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Submission of papers/articles for Sarvekshana

'Sarvekshana' is aimed at encouraging research and analysis of NSS, Census, ASI data and other official statistics to bring about a deeper understanding of statistical data. For details about submission of papers/articles, refer to back of cover page.

Suggestions for improvement of the Journal may be addressed to:

The Managing Editor, Sarvekshana,
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Foreword

Bringing out *Sarvekshana* has always been a pleasant and enlightening endeavor. The first issue of *Sarvekshana* was released during July, 1977 and the latest released issue of *Sarvekshana* is 112th issue. The present 113th issue comes with three papers on the subjects of (i) Estimating Annual Change in Inventory for the Unorganised Sector – An Alternative Approach, (ii) Status of Morbidity and Prevalence of Disease Specific Morbidity in Assam based on NSS 75th Round and (iii) Disaggregate Level Estimation and Mapping of Time Spent by Women on Unpaid Activities Via Small Area Modeling by Integrating Survey and Census Data. In addition, the highlights of reports based on Periodic Labour Force Survey (PLFS) 2020-21 namely '*Annual Report of Periodic Labour Force Survey (PLFS) July 2020 – June 2021*' and '*Migration in India 2020 - 2021*' have also been included in the 113th issue.

Referees have been kind in examining the papers in detail and offering their suggestions in a short span of time. So have been the Members of the Editorial Advisory Board. I offer my sincere gratitude to them and solicit continued support for the Journal. Authors of the papers too have been cooperative in acceding to the suggestions for repetitive revisions. I congratulate them for their work. Officers of Survey Coordination Division of National Statistical Office have been meticulous at various stages of publication and their hard work deserves appreciation.

The *Sarvekshana* is a known Journal among researchers, academicians and policy makers. I welcome students, researchers, Government officials and others working on data based on sample surveys and censuses to contribute papers for this Journal.

G. C. Manna

New Delhi
October, 2022

Chairman
Editorial Advisory Board

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PART-I

TECHNICAL PAPERS

Estimating Annual Change in Inventory for the Unorganised Sector–An Alternative Approach

Dipankar Mitra[1,2]

Abstract

Estimating Change in Inventories (*CII*) poses one of the most difficult problems in compilation of National Accounts Statistics (NAS). The currently available estimates of *CII* are among the weakest estimates used for compilation of the NAS in India. Generally, the estimates of *CII* are compiled separately for organised and unorganised sectors of the economy. For the organised sector, the estimates of annual *CII* are based on figures reported in the annual accounts maintained by units. On the other hand, for the unorganised sector these are mostly obtained from the monthly memory-based figures reported by a sample of units of surveys on unorganised non-agricultural enterprises conducted by the NSO, MoSPI. The estimates of annual *CII* are subject to very high Relative Standard Error (RSE). The present study is a modest attempt to critically examine the current method of estimation of annual *CII* for the unorganised sector and suggest an alternative method. Based on the results of the study, the proposed alternative method seems to perform better than the current method in terms of RSE and Relative Bias (RB) for each of the six experimental simulated populations created for comparing the two methods.

Key Words: Change in Inventories (*CII*), Simulation, Unorganised sector, Annual Survey of Industries (ASI), National Accounts Statistics (NAS)
JEL Codes: C13, C18

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1. Introduction

As per the New Series of National Accounts Statistics (NAS) with base year 2011-12, the Indian economy is divided into organised sector and unorganised or household sector. Although the unorganised sector has a relatively small contribution to total Gross Value Added (GVA), it has an overwhelming presence in the economy in terms of number of units and workforce. For instance, the contribution of unorganised sector in the GVA of manufacturing activities is about 17.6%, but it accounts for 99% of the manufacturing units and 77% of total workers engaged in manufacturing activities. Hence, much as the other developing countries, employment in the unorganized sector is the economic mainstay of millions in India. A high proportion of socially and economically under privileged sections of the society depend heavily on unorganized sector activities.

With very limited regulatory control over its units, policy makers are constrained to rely on non-administrative data sources for devising effective policy interventions for the unorganised sector. The Enterprise Surveys (ESs) conducted periodically by NSO, MoSPI, for unincorporated non-agricultural enterprises are the main source of data for the unorganised sector. Important performance indicators of the unorganized sector, such as Gross Value Added Per Worker (GVAPW), Gross Value Added Per Employee (GVAPE), total output, total input, number of estimated enterprises, estimated number of employed persons and annual change in inventory etc. are based on the sample survey results. But, due to the volatile nature and data non-availability issues it is not always possible to estimate all the operational and economic characteristics of unorganized sector with high precision. One such parameter is the annual Change in Inventories (*CII*).

Estimating annual *CII* of the unorganized sector poses one of the most difficult measurement problems in compilation of the NAS. Rise and fall in annual *CII* is an important pointer of economic cycles. Unplanned rise in inventories is an early sign of a recession in the offing. The item-wise estimates of *CII* serve as indicators of imminent economic booms and recessions. Unfortunately, estimates of *CII* of the unorganized sector in India are the weakest among the available economic indicators. As it appears, there is no usable estimate of annual *CII* for the unorganized sector. Besides, the required unorganized sector data for compiling annual NAS are as yet not available for every year, as the unorganized sector enterprise surveys for manufacturing, trade and other services have so far been conducted mostly once in five years. With the introduction of the proposed Annual Survey for Unincorporated Sector Enterprises (ASUSE), this vital data gap is expected to be closed soon in the coming years. But, even then a methodological problem of using monthly *CII* data for estimating annual *CII* will continue to persist.

Against this backdrop, the present study is undertaken to investigate the limitations of the current method of estimation of *CII* of the unorganised sector and suggest an alternative method for estimating *CII* from the ASUSE being conducted annually since 2021.

Unlike the organized sector, in which every unit maintains a book of accounts, annual *CII* are estimated from the memory-based monthly data in unorganised sector. Enterprise Surveys (ESs) have so far been conducted periodically for unorganised non-agricultural sector mostly with a reference period of last 30 days preceding the date of survey or last month to collect the data on most of the items. The monthly estimates of different principal characteristics like GVA, monthly *CII* (CII_m) are calculated using these memory-based data. The monthly estimates so obtained are converted into annual estimates by using a suitable conversion factor. Most commonly, 365/30 or 12 is used for perennial enterprises and the number of operating months for seasonal and casual enterprises. The present study focuses on the most commonly used conversion factor and examines the annual estimates of change in inventories, $CII_A = CII_m \times 12$.

In fact, the annual estimates of economic parameters obtained from the Enterprise Surveys are based on an additional stage of sampling – sampling 30 days out of 365 days for each unit in the sample. Hence, these estimates are subject to unduly high sampling error. The annual estimate of *CII*, especially, is worst affected, and the CII_m reported by sample units take both positive and negative values.

Table-1 exhibits the problem of low reliability of the annual *CII* estimates derived from the reported monthly *CII* data. The annual estimates of *CII* for raw material, finished goods and goods for resale, even at the most aggregated level are all subject to RSE higher than 20%. This calls for close examination for identification of possible reasons. Very high RSE*s* of the annual *CII* estimates (*CIIa*) also necessitate exploring for alternative methods.

Table-1: Sector Wise RSE (%) of the Estimates of Some Selected Characteristics of Non-Agricultural Unincorporated Enterprises Engaged in Market Production

Sector	Est. Ent.	Workers	GVA	***CIIa* of** Raw Materials	Finished Goods	Semi-Finished Goods	Goods for Resale	Fixed Assets
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Rural	1.65	1.99	2.65	54.73	73.90	10.43	6.48	3.18
Urban	2.95	3.04	3.42	186.10	89.29	9.23	25.71	6.41
Combined	1.75	1.99	2.58	153.98	58.03	6.96	22.63	4.73

Source: Computed from NSS 73rd Round Unit-Level Data.

The present section, Section-1, introduces the problem addressed in the study. Section-2 describes the methodology adopted for the study. This includes a detailed description of construction of an experimental population and the sampling and estimation procedures used for making an empirical comparison between the current and the proposed methods examined in the study. Section-3 presents the results of the study and is followed by Section-4 presenting the main conclusions drawn from them.

2. Material and Method

2.1 Data

This study uses the unit level data on NSS 73rd round (2015-16) carried out on unincorporated non-agricultural enterprises (excluding construction) for unorganized sector. Apart from this, two consecutive years ASI panel data for the years 2014-15 and 2015-16 has also been used in this study for carrying out the desired analysis.

2.2 Methodology

The study is planned to be conducted mainly in four steps as follows:

i. *Preparation of Study Population*: The study population is prepared using ASI panel data for the years 2014-15 and 2015-16.
ii. *Creation of Experimental Populations*: From the study population a few experimental populations are created borrowing seasonal patterns observed in the NSS 73rd round data using simulation techniques.
iii. *Selection of Sample*: In this step, independent sets of samples are selected from each of the six experimental populations to calculate different statistics.
iv. *Comparison of Efficiency*: For each of the experimental populations, the efficiency of the current method of annual total *CII* estimation is compared with that of the proposed method of estimation.

2.2.1 Preparation of Study Population

Since data for two consecutive years are, as yet, not available from the enterprise surveys for unorganized sector, two consecutive years ASI panel data viz. 2014-15 and 2015-16 are used for the study. The ASI 2014-15 and 2015-16 panel data consist of total 63296 and 65110 factories respectively. For ease of calculation, a subset of matched units between these two years panel data is identified under the following conditions:

i. Units should have same factory code over the panels which is a unique 8-digit code assigned to each factory.
ii. Units should be surveyed as 'OPEN' either in two years i.e., having unit status code[3] '1' in either in 2014-15 or in 2015-16.
iii. Units should report total inventory of that factory i.e., units should report the value for closing and opening stock of at least one of the five inventory categories viz. raw materials and components and packing materials, fuels and lubricants, Spares, Stores and others, semi-finished goods/work in progress and finished goods.

The total number of matched units between two years 2014-15 and 2015-16 which have reported total inventory item is 31429. Based on the status of a unit in two years, the number of matched units is shown in Table-2.

Table-2: Distribution of Matched units Between two Panels by Status of Unit

Units with status code = '1' i.e., 'open'	No. of units
(1)	**(2)**
Both in 2014-15 and 2015-16	30601
In 2014-15 but not in 2015-16	397
In 2015-16 but not in 2014-15	100
Not in both 2014-15 and 2015-16	331
Total	**31429**

Source: Computed from ASI Panel Data

[3]In ASI the codes used for 'status of units' are as: 1-Open, 2-Existing with fixed assets and maintaining staff but not having production, 3-Deleted, 5-Existing but non-response due to closure and owner / occupier is not traceable, 7-Non-response due to production not yet started or accounting year not closed during the year and 8-Non-response due to other reasons.

Among total 31429 units, 31098 units have the unit status code as '1' which means 'Open' either in any of these two years. Out of 31098 units in ASI 2015-16 panel data, 25 units have not reported the total employee information. The remaining 31073 units are divided into seven bins (1-9; 10-19; 20-49; 50-99; 100-199, 200-299 and 300 + workers) depending on average number of persons employed in 2015-16. Similarly, the surveyed enterprises obtained from NSS 73rd round are also distributed over the same seven size-categories.

As the operational and economic characteristics of unorganized sector units are very different from those of ASI units, only the smaller ones among the ASI units, i.e., only the units with less than 20 workers are considered for the study. Tables (3 & 4) give distributions of surveyed and estimated units for organized and unorganized sectors by the firm size (in terms of number of workers) obtained from ASI 2015-16 panel data and NSS 73rd round unit level data respectively. The percentage shares of different size-classes in total estimated units are also shown in the tables.

Table-3 shows that there are 7640 surveyed factories (2810 rural + 4830 urban) in ASI panel 2015-16 data having less than 20 workers. Out of these, 5926 units that have reported the CS of the previous year as the OS of the current year constitutes the study population.

Table-3: Distribution of Surveyed and Estimated ASI Units by Firm Size

Firm size	Number of Surveyed Ent.			Number of Estimated Ent.			% Share of Estimated Ent.		
	Rural	Urban	Combined	Rural	Urban	Combined	Rural	Urban	Combined
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1-9	1323	2468	3791	2787	5123	7910	13.93	19.14	16.91
10-19	1487	2362	3849	3276	5563	8839	16.37	20.79	18.90
20-49	1670	2313	3983	3363	4859	8222	16.80	18.16	17.58
50-99	1460	1590	3050	2357	2563	4920	11.78	9.58	10.52
100-199	3021	3097	6118	3235	3308	6543	16.17	12.36	13.99
200-299	1436	1590	3026	1454	1623	3077	7.27	6.06	6.58
300+	3450	3716	7256	3540	3723	7263	17.69	13.91	15.53
Total	**13937**	**17136**	**31073**	**20012**	**26762**	**46774**	**42.78**	**57.22**	**100.00**

Source: Computed from ASI panel data.

Table-4: Distribution of Surveyed and Estimated Enterprises in NSS 73rd Round by Firm Size

Firm size	Number of Surveyed Ent.			Number of Estimated Ent.			% Share of Estimated Ent.		
	Rural	Urban	Comb.	Rural	Urban	Comb.	Rural	Urban	Comb.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1-9	138307	142051	280358	32314781	30514524	62829305	99.46	98.75	99.11
10-19	2455	3290	5745	132615	316796	449411	0.41	1.03	0.71
20-49	1875	1284	3159	32615	57702	90317	0.00	0.11	0.14
50-99	324	213	537	6371	10146	16517	0.00	0.02	0.03
100-199	155	71	226	2306	2624	4930	0.01	0.01	0.01
200-299	32	10	42	584	121	705	0.00	0.00	0.00
300+	31	15	46	397	391	788	0.00	0.00	0.00
Total	**143179**	**146934**	**290113**	**32489669**	**30902304**	**63391973**	**51.25**	**48.75**	**100.00**

Source: Computed from NSS 73rd Round Unit-Level Data.

