



Appendix D

Imputation Method



Imputation Method

5.1 Method used for imputation of value figures of selected items received free of cost

5.1.1 In HCES: 2022-23, a provision has been made to collect information on the quantity of consumption for a number of items received and consumed by households free of cost through various social welfare programmes. Subsequently, it has been decided to generate a second set of estimates of MPCE considering the imputed values of the following items:

Free Food Items			
Sl. No.	item	Sl. No.	item
1	rice-free (061)	8	ragi-free (067)
2	wheat/atta-free (062)	9	small millets-free (068)
3	coarse grains-free (070)	10	pulse-free (071)
4	jowar-free (063)	11	gram-free (072)
5	bajra-free (064)	12	salt-free (073)
6	maize-free (065)	13	sugar-free (074)
7	barley-free (066)	14	edible oil-free (075)

Free Non-food Items			
Sl. No.	item	Sl. No.	item
1	Laptop/PC (S No. 1, Q4.3.2)	5	Motorcycle/ Scooty (S No. 5, Q4.3.2)
2	Tablet (S No. 2, Q4.3.2)	6	Clothing (School Uniform etc.) (S No. 6, Q4.3.2)
3	Mobile handset (S No. 3, Q4.3.2)	7	Footwear (School Shoe etc.) (S No. 7, Q4.3.2)
4	Bicycle (S No. 4, Q4.3.2)		

5.1.2 The value figures of these free items have been imputed by identifying the unit price at which the beneficiary household would have bought the same if it is not received free of cost. While deciding on an appropriate method of imputation, it has been assumed that all households belonging to a particular sector, state and second stage stratum (SSS) are homogeneous in terms of purchasing power and have more or less similar consumption pattern. Besides, consideration of a representative unit price for each of the imputed items at Sector × State × second stage stratum (SSS) level would also address the variation in state-level prices. Thus, the adopted imputation method has been essentially based on finding an item-wise unit price at which the majority of the households would have purchased the item during the reference period.

5.1.3 In the questionnaires of HCES, in addition to collection of information on quantity figures for items received free of cost, there is provision for gathering information on quantity and value of each of these items consumed by the households 'out of purchase' during the reference period. From these quantity and value figures of each of the items consumed by the households 'out of purchase', item-level unit prices (value/quantity) are calculated for all households belonging to a particular Sector × State × second stage stratum (SSS) level combination. Thereafter, the modal unit price for a particular item is determined at Sector × State × SSS level. In the absence of availability of sufficient number of observations at Sector × State × SSS level, the modal unit values are determined at Sector × State level. Using these item-wise modal unit prices, the total value of consumption of a particular free item is imputed as:

$$\text{Imputed value} = \text{Quantity consumed} \times \text{Modal unit value.}$$

5.1.4 For computation of Mode, Kernel Density Estimation procedure has been used *i.e.*, each discrete point (*i.e.*, each unit value) has been replaced by Gaussian distribution (kernel). The probability density at any given point in the space is then estimated to be the sum of the kernels at the chosen point over all the discrete points (after proper normalization). The rule-of-thumb bandwidth estimator has been used to approximate the width of a kernel or bandwidth.

5.1.5 In most of the cases while computing unit prices, it has been observed that sufficient observations are not present for at least one SSS (out of three) at Sector × State level. Therefore, to maintain uniformity, the unit prices for each item are calculated at the Sector × State level. The items that have been considered for imputation of the value figures of the items received free of cost are given in the tables below:

Free Items and corresponding item(s) considered for imputation: Food	
Item (value) imputed	Item(s) considered for imputation
rice-free (061)	rice-other sources (102)
wheat/atta-free (062)	wheat/atta-other sources (108)
coarse grains-free (070)	coarse grains - other sources (002)
jowar-free (063)	jowar-other sources (115)
bajra-free (064)	bajra-other sources (116)
maize-free (065)	maize-other sources (117)
barley-free (066)	barley-other sources (118)
ragi-free (067)	ragi-other sources (121)
small millets-free (068)	small millets-other sources (120)
pulse-free (071)	items 140, 141, 143, 144, 145 & 148
gram-free (072)	gram whole-other sources (142)
salt-free (073)	salt-other sources (170)
sugar-free (074)	sugar-other sources (172)
edible oil-free (075)	items 181, 184, 182 & 183

Free Items and corresponding item(s) considered for imputation: durables	
Item (value) imputed	Item(s) considered for imputation
Laptop/PC (S No. 1, Q4.3.2)	item 622 with value > Rs. 5000
Tablet (S No. 2, Q4.3.2)	item 622 with value > Rs. 5000
Mobile handset (S No. 3, Q4.3.2)	Mobile handset (item 623)
Bicycle (S No. 4, Q4.3.2)	Bicycle (item 600)
Motorcycle/ Scooty (S No. 5, Q4.3.2)	Motorcycle, scooter (item 601)
Clothing (School Uniform etc.) (S No. 6, Q4.3.2)	Unit value = (Total value reported in items 356 & 357 of Section 13.1)/number of members attending government institution as reported in Q4.2.3 of Section 4.2
Footwear (School Shoe etc.) (S No. 7, Q4.3.2)	items 390 & 394 of Section 13.2

Further, it may be noted that no imputation is done for free education and health services received by the households.