.036[a]
	(0.003)	(0.002)	(0.004)	(0.003)	(0.002)	(0.005)	(0.008)	(0.006)	(0.007)	(0.004)	(0.004)	(0.004)
Observations	69,105	79,175	59,672	69,101	79,175	59,672	69,083	79,139	59,668	69,100	79,166	59,670
District fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.309	0.365	0.214	0.360	0.403	0.140	0.147	0.164	0.165	0.393	0.425	0.380
Kleibergen-Paap F statistic	4891	4849	5529	4889	4849	5529	4882	4847	5532	4889	4850	5529
MP Effective F statistic	3999	3903	5755	4000	3903	5755	4000	3905	5758	3997	3909	5755
Endogeneity test statistic	91.60	103.6	45.63	243.8	199.2	37.80	21.89	44.53	66.51	283.1	272.9	178.3
Endogeneity test P value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Notes: State-region fixed effects have been employed for *the 1993–94 sample. Standard errors clustered at FSU level are reported in parentheses;* [a] $p < 0.01$, [b] $p < 0.05$, [c] $p < 0.1$.

Table A5
Estimated results of UCI and LTZ methods.

Rural	UCI		LTZ			
2011–12	Lower bound	Upper bound	Coefficient	P value	Lower bound	Upper bound
Daily per capita calorie intake	−0.211	0.218	0.100 (0.039)	0.011	0.023	0.177
Daily per capita protein intake	−0.657	0.640	0.117 (0.148)	0.429	−0.173	0.406
Daily per capita fat intake	−0.862	0.852	0.206 (0.181)	0.255	−0.149	0.561
Daily per capita iron intake	−1.125	1.123	0.133 (0.200)	0.505	−0.258	0.524
Daily per capita zinc intake	−0.449	0.454	0.121 (0.098)	0.218	−0.071	0.314
Daily per capita vitamin A intake	−1.294	1.273	0.163 (0.279)	0.560	−0.384	0.710
Daily per capita calcium intake	−1.029	1.007	0.185 (0.212)	0.383	−0.231	0.601

Table A6
Some existing estimates for India.

Author(s)	Elasticity estimates	Publication outlet
Behrman & Wolfe (1984)	0.14 (Calories), 0.12 (Protein), 0.12 (Iron), 0.13 (Vitamin A)	Journal of Development Economics
Behrman & Deolalikar (1987)	0.17 (Calories), 0.06 (Protein), 0.11 (Iron)	Journal of Political Economy
Behrman & Deolalikar (1990)	0.04 (Calories), 0.04 (Protein), 0.06 (Iron)	Journal of Human Resources
Bhargava (1991)	0.06 (Calories), 0.10 (Protein), 0.01 (Iron)	Journal of the Royal Statistical Society
Subramanian & Deaton (1996)	0.36 (Calories)	Journal of Political Economy
Gaiha et al. (2013a)	0.35 to 0.43 (rural calories), 0.42 to 49 (rural protein), 0.74 to 1 (rural fat); 0.25 to 0.28 (urban calories), 0.29 to 0.44 (urban protein), 0.68 to 0.94 (urban fat)	Applied Economics
Kaicker & Gaiha (2013)	Calories: Rural poor: −0.14; Urban poor: −0.20 to −0.17	Journal of Policy Modelling
Bhuyan et al. (2020)	0.20 to 0.43 (rural calories); 0.22 to 0.33 (urban calories)	Journal of Quantitative Economics
Dutta et al. (2020)	0.52 (Calories), 0.65 (Protein), 0.72 (Iron), 0.44 (Carbohydrates), 0.94 (Calcium)	Review of Development Economics

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