Table-5 presents some of the principal characteristics *CII* of the study population consisting of 5926 'small' ASI units. For each of the inventory type like raw material, fuel, semi-finished and finished goods, the total annual *CII* (CII_A) are estimated as:

$$\widehat{CII}_A = \widehat{CS}_t - \widehat{OS}_t$$

where $\widehat{CS}_t$ and $\widehat{OS}_t$ are the annual estimates of total Closing Stock (CS) and Opening Stock (OS) of a particular inventory type based on the study population. Henceforth, these estimates are treated as the parameter of the study population.

Table-5: Principal Characteristics of Study Population

(Values in ₹ Lakh Unless Otherwise Mentioned)

Characteristics		Estimates
(1)		(2)
Number of surveyed factories		5926
Number of estimated factories/factories in operation		12873
Total output		4534399
Total input		4077066
GVA		457333
Workers		88619
Employees		130723
Total *CII*		-26886
(i)	Raw Materials	-13533
(ii)	Fuels	-391
(iii)	Others	-116
(iv)	Semi-finished goods	-13078
(v)	Finished goods	232

Source: Author's Calculation.

2.2.2 Creation of Experimental Populations for the Year 2015-16

Next, a few experimental populations are simulated for the year 2015-16 superimposing seasonality patterns observed in the NSS 73rd round data. The steps of simulation are described in some detail in the following sub-sections.

2.2.2.1 Ascertaining 'Survey Month' from the Date of Survey of NSS 73rd Round

The seasonal patterns of acquisition and disposal of inventories observed in the NSS 73rd round are used in the present study for comparison of efficiency of the current and proposed methods of estimating annual *CII*. From the unit-level dataset, the 'survey month' is ascertained using the entries of date of survey of each unit. For the units with missing date of survey entries, imputed values of "survey month" are used.

Table-6 shows the month-wise distribution of number of surveyed and estimated enterprises, obtained after imputation of missing 'date of survey'. It is seen that the number of surveyed enterprises is more or less uniformly distributed over all the months, except July, the starting month of the survey.

Table-6: Month Wise Distribution of Enterprises

Month	Number of Units Surveyed	Share of Survey Months in Units Surveyed (%)	Estimated Number of Units
(1)	(2)	(3)	(4)
July	16,118	5.556	43,44,218
August	26,788	9.234	61,10,556
September	28,010	9.655	63,03,569
October	22,421	7.728	51,16,512
November	23,602	8.135	53,74,207
December	23,883	8.232	50,77,007
January	23,331	8.042	52,75,647
February	26,345	9.081	56,59,281
March	25,741	8.873	49,75,964
April	24,777	8.540	54,59,819
May	27,579	9.506	61,67,558
June	21,518	7.417	35,27,636
Total	**2,90,113**	**100.00**	**6,33,91,974**

Source: Computed from NSS 73rd round unit-level data.

2.2.2.2 Seasonal fluctuation of raw materials purchase from NSS 73rd round data

From the unit-level dataset of NSS 73rd round, the food processing units (NIC-08 Div. 10 excluding 105) are considered for tracing seasonal fluctuation in raw materials purchase. The raw materials selected for this purpose are those with (3-digit) product code[4] '011' to '529' and are reported to have been purchased by at least 100 sampled units. Five product codes satisfying this criterion and eventually selected for the study, viz. '011', '012', '021', '043' and '221', are found to have distinctly different seasonal patterns of purchase by the food processing units (Table-7). The value shown for each of the selected products in the last row of the table is a simple measure of degree of monthly fluctuation, *RR*, defined as

$$RR = \frac{P_m^{max} - P_m^{min}}{\bar{P}}$$

Where, P_m^{max} and P_m^{min} respectively represent the maximum and minimum monthly purchase value for each of the product code respectively and $\bar{P}$ the average of total monthly purchases. Note that (i)$0 \leq RR \leq 12$, (ii) *RR* = 0 indicates complete absence of monthly fluctuation and (iii) *RR* = 12 indicate all the purchases are made in a single month. Also note that the 5 products selected for the study have widely different values of *RR*, so that the comparison of the current and proposed method of estimating annual *CII* can be made for varying degrees of seasonality.

[4]According to the Structured three-digit product codes for goods inputs/ outputs of NSS 73rd round the description of '012', '043', '221', '021'and '011' are as: '012'-Wheat, '011'-Paddy, '021'-Sugarcane, '043'-Egg and poultry and '221'-Processed fruits & Processed Vegetables.

Table-7: Estimated Total Monthly Purchase (in Lakh Rs.) and Number of Enterprises for Different Product Codes

Month	Product code '012' Purchase	'012' Est. Ent.	'043' Purchase	'043' Est. Ent.	'221' Purchase	'221' Est. Ent.	'021' Purchase	'021' Est. Ent.	'011' Purchase	'011' Est. Ent.
	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
July	666	4546	3865	10160	276	1530	28	110	1819	15061
August	399	4366	12371	25934	930	2273	1101	2519	4671	12708
September	1134	6302	11310	31568	2175	6077	496	461	1744	2691
October	537	4677	5680	15567	1242	2875	1115	2087	4166	4232
November	1121	6275	9816	18517	431	1911	3374	2242	1630	3884
December	25935	4843	13294	25907	568	1653	1364	487	1155	6783
January	1406	5079	5784	14836	678	1420	5433	1696	5642	43842
February	1616	2465	10929	20031	340	645	1593	705	681	517
March	1032.2	2807	10988	25915	1786	3792	696	63	604	534
April	281	1319	8942	15975	470	1021	2946	2387	544	2747
May	212	891	15902	26609	11021	13948	7626	15236	19749	18383
June	487	3146	8422	16526	84	181	1912	496	492	672
Total	34825	46716	117304	247545	20001	37326	27684	28489	42897	112054
RR	**8.86**		**1.23**		**6.56**		**3.29**		**5.39**	

Source: Computed from NSS 73rd round unit-level data.

2.2.2.3 Deriving seasonal factors

For each of the selected product-codes, seasonal factors are derived from the estimates of their monthly purchase values. From the product-wise purchase value reported by food processing industry (NIC-08 Div. 10 excluding Group 105) the seasonal factors are computed for the 12 months as the ratio between the monthly estimated purchase per enterprise and the annual estimated purchase per enterprise as follows:

$$SF'_m = \frac{P_m/E_m}{P_A/E_A}$$

Where, SF'_m is the seasonal factor of the m^{th} months $(m = 1,2,\ldots,12)$; P_m and E_m are the estimates of total purchase and number of enterprises for the units surveyed in the m^{th} month. Note that $P_A(= 12 \times \sum_{m=1}^{12} P_m)$ and $E_A(= \sum_{m=1}^{12} E_m)$ are the annual estimates of total purchase and number of enterprises.

The factors are standardised on pro-rata basis so that their sum is one. Hence the final adjusted seasonal factor of the m^{th} is obtained as

$$SF_m = \frac{SF'_m}{\sum_{m=1}^{12} SF'_m}$$

Table-8 presents the adjusted seasonal factors for the 12 survey months for each of the 5 selected product codes. A hypothetical product with *RR*=0 is also included for comparison of the two estimation methods. Figure-1 shows the seasonal factors of all the six selected products.

Table-8: Adjusted Seasonal Factors for Different Survey Months and Selected Product Codes

Month	Product code				
	‘012’	‘043’	‘221’	‘021’	‘011’
(1)	(2)	(3)	(4)	(5)	(6)
July	0.0184	0.0673	0.0351	0.0087	0.0166
August	0.0115	0.0844	0.0796	0.0152	0.0504
September	0.0226	0.0634	0.0697	0.0375	0.0889
October	0.0144	0.0646	0.0841	0.0186	0.1350
November	0.0224	0.0938	0.0439	0.0524	0.0575
December	0.6717	0.0908	0.0669	0.0976	0.0233
January	0.0347	0.0690	0.0929	0.1116	0.0176
February	0.0822	0.0966	0.1025	0.0787	0.1807
March	0.0461	0.0750	0.0917	0.3849	0.1552
April	0.0267	0.0991	0.0896	0.0430	0.0271
May	0.0299	0.1058	0.1538	0.0174	0.1473
June	0.0194	0.0902	0.0904	0.1343	0.1004

Source: Computed from NSS 73rd round unit-level data.

2.2.2.4 Constructing Experimental Populations CII

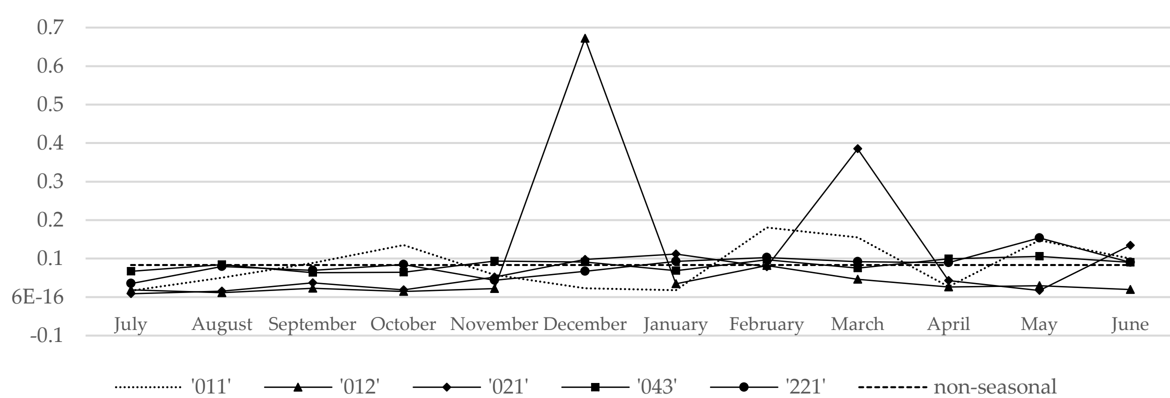
Six experimental populations are constructed for the study. Each of these consists of the selected 5926 ASI units and represents units having one of the selected products as their main raw material. For each of the units, the monthly purchases are simulated using the seasonality patterns observed in the NSS 73rd round dataset.

The value of raw material consumed, raw material purchased, opening and closing stocks of raw materials are related in the following manner

Value of raw material consumed = OS + value of raw material purchased – CS

or CII_A = Annual total raw material purchased (RM_{P_A}) – Annual total raw material consumed (RM_{C_A})

Figure-1: Adjusted Seasonal Factors for Different Survey Months



From the purchase value (valued at delivered prices) of total basic raw materials consumed by a unit, the annual total purchase value for raw materials consumed is calculated for each of the 5926 units. The annual value of total purchase of raw materials purchased is obtained as the sum of annual total value of raw material consumed and CII_A. The monthly values of purchase of raw materials are obtained by multiplying the adjusted seasonal factor (as in Table-8) with total annual purchase value of raw material.

To obtain the monthly *CII* values it is assumed that the annual estimates of raw material consumed is evenly distributed over the months i.e., there is no seasonal fluctuation in the use of raw materials. An additive error term is also introduced in the *CII* values thus computed. While generating the monthly purchase value of raw materials consumed the totality constraint is taken care of so that the total value of monthly *CII* be equal to annual *CII*.

Corresponding to 6 *RR* values 6 experimental populations consisting of monthly *CII* data of raw materials for 5926 units are generated using the following relation,

$$CII'_m = RM_{P_m} - RM_{C_m}$$

Where, CII'_m, $RM_{P_m} = RM_{P_A}/12$ and $RM_{C_m} = RM_{C_A} \times SF_m$ are the total *CII* for raw material, total value of raw materials purchased and total value of raw materials consumed the m^{th} $(m = 1,2, \dots ,12)$ month respectively.

Then the simulated monthly *CII* data (CII''_m) for raw material are obtained from these generated monthly figures for each of the 6 populations as

$$CII''_m = CII'_m + e_m$$

Where, e_m is an additive error term with mean 0 and variance as the semi range calculated from the CII'_m data. Finally, the CII''_m data are approportionated to the sum of CII_A using the mathematical relationship,

$$CII_m = CII''_m \times \frac{CII_A}{\sum_{m=1}^{12} CII''_m}$$

For the population with no seasonality, the monthly CII values are obtained as

$$CII_m = CII_A/12$$

2.2.3 Sampling Design Adopted for the Study

A mixture of Simple Random Sampling Without Replacement (SRSWOR) and Linear Systematic Sampling (LSS) is adopted for sampling the units in this study. The sampling design consists of the following two major steps:

i. First of all, a sample of size (n) are drawn out of 5926 units from each of the 6 experimental populations using SRSWOR sampling scheme.
ii. Then, the sampled units are arranged in the order of their selection followed by the allocation of sampled units into 12 months along the line of allocating sampled units in 4 sub-rounds as was done in *the* NSS 73^{rd} round. The n sampled units are allocated to 12 survey months using the following operation.

If the order of selection of i^{th} $(i = 1,2, \dots , n)$ sample unit, is x_i, then survey month (m_i) of the i^{th} unit will be

m_i = [x_i modulo 12] if it is >0

= 12, otherwise.

The standard formula for estimation of sampling variance of SRSWOR and LSS designs cannot be applied in this case because it is a mixture of both these sampling designs. In the absence of a standard formula to estimate the sampling variance for this particular sampling design, 1000 sets of independent samples each of size 300 are drawn from each of the experimental population to estimate the sampling variance of the estimates obtained by the current and proposed method of estimation.

2.2.4 Estimation of Relative Bias (RB) and Relative Standard Error (RSE)

For each of the 6 experimental populations, the parameter to be estimated is the annual *CII* and its value is -13533 (₹ Lakh), which is the estimate obtained from the selected 5926 ASI units.

The 1000 independent samples of size 300 (sampling fraction approximately 5%) are first selected from each of the populations by SRSWOR. Having selected the 300 sampled units by SRSWOR, these are allocated to 12 months following a linear systematic scheme for each experimental population. Note that, under such selection scheme, the standard SRSWOR variance estimators of totals are biased because of the systematic allocation of the SRSWOR sample over the 12 months.

For each of the 1000 replicate samples, the estimate of annual total *CII* (CII_A) by the current method and estimates of CS for proposed method are estimated as follows:

Current Method: $\widehat{CII}_{A_i}^{curr} = \frac{N}{n}\sum_{j=1}^{n}(CII_{m_j}^{i} \times 12)$, where $CII_{m_j}^{i}$ is the *CII* of the j^{th}($j = 1, 2 \ldots, n$) sampled unit of the i^{th} replicate ($i = 1, 2 \ldots, 1000$) surveyed in the m^{th} ($m = 1, 2, \ldots, 12$).

Proposed Method: $\widehat{CS}_t^i = \frac{N}{n}\sum_{j=1}^{n} CS_{t_j}^{i}$, where $\widehat{CS}_t^i$ and $CS_{t_j}^{i}$ represent the estimated CS obtained from the i^{th} replicate and the value of CS of the j^{th} sampled unit in the i^{th} replicate for the current year.

For each replicate the estimates of Relative Bias (RB) are obtained for the current methodology as

$$\widehat{RB}(\widehat{CII}_{A_i}^{curr}) = \frac{\left(\widehat{CII}_{A_i}^{curr} - CII_A\right)}{CII_A} \times 100$$

Finally, the estimated RB based on 1000 replicates for each of the 6 experimental populations is computed as

$$\widehat{RB}(\widehat{CII}_{A}^{curr}) = \frac{1}{1000}\sum_{i=1}^{1000}\widehat{RB}(\widehat{CII}_{A_i}^{curr}) \quad (1)$$

The estimate of Mean Square Error of the estimate is obtained from the current method ($\widehat{CII}_{A}^{curr}$)

$$\widehat{MSE}\left(\widehat{CII}_{A}^{curr}\right) = \frac{1}{1000}\sum_{i=1}^{1000}(\widehat{CII}_{A_i}^{curr} - CII_A)^2 \quad (2)$$

The estimated Relative Standard Error (RSE) is calculated for each of the population for the current method as

$$\widehat{RSE}(\widehat{CII}_{A}^{curr}) = \frac{\sqrt{\widehat{MSE}(\widehat{CII}_{A}^{curr})}}{CII_A} \times 100 \quad (3)$$

The estimated relative bias of the estimated CSs is obtained based on the 1000 replicates as

$$\widehat{RB}(\widehat{CS}_t) = \frac{1}{1000}\sum_{i=1}^{1000}\left[\frac{(\widehat{CS}_t^i - CS_t)}{CS_t}\right] \times 100 \tag{4}$$

Where, the $\widehat{CS}_t^i$ and CS_t are respectively the estimated CS from the i^{th} replicate and true value of population CS for the current year.

The proposed methodology consists of obtaining an estimate of the *CII* for the current year as $\widehat{CS}_t - \widehat{CS}_{t-1}$.

For the proposed methodology, the estimate of sampling variance of $\widehat{CII}_A^{prop}$ is given by

$$\widehat{Var}\left(\widehat{CII}_A^{prop}\right) = \widehat{Var}\left(\widehat{CS}_t - \widehat{CS}_{t-1}\right) = \widehat{Var}\left(\widehat{CS}_t\right) + \widehat{Var}\left(\widehat{CS}_{t-1}\right) \tag{5}$$

The covariance of the CS estimates of the current year and preceding year is zero, since they are based on two independent samples in annual enterprise surveys of unorganised sector.

It is fairly reasonable to assume that the sampling variance of the estimated CS for the two consecutive years would be of the same order. Under such an assumption, the $\widehat{Var}\left(\widehat{CII}_A^{prop}\right)$ can be approximated by

$$\widehat{Var}\left(\widehat{CII}_A^{prop}\right) \cong 2\widehat{Var}\left(\widehat{CS}_t\right) \tag{6}$$

One way to estimate the MSE*s* of the estimator under the proposed methodology is to take the square of the deviations of the estimated CS*s* from the population CS value for each of the replicates and then take average of these squared values to get an estimate of sampling variance.

That is

$\widehat{Var}\left(\widehat{CS}_t\right) = \frac{1}{1000}\sum_{i=1}^{1000}\left(\widehat{CS}_t - CS_t\right)^2$, where CS_t is the actual value of CS of the population of 5926 units.

The estimated Relative Standard Error (RSE) is then calculated for each of the experimental populations for the proposed method as

$$\widehat{RSE}(\widehat{CII}_A^{curr}) = \frac{\sqrt{2\,.\widehat{Var}(\widehat{CS}_t)}}{CII_A} \times 100 \tag{7}$$

3. Findings

For each of the six experimental populations, the Relative Bias (RB) of the total annual *CII* by the current method and that for total annual CS are computed respectively as defined in (1) and (4). Further, the RSEs by the current and proposed methodology are computed respectively as defined in (2) and (6) for each of the six experimental populations. These are presented in Table-9.

Clearly, the estimate of annual *CII* by the proposed method has much lower RSE than that by the current method for each of the six experimental populations. Further, unlike the estimates of *CII* by the current method, which is subject to very high bias, those by the proposed method have much lower relative bias.

Table-9: Estimated RSE and RB of Estimates for the Current and Proposed Methods

Population	RB (%)		RSE (%)	
	Current	Estimated CS	Current	Proposed
(1)	(2)	(3)	(4)	(5)
Pop. 1	-8.36	-5.09	294.59	119.62
Pop. 2	26.87	-1.12	317.92	126.53
Pop. 3	-803.34	1.29	3372.04	130.99
Pop. 4	-9.64	-0.03	271.93	126.09
Pop. 5	290.11	-0.83	966.45	129.88
Pop. 6	-2.71	-3.09	207.22	118.10

Source: Author's calculation.

Though the RSEs of the annual *CII* estimates by the proposed method are much lower than those by the current method, they are undesirably high. This is mainly because the sample size for the entire exercise is fixed at 300. In practice, the sample size is expected to be much more than that. In the 73rd round the national-level sample size for the broad activity categories of 'manufacturing', 'trade' and 'services' were all more than 80 thousand. If the proposed method is applied to estimate annual *CII* for domain as large as these and sample sizes of the same order, the RSE is expected to come down to well below 10%.

4. Conclusions

The study strongly suggests superiority of the proposed method over the method currently used for estimating annual *CII*, especially when the monthly stocks of inventories of the units are subject to high seasonal fluctuations. While the current method fails to yield usable estimates of annual *CII* of unorganised sector as a whole, the proposed method appears to be capable of providing fairly reliable estimates for at least the large domains from annually conducted surveys, such as the ASUSE.

The proposed method is applicable only for estimating annual *CII* of large enough domains and from surveys conducted every year, since, by this method, it is estimated as the difference of estimated closing stocks of two consecutive years. On the other hand, apart from being subject to lower sampling error, the main advantage of adopting the proposed method is that the estimates of *CII* are expected to be largely free from the respondents' recall lapse. The reporting of closing stocks as on the date of survey should not be seriously affected by the respondents' recall lapse.

Finally, it can be concluded that the proposed method of estimating annual *CII* would provide more precise estimates if adopted for the Annual Surveys of Unorganised Sector Enterprises (ASUSE) to be conducted every year on independent samples of units. Keeping in mind that the reference period generally adopted for the ASUSE would be 'last 30 days', the following are a few advantages of applying the proposed method of estimating annual *CII* in the ASUSE:

a. For national accounts compilation, the estimates of *CII* are required for each compilation category. The required set of *CII* estimates for t^{th} accounting year could be obtained with greater precision using the proposed method of estimating difference between closing stocks of t^{th} and $(t\text{-}1)^{th}$ accounting year.

b. The proposed method permits adoption of an approach of combining the estimates obtained by it for the units not maintaining accounts with those based on directly reported annual *CII* by the units maintaining accounts. Pre-stratification of units maintaining books of accounts at the ultimate-stage selection should help in improving the efficiency of the estimates further.
c. The proposed method, modified suitably, can be applied for estimating quarterly *CII* for broader segments of the unorganized sector with fairly high precision. This, however, needs further exploration.

The proposed method of estimating annual *CII* for the unorganized sector may be examined further by applying it in practice on the data of ASUSE, once its first two annual rounds are completed. This may provide a lasting solution to the problem of estimating *CII* of the unorganised sector in India.

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References

1. NSSO (2019): Annual Survey of Industries Report (2014-15), volume-I.
2. NSSO (2020): Annual Survey of Industries Report (2015-16), volume-I.
3. NSSO (2017): NSS 73rd round (July 2015-June 2016): Operational Characteristics of Unincorporated Non-Agricultural Enterprises (Excluding Construction) in India.
4. NSSO (2017): NSS 73rd round (July 2015-June 2016): Economic
5. Characteristics of Unincorporated Non-Agricultural Enterprises (Excluding Construction) in India.
6. MoSPI (2015): Report of the Sub-Committee on System of Indian National Accounts (February, 2015) under the chairmanship A. C. Kulshreshtha.
7. Mukim, M (2011): Industry and the urge to cluster: a study of the informal sector in India, *Department of International Development*, *London School of Economics*, SERC Discussion Paper 72.
8. Mohanan, P. C. and Chopra, A. (2012). Problems and Prospects in the Use of ASI Data: A Study of ASI Panel Data, *The Journal of Industrial Statistics*, vol. 1, no 1, pp. 32-39.
9. Chattopadhyay, S. (2012). Fluctuation in ASI Data- an Empirical Study from ASI Panel Data, *The Journal of Industrial Statistics*, vol. 1, no 2, pp. 208-221.
10. Murthy, M. N (1967): Sampling theory and methods, Statistical Publishing Society, Calcutta.

Status of Morbidity and Prevalence of Disease-Specific Morbidity in Assam based on NSS 75th Round

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Abstract

This paper makes use of the NSS 75th round unit-level data for estimating morbidity and disease-specific morbidity in the Indian States, with particular reference to Assam. Assam shows a deficient level of reporting of Ailment for Acute (19 per 1000) and Chronic Aliment (6 per 1000) when compared with the highest reporting state of Kerala (74 per 1000 and 181 per 1000, respectively). The socio-economic correlates that explain morbidity reporting are also discussed based on binary logistic and multivariate logistic regression. The findings show that Assam like most other Indian States is facing prevalence of both communicable and non-communicable diseases (NCD). Morbidity reporting is significantly higher in the lowest and highest age categories and also among females. Reporting is higher in urban than rural areas. NSS region-level analysis of Assam shows high reporting of morbidity in the Western Plains region. Disease-specific morbidity at the state level in Assam for in-patient of medical institutions in the last 365 days shows equal reporting of infectious diseases for males and females. The reporting is higher in the NSS regions of Cachar Plains and Central Brahmaputra Plains. For NCDs, the reporting is higher among the females (3 per 1000) than males (2 per 1000) and the urban population. Disease-specific morbidity for a spell of Ailment reported during the last 15 days shows more infectious diseases among females (11 per 1000). Infectious disease reporting is highest in Western Plains, followed by Eastern Plains by NSS regions. NCD reporting is higher among females (3 per 1000) and in the Western Plains (14 per 1000).

Keywords: Morbidity Prevalence; Disease-Specific Morbidity; NSS Region; Health and Economic development

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1. Introduction

Studies on morbidity, based on National Sample Survey (NSS) unit-level data on self-reported morbidity, for the state of Assam, is almost negligible. This paper is an attempt to fill the gap by providing us unit-level estimations on morbidity reporting in Assam.To understand the overall patterns of morbidity and disease burdens in Assam, we take the help of the NSS 75th round (2017-18) unit-level data on *Social Consumption for Health*.

This paper is discussed in four sections. The first section discusses the literature on self-reported morbidity and the use of NSS unit-level data and self-reported morbidity studies. The second section discusses the data used for estimation and the methods used.The third section brings out the socio-economic correlates of morbidity status in Assam, followed by a binary logistic and multivariate logistic regression. Section four discusses the results and limitations of the exercise.

1.1 Self-Reported Morbidity

Morbidity refers to a state of being in ill health. Two fundamental types of morbidity measures are discussed in the health literature. They are self-reported morbidity and observed morbidity. Self-reported morbidity is an individual's perception of his or her health status and is a response to an inquiry about health. Observed morbidity is assessed by an independent trained observer who employs specific methods to ascertain the state of illness of an individual. Some of the early works done on morbidity measures by Belcher, Neumann, Wurapa, and Lourie (1976) have argued that self-reported morbidity and observed morbidity measure fundamentally different aspects of illnesses and diseases, the former based on comparisons about conditions reported and the latter based on clinical examinations of thesame sample population. Scholars such as Murray and Chen (1992) have elaborated analytical frameworks to assess health status based on self-reported morbidity, observed morbidity, and mortality.

In developing countries like India, self-reported morbidity is one of the most common measures used in morbidity reporting. The NSS largely relies on self-reported morbidity statistics, as people's health-seeking behavior in the form of institutional and hospitalization care is either not much available or reliable (see, e.g., Shariff, 1995). At the same time, there are limitations of self-perceived morbidity in terms of consistency and reliability. However, Murray and Chen (1992) highlight some advantages of considering self-reported morbidity as a measure. (i) Perceived illness is in itself a significant social phenomenon as if more and more people feel ill, it reflects on the general level of wellbeing of a population, (ii) Self-perceived morbidity provides critical information on the relevance of the disease to the individual and the impact pain and suffering due to the disease has on the individual concerned, (iii) Self-perceived morbidity can be a valuable tool for monitoring changes in the burden of disease.

Irrespective of whether we consider self-reported or observed morbidity, the presence of illness can be measured by incidence of morbidity or prevalence of morbidity. The incidence rate of morbidity measures the frequency of illness commencing during a defined period, whereas, prevalence rate of morbidity measures the frequency of illness in existence at any time during a defined period.

1.2 NSS and Self-Reported Morbidity in India

Morbidity data at all-India level from secondary source is mainly available from National Sample Survey. NSS is the oldest data source that has provided morbidity data for India since the 1950*s*.

The very first attempt to collect data on health and morbidity was made by NSS in its 7th round (October 1953-March 1954). This survey and the morbidity surveys conducted in the three subsequent rounds (the 11th to 13th round, 1956-58) were all exploratory in nature. A full-scale survey on morbidity was conducted in the 28th round (October 1973 - June 1974). Since then, the NSS had not undertaken any separate morbidity survey, and data on morbidity became a part of the decennial surveys on social consumption. The second survey on Social Consumption was carried out in the 42nd round (July 1986 - June 1987). Topics like problems of aged persons were included in this round. The third Survey on Social Consumption was carried out in the 52nd round (July 1995 - June 1996). In the 60th round of NSS (January-June 2004), a survey on morbidity and health care, including the problems of aged persons, was carried out. Since then, there has been no NSS survey on health until the 71st round during January - June 2014 (NSS, 2016) followed by the very recent round 75th round July 2017- June 2018 (NSS, 2020).

1.2.1 Studies Based on NSS data

There have been various studies asessing trends and patterns of morbidity in India based on NSS data. Srinivasan et al. (2017) give an overall picture of morbidity based on NSS data since the independence of India. The study analyzes and provides an account of the relative positions of major States of India on their ill-health status with respect to rural/urban, and male/female categories. Among the States in India, Kerala, Tamil Nadu, West Bengal, Punjab, and Andhra Pradesh, have relatively higher rankings (higher than national average) with respect to self-reported illness. Assam, Bihar, Madhya Pradesh, Rajasthan, Uttar Pradesh and Haryana have the lowest rankings (their self-reported ailments are far below the national average). Based on a logistic regression analysis, Srinivasan et al. (2017) also showed that males were less likely to report sickness than their female counterparts. It also showed that children (0–6 years) mostly reported by proxies[3] were more likely to report sickness than individuals between ages 6–61 years. Moreover, the results also showed that individuals who had higher educational attainment levels reported lower levels of any self-reported morbidity. Social groups significantly impact the prevalence of an ailment, especially in the case of Scheduled Tribes (ST*s*) and Other Backward Castes (OBC*s*). Some of the variables which show significant impact are age and urban residents. Age positively and significantly impacted the duration of sickness, while the income of an individual does not seem to be affecting the duration of sickness. On average, urban residents report being sick for a significantly higher number of days compared to their rural counterparts.

Sundararaman and Muraleedharan (2015) based on the summary report on health from the 71st round conducted in 2014 showed that there had been a steady increase in the gap between the proportions of ailing persons in urban and rural areas. They argued that this widening of the gap is mainly attributed to the perception that morbidity could change with cultural contexts, health awareness, and also with access to care. This is the reason that the data showed that States with the best maternal and child mortality rates like Kerala, Tamil Nadu, West Bengal, and Punjab have proportion of ailing persons far higher than those with the highest maternal and child mortalities, like Assam, Chhattisgarh, Jharkhand, and Madhya Pradesh. Even utilization is very high as shown by the very high hospitalization rate in Kerala (117 rural and 99 per 1,000 urban) which is almost twice the rate of the next state, Andhra Pradesh (59 rural and 55 urban). The study reported the outcomes of the NSS 71st round of various diseases which lead to hospitalization. It reported 24.95 percent for infections, 5.44 percent for complications in pregnancy and the newborn, and another 6.72 percent for other genito-urinary and reproductive tract problems; 11.09 percent due to external injuries and accidents and the

[3]The NSSO survey is also based on proxy reporting of morbidity, i.e. other household members report about the morbidity status of an individual.

remaining 51.8 percent coming largely but not exclusively from non-communicable diseases. Of this 51.8 percent, 10.9 percent reported as gastrointestinal, 9.09 percent as cardiovascular, 5.14 percent as respiratory diseases excluding tuberculosis, 5.97 percent as mental health or neurological health problems, 5.01 percent as eye or ear problems, and about 2 percent to 3 percent each for metabolic and endocrine causes, cancers and blood disease.

Paul and Singh (2017) threw light on the epidemiological transition in India with changes in the disease profile of its population. They used self-reported morbidity estimates across Indian States using three NSS rounds (52nd, 60th and 71st). Their results showed that cardiovascular diseases (CVD*s*) increased by seven times, disability increased by four times, and infectious diseases, and non-communicable diseases (NCD*s*), increased by nearly three times. Self-reported morbidity was persistently higher among the female population as compared to the male population irrespective of the types of morbidities reported. Urban residents reported a higher prevalence of self-reported morbidity as compared to their rural counterparts for most of the morbidities. Among the States, Assam reported the highest prevalence of infectious diseases. Kerala showed an increasing trend in CVD*s* in all three rounds of NSS. NCD*s* in Kerala increased by more than six times within a span of two decades. Tamil Nadu, Andhra Pradesh, West Bengal, Gujarat, and Rajasthan also showed an increasing trend in NCD*s* across the three rounds.

A study (Singh, 2017) on self-perceived morbidity using NSS 60th round was carried out to understand how different socio-economic determinants are associated with the level of morbidity in North East India and to asess the inequality and patterns of morbidity among the North-Eastern States. Women were found to have more illness rates than males in all the North-East States, except Sikkim. Social class was also found to have a significant influence on the health status of the population. The scheduled caste community reported the highest rate of illness among all the social classes. Enabling factors like education and income also have a significant impact on illness rate.

In the backdrop of the literature discussed so far in the above section, the main objective of our paper is to understand the recent pattern of morbidity reporting and disease-specific morbidity in Indian States and in the state of Assam based on the NSS 75th round. Studies show variations at the inter-state level with difference in reporting of morbidity as well as disease-specific morbidity. Most of the studies show Assam appears in the bottom five States in terms of morbidity reporting. Literature shows, that various socio-economic and demographic factors affect reporting of morbidity. Therefore, for the State of Assam, we try to understand the morbidity patterns in the overall population and their association with various demographic and socio-economic variables. We try to locate which are the most vulnerable regions and population groups and the variables that contribute most to morbidity prevalence.

2. Data and Methods

We use NSS unit-level data to study the morbidity pattern of Other States and Assam.The NSS 75th round (2017-2018) Social Consumption Health round has been used. The all-India sample size at the individual level of the 75th round is 555115 persons covering 113823 households. At the Assam State level, the individual sample size is 18463 and the corresponding household sample size is 3744. The Assam state sample for the 75th round is still under process and is not available. All analysis are based on the central sample.

For the 75th round, data were collected separately for reporting of morbidity for acute ailment and chronic ailment at the individual level. Data on acute ailment was collected for a reference period of 15 days and for chronic ailment data was collected for ailment continuing for more than one month.

Data on disease-specific morbidity or the nature of ailment was collected under two heads: i) nature of ailment reported as an in-patient of medical institution during the last 365 days and ii) nature of ailment reported for spell of ailment of household members during the last 15 days.

Disease-specific morbidity reported as an in-patient of medical institution during the last 365 days includes the nature of ailment reported for all the cases of hospitalization by any member of the household during the last 365 days. The cases of hospitalization considered are different persons of the household hospitalized, same person hospitalized in two different hospitals, and same person hospitalized in the same hospital for two different ailments or two different spells of ailment.

Disease-specific morbidity for spell of ailment of household members during the last 15 days includes cases of persons who are ailing during the last 15 days from at least one chronic ailment and also persons who are suffering from at least one other (non-chronic) aliment. Cases of spell of ailment during the last 15 days include ailments of different persons, two ailments of different nature of the same person and two different spells of ailment of the same nature of the same person.

Data for the nature of ailment for both the above-mentioned cases were collected for 61 different types of diseases in NSS 75th round.

For our analysis, we have classified the 61 different types of diseases into five broad categories of infectious diseases, Cardio Vascular Diseases (CVD), Non-Communicable Diseases (NCDs), Disability, and Other Diseases. The classification of disease has been done according to the International Classification of Disease (WHO). (Disease list Table-A3 in *Appendix*).

2.1 Descriptive Statistics

Prevalence of morbidity has been calculated for both acute and chronic ailments reported by individuals. Reporting of disease-specific morbidity is also calculated for all the five categories of diseases in all the States of India. For our analysis at the Indian state level, we have categorized the Indian States and Union Territories into six broad groups: Northern Region, Southern Region, Eastern Region, Western Region, North Eastern Region, and Central Region.

Table 1: State Regions of India

Northern Region	Southern Region	Eastern Region	Western Region	North Eastern Region	Central Region
Chandigarh, Delhi, Haryana, Himachal Pradesh, Jammu & Kashmir, Punjab and Rajasthan	Andaman & Nicobar Islands, Andhra Pradesh, Karnataka, Kerala, Puducherry, Tamil Nadu and Telangana	Bihar, Jharkhand, Odisha and West Bengal	Dadra & Nagar Haveli, Daman & Diu, Goa, Gujarat, Lakshadweep and Maharashtra	Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura	Chhattisgarh, Madhya Pradesh, Uttarakhand and Uttar Pradesh

For the state of Assam prevalence of morbidity both acute and chronic as well as disease-specific morbidity is also calculated by twelve background characteristics. The background characteristics are categorized under various heads. Under **demographic characteristics,** we consider gender, age, marital status, social group, and religion. Under **socio-economic factors,** we have considered wealth quintile, education, household size, activity status, and coverage under health insurance. For **geographic factors,** we have considered place of residence (Rural and Urban) and NSS State Regions. Assam has four NSS state regions: Western Plains, Eastern Plains, Cachar Plains, and Central Brahmaputra Plains (NSS States Regions Districts List Table-A4 in *Appendix*).

2.1.1 Prevalence of Morbidity

Prevalence of self-reported morbidity is calculated in terms of number of persons reporting morbidity per thousand population. Weights were assigned to the samples to estimate the prevalence of morbidity at the population level. The weights assigned to make the estimation at population level were the pre-assigned weights provided by NSS for each round. All statistical and econometric analysis was carried out in STATA 16.

The prevalence of morbidity per thousand population is calculated by the following formula:

$$Pi = \frac{Mi}{Ti} \times 1000 \qquad (1)$$

Where,

Mi =Number of persons with a particular ailment

Ti=Total number of persons alive in the sample households

2.2 Statistical Models

For the analysis of morbidity reporting by background characteristics, logistic regression has been used. The results of the analysis have been interpreted in terms of odds ratio.

$$\text{Logit (Y)} = In[\frac{p}{1-p}] = \alpha + \beta_1 x_1 + \beta_2 x_2 + \mu_i \qquad (2)$$

Where, p is the probability of occurring of the event and $[\frac{p}{1-p}]$ is the odds of success i.e., the ratio of the probability of the eventoccurring and probability of the eventnot occurring. α is intercept, β are regression coefficients, x_i is set of predictors and u is an error term. Odds ratio has been used for interpreting the results of the regression in the data analysis (Paul. K. et. al. 2019, Abedin T. et. al. 2016).

2.2.1 Definitions of Dependent and Independent Variables

Dependent Variables

Self-reporting of acute ailment and self-reporting of chronic ailment by the individuals in the NSS 75th round are taken as the dependent variable. For disease-specific morbidity, the dependent variables considered i.e., morbidity reporting due to infectious diseases, cardio-vascular diseases (CVD), non-communicable diseases (NCDs), disability, and other diseases.

Independent Variable

Independent Variable	**Description**
Gender	The data provide information on the sex of the individuals: Male & Female. For our model, we have taken male as the reference category.
Age (in years)	For the age of the individuals, we have categorized the individuals into five groups: 0-14, 15-30, 31-45, 46-59, 60 and above. The reference category considered is 60 and above.
Marital Status	For marital status, we have considered two groups: Currently Married and Others (which includes never married, widowed,

Independent Variable	Description
	divorced/separated). We have considered other category as the reference group.
Social group	The data provides information on four social groups Scheduled Tribes (ST), Scheduled Caste (SC), Other Backward Castes (OBC) and Others. We have taken Others as the reference group.
Religion	We have categorized religion into four groups Hindu, Muslim, Christians, Others (Sikhism, Jainism, Buddhism, Zoroastrianism, others). We have taken Hindu as the reference category.
Wealth Quintile	For descriptive analysis, we have categorized five wealth quintiles based on the monthly per capita consumption expenditure (MPCE) into Poorest, Poor, Medium, Rich, and Richest. For our regression analysis, we have taken the MPCE as a continuous variable and the log of MPCE has been considered for our analysis.
Education	We have broadly categorized the education level of the individuals into four categories: Illiterate, Below Primary & Primary, Secondary & Higher Secondary, Graduate & above. We have taken illiterate as the reference category.
Household Size	For descriptive analysis, we have categorized household size into three categories: 1-4 members, 5-7 members, 8 or more members. For our regression analysis, we have taken household size as a continuous variable.
Activity Status	The usual principal activity status of the individuals was broadly categorized into four categories: Employed, Unemployed, Others, and Not in work force (which are children 0-4 years of age). Here employed category has been taken as the reference category.
Health Insurance Coverage	Health insurance has been categorized into two broad categories: Covered under health insurance and not covered under health insurance. Covered under health insurance has been taken as the reference category.
Area of Residence	Based on the place of residence the data provides information on individuals residing in rural areas and urban areas. Here urban category has been taken as the reference category.
NSS Region	Eastern Plains, Western Plains, Cachar Plains and Central Brahmaputra Plains. We have taken the Western Plains region as the reference category.

2.2.2 Binary Logistic Regression for Reporting of Morbidity (Acute and Chronic) by Background Characteristics

The dependent variable in this model is "*Reporting of Any Ailment other than chronic in last 15 days (Acute Ailment)*" if yes, the variable takes value 1, or 0 otherwise. For the model, we have considered 12 independent variables keeping in mind the variables which affect reporting of morbidity based on the literature review.

Similarly, for the second model, the dependent variable is "*Reporting of Chronic Ailment*" if yes, the variable takes 1, or 0 otherwise. The same 12 independent variables have been considered in this model.
The independent variables used for the model are described below. The functional form of the logistic regression model is:

$Y=\alpha+\beta_1$(Gender)$+\beta_2$(Age)$+\beta_3$(Marital Status)$+\beta_4$(Social Group)$+\beta_5$(Religion)$+\beta_6$(log mpce)$+\beta_7$(Education)$+\beta_8$(Household Size)$+\beta_9$(Activity Status)$+\beta_{10}$(Health Insurance)$+\beta_{11}$(Area of Residence)$+\beta_{12}$(NSS Region)$+\mu_i$

2.2.3 Multivariate Logistic Regression for Reporting of Disease Specific Morbidity by Background Characteristics

For the analysis of disease-specific morbidity reporting by background characteristics multivariate logistic regression has been used. In this model, each type of disease reported is treated as the dependent variable and the background characteristics as independent variable. The results of the analysis have been interpreted in terms of odds ratio.
The dependent variable taken for the first model is "*Reporting of Infectious Disease as In-Patient of Medical Institution*" if yes, the variable takes value 1, or 0 otherwise. The 12 independent variables considered for this model are x_1 Gender, x_2 Age, x_3 Marital Status, x_4 Social Group, x_5 Religion, x_6 log mpce, x_7 Education, x_8 Household Size, x_9 Activity Status, x_{10} Health Insurance, x_{11} Area of Residence, x_{12} NSS Region.
Similarly, we take awthe second model, where the dependent variable is "*Reporting of CVD as In-patient of Medical Institution*" if yes, the variable takes 1, or 0 otherwise. Likewise, we consider three other models for which the dependent variables considered are: *reporting of NCDs as in-patient of medical institution*, *reporting of disabilities as in-patient of medical institution* and *reporting of other diseases as in-patient of medical institution*.
For multivariate analysis of reporting of disease-specific morbidity for spell of Ailment in the last 15 days, the dependent variable considered for the model is: "*Reporting of Infectious Disease for Spell of Ailment in the Last 15 Days*" if yes, the variable takes value 1, or 0 otherwise and so on for all the five types of diseases for spell of Ailment in the last 15 days.

3. Results

3.1 Reporting of Morbidity – Assam and Other States

Prevalence of self-reported morbidity stands at 39 persons and 37 persons per 1000 population at All-India level for Acute and Chronic Ailment respectively (see Table-A1 in *Appendix*). Of the major States, highest reporting of Acute Ailment was in Kerala (74 persons per 1000 population), followed by Punjab, Odisha, Jharkhand and Uttar Pradesh. Assam is on the lower side of reporting Ailment (19 persons per 1000 population) among the major States of India. Other major States reporting low morbidity prevalence are Bihar, Goa, and the North-Eastern States of Nagaland, Manipur, and Meghalaya. Reporting of Chronic Ailment was highest for Kerala (181 persons per 1000 population) followed by Andhra Pradesh and West Bengal. Assam has a very low reporting rate (6 persons per 1000 population). Other major States which have low reporting of chronic ailment are Bihar, Uttarakhand and all the other Northeastern States.
Comparing the States region-wise, along with all-India estimates, in the Northern region (Fig. 1) reporting of Acute Ailment is higher than All-India estimates for Delhi, Himachal Pradesh, Jammu & Kashmir and Punjab. On the other hand, reporting of Chronic Ailment is higher for Chandigarh, Himachal Pradesh and Punjab. Within the Northern region,the highest reporting of Acute Ailment is in Punjab (60 persons per 1000

population) and Chronic Ailment in Chandigarh (69 persons per 1000 population). Rajasthan is the lowest reporting state within this region.

In the Southern region (Fig. 2) reporting of Acute Ailment is higher than all-India estimates only in Kerala and Andhra Pradesh. Chronic Ailment reporting is higher for Kerala, Andhra Pradesh and Andaman & Nicobar Islands. In the Southern region, most of the States showed higher reporting of Chronic Ailment compared to Acute Ailment except for Karnataka.

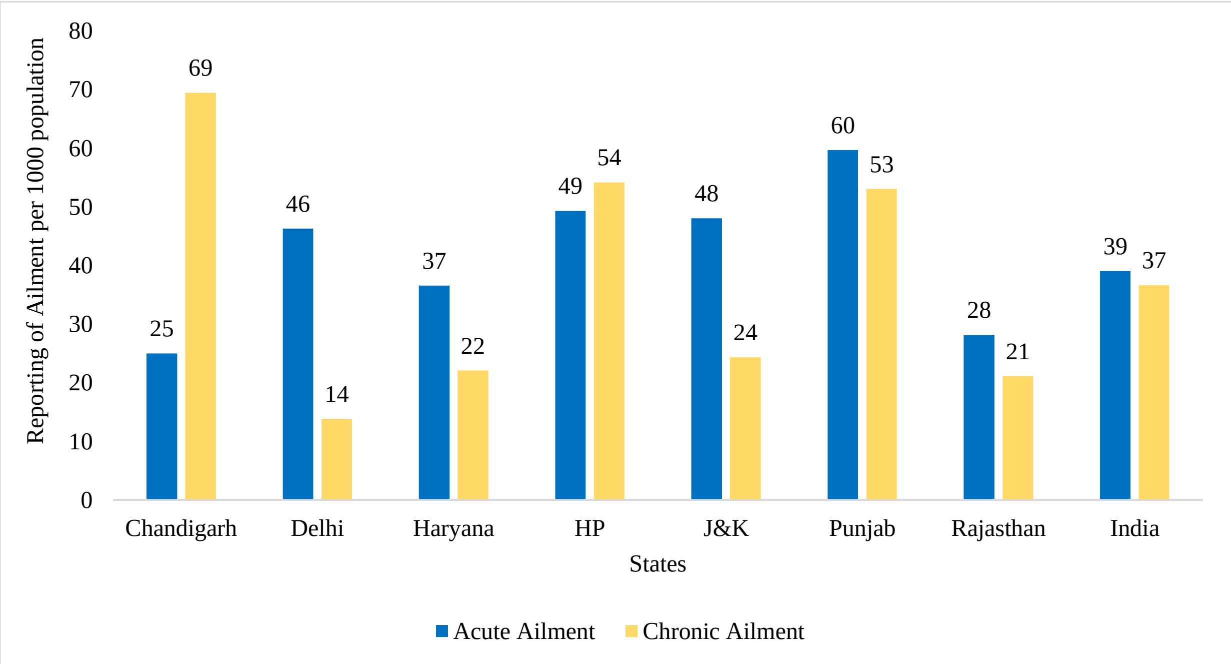
For the Eastern region (Fig. 3) all the States showed higher reporting of Acute Ailment as compared to all-India estimates, except for Bihar. Whereas, for Chronic Ailment, most of the States showed less reporting of Chronic Ailment, except West Bengal when compared to all-India estimates. Overall, all the States in the Eastern region showed higher reporting of Acute Ailment except for West Bengal where Chronic Ailment reporting was higher.

In the Western region (Fig. 4) reporting of Acute Ailment is higher than all-India estimates for Dadra & Nagar Haveli and Maharashtra. On the other hand, reporting of Chronic Ailment is higher for Goa, Lakshadweep and Maharashtra. Within the Western region, highest reporting of Acute Ailment is in Dadra & Nagar Haveli (61 persons per 1000 population) and Chronic Ailments in Lakshadweep (85 persons per 1000 population).

For, the North-Eastern region (Fig. 5) all the States showed lower reporting of both Acute and Chronic Ailments as compared to all-India estimates. Within the North-Eastern States, reporting of Acute Ailments were highest in Arunachal Pradesh followed by Tripura and Mizoram. Overall, all the States in the North-Eastern region showed relatively higher reporting of Acute Ailment, except for Sikkim, where reporting of Chronic Ailment is higher.

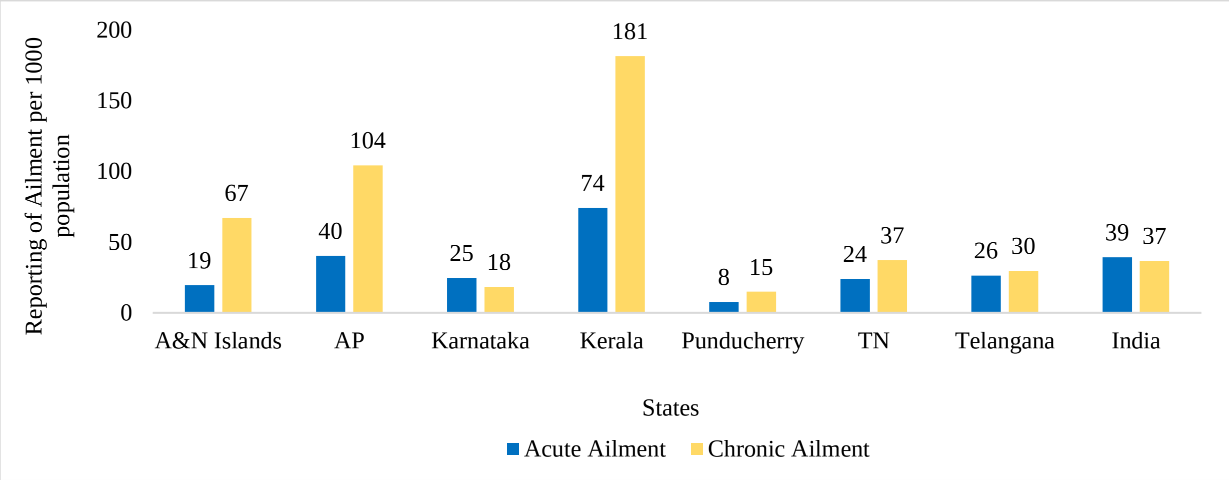
In the Central region (Fig. 6) reporting of Acute Ailment is higher than all-India estimates only in Uttar Pradesh. On the other hand, Chronic Ailment reporting is lower for all the States, when compared with all-India estimates.

Figure-1: Reporting of Acute and Chronic Ailment Northern Region of India, NSS 75th Round



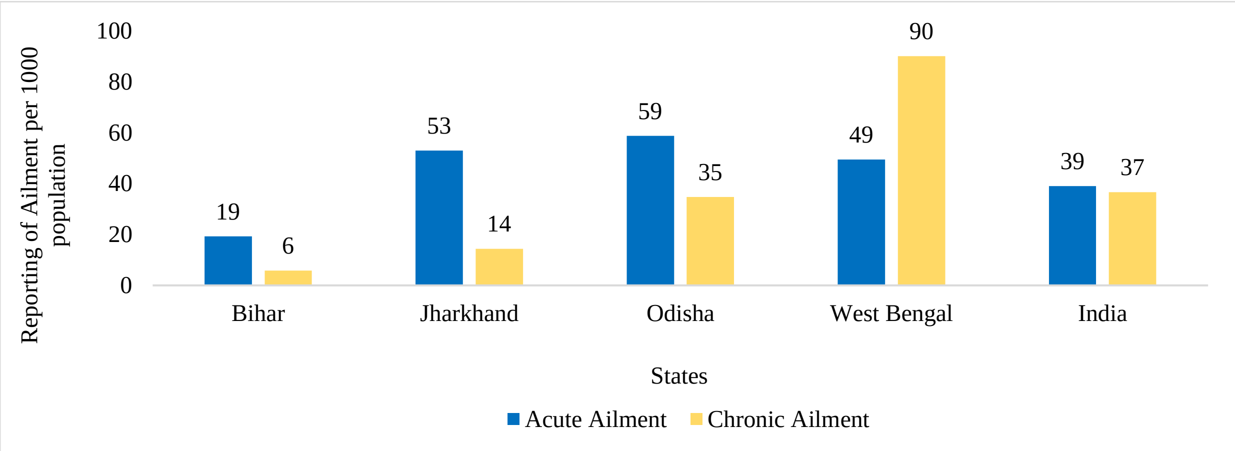
Source: Calculated from NSS 75th Unit-Level Data

Figure-2: Reporting of Acute and Chronic Ailment Southern Region of India, NSS 75th Round



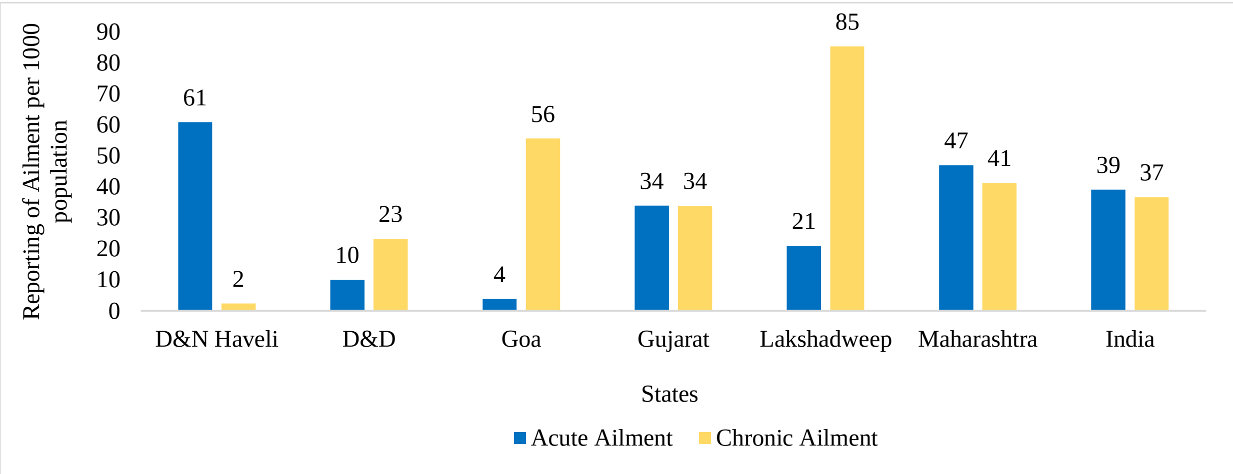
Source: Calculated from NSS 75th Unit-Level Data

Figure-3: Reporting of Acute and Chronic Ailment Eastern Region of India, NSS 75th Round



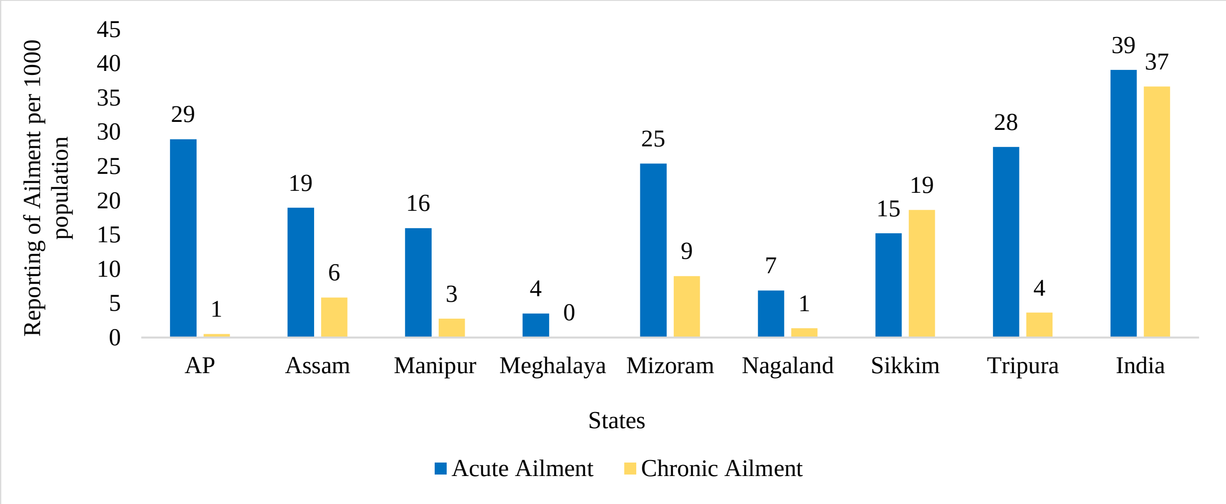
Source: Calculated from NSS 75th Unit-Level Data

Figure 4: Reporting of Acute and Chronic Ailment Western Region of India, NSS 75th Round



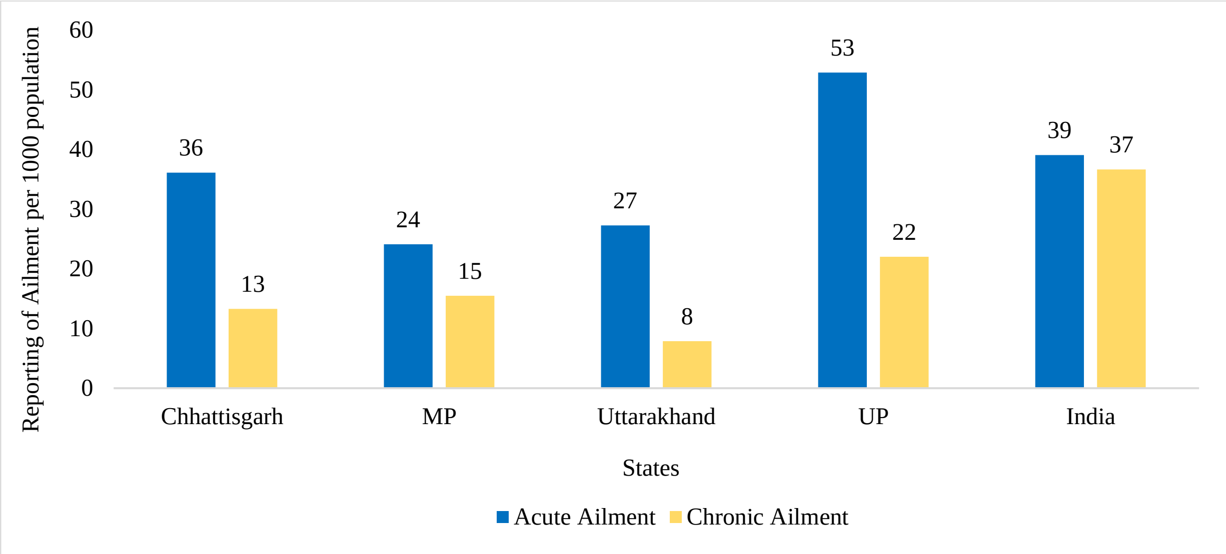
Source: Calculated from NSS 75th unit-level data

Figure-5: Reporting of Acute and Chronic Ailment North Eastern States of India, NSS 75th Round



Source: Calculated from NSS 75th unit-level data

Figure-6: Reporting of Acute and Chronic Ailment Central States of India, NSS 75th Round



Source: Calculated from NSS 75th unit-level data

3.2 Disease-Specific Morbidity – Assam and Other States

Table-2 showsthe disease-specific morbidity reported or the nature of Ailment reported asin-patient of the medical institution during the last 365 days. The result shows that reporting of NCDs is higher in most States. The States reporting higher NCDs are Kerala, Goa, Andhra Pradesh, West Bengaland Himachal Pradesh. Whereas States reporting higher infectious diseases are Arunachal Pradesh, Tripura and Kerala. States withhigher prevalence of CVDs are Kerala followed by Goa. Disability prevalence is highest in Kerala, followed by Andhra Pradesh.

Region wise, in the Northern region, infectious disease reporting is higher in Himachal Pradesh followed by Delhi and Haryana. For CVDs, NCDs and disability, reporting is highest in Himachal Pradesh. All the States show higher reporting of NCDs when compared to infectious diseases. On the other hand, reporting of CVDs is higher than infectious diseases only for Chandigarh and Delhi.Other diseases reporting is higher in Himachal Pradesh, Delhi and Haryana.

The southern region, particularly Kerala, Andhra Pradesh, Tamil Nadu and Telangana shows higher NCD*s* reporting. Reporting of CVD*s* is higher in Kerala.

In the Eastern region, all the States showed higher reporting of NCD*s*, when compared to infectious diseases. All States showed lower reporting of CVD*s* compared to infectious diseases and NCD*s*. Among the States, reporting of NCD*s*, CVD*s*, disability and other diseases is highest in West Bengal.

In the Western region, reporting of NCD*s* is highest in Goa and Lakshadweep followed by Maharashtra. Among the States, reporting of CVD*s* and disability is highest in Lakshadweep followed by Goa. Overall, the reporting of infectious diseases is low in all the States.

The North-Eastern States of Arunachal Pradesh, Manipur, Meghalaya and Tripura show higher reporting of infectious diseases when compared with NCD*s*. On the other hand, States of Mizoram, Nagaland and Sikkim showed equal reporting of NCD*s* and infectious diseases, except for state of Assam, where the reporting of NCD*s* was more. Overall, there is a low reporting of CVD*s* in all the States. Higher disability and other diseases were reported in Tripura, Sikkim and Mizoram.

In the Central region, all the States showed higher reporting of NCD*s* compared to infectious diseases, except for Madhya Pradesh which showed equal reporting of NCD*s* and infectious diseases.

Disease-specific morbidity for spell of ailment during last 15 days show apart from high reporting of NCD*s*, reporting of infectious disease is high in most of the States (Table-2).

In the Northern region, the States of Haryana, Jammu & Kashmir, Punjab and Rajasthan have higher reporting of infectious diseases compared to NCD*s* whereas, Chandigarh, Delhi and Himachal Pradesh have higher reporting of NCD*s*. CVD reporting is lower than NCD*s* in all the States, except for Jammu & Kashmir. Disability reporting is lower in all the States whereas other disease is overall high in all the States.

All the Southern region States show higher reporting of NCDs and CVDs compared to infectious diseases. Kerala shows the highest reporting of NCDs and CVDs followed by Andhra Pradesh. Disability and other disease reporting are also highest in Kerala followed by Andhra Pradesh.

In the Eastern Region, reporting of infectious diseases is more compared to CVDs and NCDs, except for West Bengal where reporting of infectious diseases is less than CVDs and NCDs. Overall, disability reporting is highest in West Bengal.

Western region shows higher reporting of CVDs and NCDs in Goa and Lakshadweep. On the other hand, Gujarat shows equal reporting of infectious diseases and CVDs and less reporting of NCDs. Maharashtra showed equal reporting of infectious diseases and NCDs and less reporting of CVDs. Disability reporting is highest in Lakshadweep followed by Maharashtra.

In the North-Eastern region, for spell of ailment, all the States showed higher reporting of infectious diseases, compared to CVDs and NCDs. However, reporting of NCDs is highest in Sikkim. Disability reporting is higher in Sikkim and Mizoram.

In the Central region, all the States showed higher reporting of infectious diseases compared to NCDs and CVDs. Among all the States in Central region, Uttar Pradesh reported the highest prevalence of infectious diseases, NCDs, disability and other diseases.

Table-2: All-India Reporting of Disease-Specific Morbidity at State Level NSS 75th Round (per 1000 Population)

States	Type of Ailment Reported as In-patient of Medical Institution during last 365 days					Type of Ailment Reported for Spell of Ailment during last 15 days				
	Infectious	CVD	NCDs	Disability	Other	Infectious	CVD	NCDs	Disability	Other
Northern States										
Chandigarh	1	4	4	4	6	7	21	37	16	16
Delhi	5	4	9	3	13	11	5	12	6	27
Haryana	5	3	6	5	10	11	6	10	8	24
Himachal Pradesh	6	5	10	9	13	19	17	26	15	29
Jammu & Kashmir	4	2	5	5	7	32	13	9	7	12
Punjab	4	4	8	7	8	37	19	20	17	22
Rajasthan	3	3	6	5	7	13	6	8	9	15
Southern States										
Andaman & Nicobar	13	6	13	8	9	13	28	33	8	5
Andhra Pradesh	4	4	10	9	11	15	51	39	33	26
Karnataka	3	3	5	7	12	7	10	9	6	13
Kerala	9	15	25	20	33	25	83	93	47	46
Puducherry	5	4	4	7	11	2	6	9	3	5
Tamil Nadu	3	3	7	6	12	5	12	26	7	14
Telangana	2	2	4	5	9	6	12	14	8	17
Eastern States										
Bihar	2	1	4	3	2	8	0	2	3	11
Jharkhand	2	1	4	3	3	21	4	7	8	28
Odisha	7	3	8	6	9	19	11	13	15	36
West Bengal	7	6	10	7	12	19	34	33	24	36
Western States										
D & N Haveli	1	2	2	2	19	0	1	1	1	60
Daman & Diu	0	1	2	2	5	0	1	21	1	9
Goa	3	7	19	7	10	1	24	30	3	2
Gujarat	4	4	5	4	7	18	18	12	6	15
Lakshadweep	4	12	18	9	13	9	48	31	27	6
Maharashtra	4	4	8	6	9	20	18	20	10	23
North Eastern States										
Assam	1	1	3	2	2	9	2	3	4	6
Arunachal Pradesh	16	1	7	4	7	18	1	2	3	6
Manipur	5	2	4	3	7	6	0	2	2	8
Meghalaya	7	1	2	2	4	2	0	0	1	1
Mizoram	6	1	6	5	9	10	4	5	6	9
Nagaland	3	1	3	3	3	2	1	1	2	2
Sikkim	5	4	5	5	9	6	4	10	6	8

Table-2: All-India Reporting of Disease-Specific Morbidity at State Level NSS 75th Round (per 1000 Population)

States	Type of Ailment Reported as In-patient of Medical Institution during last 365 days					Type of Ailment Reported for Spell of Ailment during last 15 days				
	Infectious	CVD	NCDs	Disability	Other	Infectious	CVD	NCDs	Disability	Other
Tripura	11	4	5	5	28	8	3	4	2	14
Central States										
Chhattisgarh	3	2	6	4	5	15	4	6	4	21
Madhya Pradesh	4	3	4	5	6	10	5	7	5	12
Uttarakhand	2	2	4	4	5	10	1	6	5	13
Uttar Pradesh	3	2	6	4	7	18	4	10	9	34
India	**4**	**3**	**7**	**6**	**9**	**15**	**14**	**16**	**11**	**23**

Source: Calculated from unit level data of NSS 75th Round

3.3 Reporting of Morbidity by Background Characteristics in Assam

Reporting of morbidity is affected by various factors. These factors can be demographic, socio-economic and geographical. Table-3 shows the number of persons reporting any other Ailment (Acute Ailment) and Chronic Ailment per thousand population by various background characteristics for the state of Assam. By **gender** females reported more as compared to males for Acute Ailment, whereas there is equal reporting of Chronic Ailment for both males and females. By **age** reporting of Chronic Ailment is highest in the oldest age group of sixty and above (41 persons per 1000 population) whereas for Acute Ailment reporting is highest for the youngest age group of 0–14 years of age (36 per 1000 persons). Reporting of morbidity is lowest in the age group of 31-45 years of age for Acute Ailment and 0-14 years of age for Chronic Ailment. By **marital status,** reporting was higherin the'others' category (which includes never married, widowed and divorced/separated) for Acute Ailment, whereas for Chronic Ailment reporting was more among currently married. Among the **social groups** reporting of Acute Ailment is highest among SC population and lowest among ST population whereas for Chronic Ailment reporting is highest among OBC followed by SC, others and ST respectively. Among the **religious groups**, reporting of Acute Ailment is highest among others group, and for Chronic Ailment, reporting is highest among Christians.

By **socio-economic variables**, for **wealth quintile** reporting is highest for both the cases among the richest and lowest among the poorest. For **education** reporting of Acute Ailmentis highest among the graduate and above and lowest in the level of secondary and higher secondary. On the other hand, reporting of chronic ailment is highest among the illiterates followed by graduates and above. In terms of **household size** reporting of Acute Ailment is highest for households having 1–4 members whereas for chronic ailment reporting is highest for households having more than 8 members. **Activity status** of the individuals showed that reporting of Acute Ailment is highest in the group of population which is not in work force (children 0-4 years), and for Chronic Ailment it is highest in the population group of employed. Under population **covered under health insurance** reporting is higher among those covered under any health insurance scheme for Chronic Ailment and among not covered under health insurance for Acute Ailment.

By **geographical variable**, indicated by place of residence (**rural and urban**), acute and chronic ailmentreporting is higher in urban areas. For reporting of morbidity in the different **NSS regions** in the state of Assam reporting is highest in both the cases for the Western Plains region. Reporting of morbidity is low in the Central Brahmaputra Plains region.

Table-3: Reporting of Morbidity by Background Characteristics in Assam NSS 75th Round (per 1000 persons)

Background Characteristics	Any Ailment in the last 15 days (Acute Ailment)	Chronic Ailment
Gender		
Male	15	6
Female	23	6
Age		
0 - 14	36	0
15 - 30	12	2
31 - 45	6	4
46 - 59	19	13
60 and above	33	41
Marital Status		
Currently Married	12	8
Others	26	4
Social Group		
ST	17	4
SC	23	6
OBC	18	7
Others	19	5
Religion		
Hindu	18	6
Muslim	20	4
Christianity	26	18
Others	61	2
Wealth Quintile		
Poorest	13	4
Poor	21	8
Medium	20	4
Rich	19	5
Richest	27	11
Education		
Illiterate	24	16
Below Primary & Primary	21	4
Secondary & Higher Secondary	10	4
Graduate & above	25	7
Household Size		
1-4 members	23	7
5-7 members	18	4
8 or more members	13	12
Usual Activity Status		
Employed	10	9
Unemployed	22	5
Others	14	3
Not in work force	46	0
Health Insurance		
Covered	18	8
Not Covered	19	6

Table-3: Reporting of Morbidity by Background Characteristics in Assam NSS 75th Round (per 1000 persons)

Background Characteristics	Any Ailment in the last 15 days (Acute Ailment)	Chronic Ailment
Area		
Rural	17	5
Urban	30	13
NSS Region		
Eastern Plains	16	2
Western Plains	35	14
Cachar Plains	9	3
Central Brahmaputra Plains	6	0

Source: Calculated from unit level data of NSS 75th Round

3.4 Reporting of Disease-Specific Morbidity by Background Characteristics in Assam

Table-4 shows the disease-specific morbidity reported at the state level in Assam by background characteristics asin- patient of medical institutions in the last 365 days and for spell of ailment reported during last 15 days.

Reporting of **infectious diseases** as in-patent of medical institution is same for males and females. It is higher in the age group of 0-14 years, 46-59 years and 60 and above. By marital status, it is higher for the others group and by social group, it is highest among the OBC. By religion, it is higher in the Hindu category. By socio-economic variables, reporting is higher in the medium and richest sections whereas by education group, it is highest among the illiterates. In terms of household size, reporting is highest among households with 1-4 members and by activity status, reporting of infectious disease is highest among those not in work force. Reporting of infectious diseases as an in-patient of medical institution is higher among those covered under health insurance and for those residing in urban areas. Overall reporting of infectious disease in Assam is higher in the NSS regions of Cachar Plains and Central Brahmaputra Plains.

For **CVD*s*** reporting is equal for both males and females.It is higher in the older age group of 46- 59 years and 60 and above. CVD reporting is higher among currently married. Among the wealth quintile, reporting is highest in the richest quintile. Urban population, those covered under health insurance scheme and employed group of population have also reported higher CVD*s*. Among the NSS regions, Cachar Plains have reported the highest CVD.

Reporting of **NCD*s*** is higher among females as compared to males. It is highest in the oldest age group. By marital status, it is higher among currently married and by social group, it is highest among OBC. As expected, NCD*s* reporting is highest among the richest quintile. NCD reporting is also higher among the urban population, unemployed and those covered under health insurance. Eastern Plains reports the highest NCD*s* asin- patient of the medical institution during last 365 days.

Disability reporting is equal among males and females. Reporting is higher in the oldest age groups,urban population, employed, covered under health insurance and currently married population group. Disability reporting as in–patient of medical institution is highest among OBC, richest wealth quintile, for population group of graduate and above and for NSS region of Eastern Plains.

For **other diseases,** there is equal reporting among both the genders and both categories under marital status. Reporting is highest among the oldest age group and OBC social group. For socio-economic characteristics, reporting is highest for the richest wealth quintile, among the illiterates and highest educated group and those covered under health insurance. Reporting is higher among the urban population and in the NSS region of Eastern plains.

On the right-hand side of Table-4, we have disease-specific morbidity reported for spell of ailment reported during last 15 days.

Infectious disease reporting is more among females. In terms of age, it is highest in the youngest age group (0-14 years) followed by the oldest age group (60 years and above). Reporting is higher among others group for marital status, urban population and those not covered under health insurance. Reporting of infectious disease in the last 15 days is highest in the NSS region of Western Plains followed by Eastern Plains. It is highest for those not in work force, population group of below primary and primary level of education and among the SC group of population.

For **CVDs and NCDs**, CVD reporting is higher among males whereas NCD reporting is higher among females. CVD and NCD reporting are highest for the oldest age group, currently married, richest wealth quintile, illiterate and employed.In terms of geographic characteristics, reporting of both CVDs and NCDs is higher in urban regions and the NSS region of Western Plains.

Disability reporting is higher among females. Its reporting is highest among the oldest age group, among OBC social group, rich quintile, illiterates and in the NSS region of Western Plains.

For **other diseases**, reporting is higher among females, youngest age group, other group of marital status and among ST population group. For socio-economic status, reporting is highest among richest wealth quintile, highest education group, not in work force and those covered under health insurance. For, geographical region, reporting is higher among the urban population and in the NSS region of Western Plains.

Table-4: Disease Specific Morbidity Reported by Background Characteristics in Assam NSS 75th Round (per 1000 population)

Background Characteristics	Disease-Specific Morbidity as In-patient of Medical Institution during last 365 days					Disease-Specific Morbidity for Spell of Ailment during last 15 days				
	Infectious	CVD	NCD	Disability	Others	Infectious	CVD	NCD	Disability	Others
Gender										
Male	1	1	2	2	2	8	3	2	3	6
Female	1	1	3	2	2	11	2	3	5	7
Age										
0 - 14	2	0	1	1	2	21	0	0	3	12
15 - 30	1	0	2	2	2	6	1	1	2	4
31 - 45	1	1	3	2	3	2	3	0	2	3
46 - 59	2	4	3	4	3	5	5	8	6	8
60 and above	2	6	7	6	4	17	10	23	26	3
Marital Status										
Currently Married	1	2	4	3	2	4	3	4	4	4
Others	2	1	1	2	2	15	1	1	4	8
Social Group										
ST	1	1	2	1	1	4	1	2	5	10
SC	1	1	2	2	2	21	2	5	2	1
OBC	2	1	3	3	3	12	3	3	7	2
Others	1	1	2	2	2	7	3	3	3	9
Religion										

Table-4: Disease Specific Morbidity Reported by Background Characteristics in Assam NSS 75th Round (per 1000 population)

Background Characteristics	Disease-Specific Morbidity as In-patient of Medical Institution during last 365 days					Disease-Specific Morbidity for Spell of Ailment during last 15 days				
	Infectious	CVD	NCD	Disability	Others	Infectious	CVD	NCD	Disability	Others
Hindu	2	2	3	2	3	9	2	4	4	6
Muslim	1	1	2	2	1	10	2	1	4	8
Christianity	1	1	1	2	3	24	8	0	12	0
Others	1	0	7	3	0	0	0	2	61	0
Wealth Quintile										
Poorest	1	1	2	2	2	7	2	1	3	4
Poor	1	1	1	2	2	13	1	4	4	6
Medium	2	1	2	2	2	10	2	1	5	6
Rich	1	1	4	2	2	6	2	3	6	9
Richest	2	5	7	4	6	13	6	6	3	11
Education										
Illiterate	2	2	3	2	3	8	6	6	12	8
Below Primary & Primary	1	1	2	2	2	12	1	2	4	6
Secondary & Higher Secondary	1	1	3	2	2	5	2	2	1	4
Graduate & above	1	1	3	5	3	8	4	3	1	16
Household Size										
1-4 members	2	1	3	2	3	10	2	3	6	9
5-7 members	1	1	2	2	2	10	2	3	2	6
8 or more members	0	1	2	2	1	8	3	2	8	3
Usual Activity Status										
Employed	1	2	2	3	2	4	4	4	4	4
Unemployed	1	1	3	2	2	12	1	3	4	7
Others	2	2	2	2	4	2	1	0	12	2
Not in work force	3	0	1	0	1	20	0	0	0	26
Health Insurance										
Covered	3	2	5	4	4	6	9	1	0	11
Not Covered	1	1	2	2	2	10	2	3	4	6
Area										
Rural	1	1	2	2	2	9	2	2	4	6
Urban	2	3	4	4	4	15	7	7	4	11
NSS Region										
Eastern Plains	1	2	3	4	4	13	0	2	1	1
Western Plains	1	1	2	1	2	14	5	6	10	14
Cachar Plains	2	3	2	1	2	4	4	1	1	3
Central Brahmaputra Plains	2	1	2	2	1	2	0	0	1	3
Source: Calculated from unit level data of NSS 75th Round										

3.5 Reporting of Morbidity and Disease-Specific Morbidity by Background Characteristics –Results of Binary Logistic Regression and Multivariate Logistic Regression

The results of binary logistic regression are presented in Table-5. In both the cases of reporting Acute and Chronic Ailment, age has been a significant factor for reporting morbidity. The younger age groups are less likely to report morbidity. By gender, females are more likely to report both Acute and Chronic Ailments, when compared to the reference groupof male. By marital status, currently married are less likely to report acute ailment and more likely to report Chronic Ailment compared to others category. Compared to other category of social group all other categories of social group (ST, SC and OBC) are more likely to report Acute Ailment and less likely to report Chronic Ailment. Education level of the individual shows that compared to the illiterate group, the graduate and above category is more likely to report Acute Ailment whereas all other categories of education level groups are less likely to report. For Chronic Ailment all categories of education level group are less like to report compared to the reference category of the illiterate group. MPCE (log_mpce) level of the individuals shows, higher the level of MPCE the more likely an individual is to report both Acute and Chronic Ailment. By household-size, higher the household-size, less likely are the individuals to report both Chronic and Acute Ailment. By residence, rural population is less likely to report morbidity. NSS region of Western Plains is more likely to report morbidity for both cases and is significant when compared to the other NSS regions of Assam.

Table-5: Binary Logistic Regression for Reporting of Ailment (Odds Ratio), Assam, NSS 75th round

Background Characteristics	Acute Ailment	Chronic Ailment
Gender		
Male^		
Female	1.188817	1.001036
Age		
60 and above^		
46-59	0.4651217*	0.4047218*
31-45	0.2234656*	0.0999757*
15-30	0.2206461*	0.0509145*
0-14	0.4371851*	0.011384*
Marital Status		
Others^		
Currently Married	0.6719684**	1.056771
Social Group		
Others^		
ST	1.226924	0.5512104**
SC	1.895749*	0.9897816
OBC	1.179862	0.8086393
Religion		
Hindu^		
Islam	1.18998	1.008199
Christian	2.940826*	1.740565
Others	2.197271	6.484113***
Education		
Illiterate^		
Below Primary & Primary	0.9053216	0.9449155
Secondary & Higher Secondary	0.8148827	0.6813338
Graduate & above	1.042774	0.6767458

Table-5: Binary Logistic Regression for Reporting of Ailment (Odds Ratio), Assam, NSS 75th round

Background Characteristics	Acute Ailment	Chronic Ailment
Activity Status		
Employed^		
Unemployed	0.8276046	1.237334
Others	0.7018949	2.205775**
Not in work force	1.089396	
Covered Under Health Insurance		
Covered^		
Not Covered	1.123551	0.6706065
Area of Residence		
Urban^		
Rural	0.8701116	0.6434106**
NSS Region		
Western Plains^		
Eastern Plains	0.3207682*	0.1170286*
Cachar Plains	0.2765005*	0.3650757*
Central Brahmaputra Plains	0.1333393*	0.0435563*
log_mpce	1.353724	1.755092*
Household Size	0.9494434	0.9935675

Source: Calculated from unit-level data of NSS 75th Round

* p <0.01, ** p< 0.05, *** p< 0.1

^ Reference group

Table-6 shows the results of the multivariate regression for the disease specific morbidity reported by the background variables.

The multivariate regression for reporting disease-specific morbidity Asin-patient of the medical institution shows that for all types of diseases, females are less likely to report. Age is the most significant variable for all the five types of disease groups. For infectious diseases, younger age group are more likely to report compared to the oldest age group, whereas for CVD*s* and NCD*s*, younger age groups are less likely to report. The older age groups are more likely to report disability. By social group, SC and OBC groups are less likely to report infectious diseases when compared to the reference category of others. The ST and OBC groups are less likely to report CVD*s*. All the categories of ST, SC and OBC are more likely to report NCD*s* when compared to other category. By education level, as education level increases,individuals are less likely to report infectious diseases and more likely to report NCD*s*. For MPCE (log_mpce), as MPCE increases, individuals are more likely to report all types of diseases, except for disability and other diseases. In terms of rural-urban population, the rural population is less like to report morbidity for all types of Ailments except NCD*s*. By Assam's NSS region classification, when compared with the reference category of Western Plains, the Eastern Plains region is less likely to report infectious disease whereas Cachar Plains and Central Brahmaputra plains are more likely to report infectious disease. For CVD*s*, all other regions are more likely to report when compared to the Western plains. For NCD*s* and disability, Cachar Plains are less likely to report compared to Western Plains, whereas Eastern Plains and Central Brahmaputra Plains are more likely to report. For other diseases, all regions compared to Western Plains are less likely to report.

The multivariate regression for reporting disease-specific morbidity for spell of ailment in the last 15 days also shows age is the most significant variable for all the five types of disease groups. Infectious diseases and other diseases are more likely to be reported by the younger age group. The older age groups are more likely in reporting CVD, NCD*s* and disability as compared to the younger age group. By gender,females are more likely to report infectious disease, NCD*s* and disability as compared to males, andare less likely to report CVD*s* and other diseases. Higher education groups are less likely to report infectious diseases, CVD*s* and disability, whereas they are more likely to report NCD*s* and other diseases. Likewise, as MPCE of the individuals increases they are more likely to report CVD*s* and NCD*s*, on the other hand, they are less likely to report infectious diseases, disability and other diseases. The rural population is more likely to report infectious diseases and NCD*s* as compared to the urban population. All the NSS regions when compared to Western Plains, are more likely to report infectious diseases whereas, less likely to report CVD*s* and NCD*s*.

Table-6: Assam Multivariate Logistic Regression (Odds Ratio)

Background Characteristics	**Disease-Specific Morbidity Reporting as In-patient of medical institution last 365 days**					**Disease-Specific Morbidity Reporting for last 15 days**				
	Infectious	**CVD**	**NCD**	**Disability**	**Others**	**Infectious**	**CVD**	**NCD**	**Disability**	**Others**
Gender										
Male^										
Female	0.6616957**	0.5515357*	0.7989686	0.2699958*	0.6155353*	1.068487	0.1865442*	2.093625**	1.321657	0.8984299
Age										
60 and above^										
46-59	1.582058	0.8332151	0.5935703**	1.780796**	1.765185**	0.8824525	1.163117	0.7780403	0.82527	2.536862***
31-45	1.383176	0.2575838*	0.3508498*	1.716686**	1.957702*	1.625432	0.8091711	0.3025543**	0.4746034	8.928687*
15-30	1.129009	0.0454065*	0.183486*	0.8925807	0.5072045*	1.787899	0.2373709***	0.277912*	0.788443	5.896737*
0-14	5.42025*	0.0494532*	0.3728827*	0.5615936**	1.140874	7.286937	0.185144***	0.0292909*	0.1493592*	11.24079*
Marital Status										
Others^										
Currently Married	0.3454516*	0.6010504*	0.8523769	0.282116*	0.3878528*	0.8050048	0.8258845	1.654459	0.4529921**	1.824056
Social Group										
Others^										
ST	1.355971	0.8162417	1.479345**	0.7242911	0.7945691	0.9211167	0.5410507	0.7971111	2.105393	1.043892
SC	0.6709888	1.339818	1.071292	0.8144243	1.110189	1.536608	0.4182694	1.73158	1.716759	0.4677626
OBC	0.9060214	0.9495938	1.346942***	0.8699972	1.084792	1.682575	0.5146667	1.565624	1.350858	0.3858198***
Religion										
Hindu^										
Islam	0.9405265	0.6867544	1.488309**	1.304365	1.103183	0.967153	0.486209	1.005259	1.645819	1.099858
Christian	1.177741	1.105733	0.8400551	0.7347749	1.291668	1.184813	1.635331	0.5685803	2.839508***	
Others	1.108888		4.728962**	0.7612404				3.792115	14.26255	
Education										
Illiterate^										
Below Primary & Primary	0.6817565***	1.188558	1.120335	0.7442861	0.7727548	0.7689538	0.451334	2.210143**	0.8572482	0.9358727
Secondary & Higher Secondary	0.5707359**	0.9730159	1.18317	0.7819914	1.013331	0.7377034	0.4247695	1.298796	0.4498433	3.610129**
Graduate & above	0.425884***	0.5372444	1.223268	1.335942	0.9166958	0.1907731***	0.552328	1.454299	0.6939092	1.896258
Activity Status										
Employed^										
Unemployed	0.4706868*	0.8672735	0.9897969	0.7627331	1.110456	0.567811	1.269302	0.7808883	0.9416703	2.539585**

Background Characteristics	Disease-Specific Morbidity Reporting as In-patient of medical institution last 365 days					Disease-Specific Morbidity Reporting for last 15 days				
	Infectious	**CVD**	**NCD**	**Disability**	**Others**	**Infectious**	**CVD**	**NCD**	**Disability**	**Others**
Others	0.6784192	0.812815	0.9551324	0.4610167**	0.9449735	0.3789597	1.683082	0.7298328	1.138403	2.155448
Not in work force	0.6688624		1.64371	0.2122964**	0.5800363	0.5824116		2.804412		2.690633
Covered Under Health Insurance										
Covered^										
Not Covered	0.5643109**	1.350969	0.9047508	0.8994183	0.9515279	1.075294	0.2161094**	0.8546065	4.113884	2.367514
Area of Residence										
Urban^										
Rural	1.183077	0.9686602	1.398335**	0.8351545	0.9098957	1.06603	0.3933695***	1.251444	0.8518022	1.477541
NSS Region										
Western Plains^										
Eastern Plains	0.8704579	1.482531***	1.377008**	1.740874*	0.8244818	3.209559***	0.4636458	0.8647328	1.357744	0.2762261***
Cachar Plains	1.17075	2.473961*	0.986984	0.4711722*	0.7791983	1.240155	0.6185993	0.9023687	0.9553472	1.815168
Central Brahmaputra Plains	1.652097*	1.773669**	1.195712	1.03496	0.4929811*	1.95393	0.4818075	0.9798913	0.8658232	0.6302932
log_mpce	1.115047	1.263231	1.390975**	0.8308139	0.9515843	0.719509	1.049215	1.438553	0.6574228	1.284601
Household Size	0.9574628	0.9495161	0.9835466	0.9671267	0.9417479	1.070877	1.098882	0.9860235	0.9120866	0.9743218

Source: Calculated from unit level data of NSS 75th Round
* p <0.01, ** p< 0.05, *** p< 0.1
^ Reference group

4. Discussion and Limitations of the Study

Based on self-reported morbidity across the States of India, we find that acute and chronic ailmentsareunevenly spread. One of the main limitations of self-reported morbidity measures is in terms of consistency and reliability. It may be due to reporting bias. Various factors affect reporting of self-perceived morbidity, such as level of educational attainment, economic status, access to media, awareness about health care services, etc. (Subramanian, et al. 2009). However, in a country like India, where there is a lack of robust data based on observed morbidity, self-reported morbidity helps us to understand the overall morbidity profile of the population.

Our results showthat except for a few States and union territories, where the reporting of both acute and chronic ailment is high, the average reporting of morbidity is around 35-40 per 1000 population. Few States, such as the north-eastern States, have morbidity reporting below the national average. Reporting is relatively higher in the Southern and Northern regions. Clearly, there is an uneven geographical spread across Indian States with respect to reporting of morbidity. This can be due to various reasons. Although the lower reporting States may have low health outcomes compared to high reporting States, self-reported morbidity to a great extentdepends on cultural factors, health awareness, and access to health care services (Sundararaman and Muraleedharan, 2015). As indicated by the literature that incidence of chronic ailments increase by enabling factors such as education, income, it is interesting to note that reporting of chronic ailment is higher in some of the more developed States such as Kerala, Andhra Pradesh, Tamil Nadu, Punjab, Chandigarh, West Bengal, Goa and Maharashtra.

Assam has a population size of more than three crores, however, is in the lower end of reporting both acute and chronic ailment. Assam has lower health outcomes in terms of higher maternal mortality and child mortality compared to all-India average. Therefore, low reporting of morbidity in Assam is inconsistent and needs further investigation. There is a need for Assam state sample data to be churned out regularly for more robust analysis.

Overall, the reporting is lower in case of in-patient of medical institutions compared to spell of ailment during the last 15 days. This is mainly because for in-patient of medical institutions only hospitalization cases have been considered, whereas for spell of ailment during last 15 days, any ailment including hospitalization in the reference period of 15 days was considered. Also, a longer recall period for in-patient of medical institution may affect the reporting of morbidity. For disease-specific morbidity reporting too, there is uneven spread across States in terms of reporting of morbidity as well as the type of disease being reported. Except for a few north-eastern States, all other States in India show higher incidence of NCDs compared to infectious diseases. This clearly indicates the changing pattern of disease prevalence in India, however, with regional imbalances. Some of the developed States like Kerala and Goa showed even higher prevalence of CVDs in comparison with infectious diseases. At the same time, it is to be noted that, even though there is a rise in NCDs across States, there is clear evidence of infectious diseases prevailing across States simultaneously. Most of the developed States in India have also reported significant proportion of disability, which clearly indicates, slowly but steady change in the demographic characteristics. For disease-specific spell of ailment, most of the States showed higher reporting of infectious diseases, except for a few of the developed States, like Kerala and Andhra Pradesh that showed higher reporting of CVDs and NCDs. It is evident that with the reference period of 15 days, people are likely to report infectious diseases, given the type of diseases under infectious diseases. This also shows that, althoughthere is evidence of prevalence of NCDs and CVDs, we cannot deny the simultaneous prevalence of infectious diseases across the States.

From the above discussion, it is clear that across the States and state regions there is prevalence of both communicable as well as non-communicable diseases. Reporting of morbidity has been low in some of the States, including Assam. Of these low reporting States some States are better off and some worse off in terms of health outcomes and other socio-economic variables like literacy level, yet the prevalence of morbidity reporting is low. Various studies report that self-reported morbidity is mainly influenced by, accessibility of health care services, various socio-economic variables like poverty, educational level (especially female education) and working conditions. The difference can also arise due to variation in disease profiles across diverse groups of population (Ghosh and Arokiasamy, 2010;Blacker, 1947; Yadav and Arokiasamy, 2014).

Analysis of morbidity prevalence at the state level of Assam by background characteristics shows an uneven spread across demographic variables, socio-economic characteristics and geographical areas. Age has been an important factor. J-shaped relation exists between reporting of acute ailment, with reporting being higher in the youngest age group and older age groups. On the other hand, reporting of chronic ailment is higher in the older age group. As evident from existing literature, reporting of ailment is more for females. As for the wealth quintile, reporting of chronic ailment is higher among the higher wealth quintile. Studies suggest that this may be due to life-style related nature of chronic ailment resulting in higher burden of chronic ailment among the economically better-off groups. At the same time the economically better off groups, are generally more aware of health issues and also have better access to health care facilities both government and private facility. Therefore, they are more likely to report morbidity(Dilip, 2002). There is a significant rural-urban gap in reporting of morbidity in Assam. This variation also spreads across NSS regions, reporting being higher in the

Western Plains. These variations clearly signify a difference in access and availability of health care facilities within Assam. It may also be due to the healthcare-seeking behavior and availability of the health care services for the population. People may not be aware of these diseases, due to lack of awareness and at the same time due to not availing the health care services.

A similar pattern can be observed in the reporting of disease-specific morbidity for both cases of in-patient in medical institutions in the last 365 days and reporting of spell of ailment in the last 15 days. Here, too age has been an important factor. J-shaped relation exists for reporting of infectious diseases, with reporting being higher in the youngest age group and older age groups. On the other hand, reporting of CVDs, NCDs and disability are higher in the older age group. Females reporting more morbidities, especially NCDs is evident from the fact that recent studies have shown there has been a rise in NCDs among females in India, especially urban females (Agrawal and Arokiasamy, 2010; Ghosh and Arokiasamy, 2010). Higher prevalence of both communicable diseases (infectious) and non-communicable diseases (CVDs & NCDs) among the richest wealth quintile clearly indicate the dual nature of disease prevalence in the population. At the same time, it is interesting to note higher prevalence of CVDs and NCDs among the lowest education group. Overall, for all types of diseases reporting is higher in urban areas, but higher prevalence of infectious diseases in urban areas is also a matter of concern, which needs to be further investigated. Therefore, we can say that the dual nature of both communicable and non-communicable disease prevalence is inevitable. For disease-specific morbidity reporting for spell of ailment, reporting has been higher in the Western Plains region whereas for in-patient of medical institutions, reporting is higher in Eastern Plains for CVDs, NCDs, disability and others. For the logistic regression models; age, gender, area of residence (rural-urban), marital status, MPCE and NSS state regions have been some of the significant variables affecting self-reported morbidity status.

Limitations

The study provides an overall picture of the prevailing pattern of self-reported morbidity in India, and in particular, state of Assam, based on population-based sample survey of NSS 75th round, 2017-2018. However, there are a few limitations, which must be considered.

As the literature suggests, and already discussed in the above sections, self-reported morbidity, may be under-reported or in some cases over-reported too. Self-reported morbidity is affected by various factors, such as educational attainment, economic status, excess to media, awareness about healthcare services, availability and access to healthcare services,etc.

Reporting of some of the diseases under disease-specific morbidity needs proper diagnosis to be self-reported, especially some of the CVDs and NCDs. Without diagnosis by health personnel and adequate awareness of these diseases among the population it may lead to under-reporting of these diseases.

Various diseases are impacted by the type of food we eat and our daily lifestyle activities (Prentice, 2006; Sinha and Kumar Kapoor, 2010; Yadav et al., 2016) especially, CVDs and NCDs. Therefore, the inclusion of these data in the data set would have given more clearer picture of the prevailing pattern of diseases in the population.

The sate level analysis of Assam gives us an overall picture of the prevailing morbidity status of the population in the state. However, there are a few limitations. At the state level of Assam, there is a lack of robust consolidated data sets providing information on the health status of the population. NSS data has been a continuous source in this aspect.

It is evident from the data that overall reporting of morbidity has been low in Assam. Although reporting of acute ailment is higher than chronic ailment, this makes sense as the reference period for acute ailment is shorter compared to chronic ailment in terms of recall by the respondent. Sinceoverall reporting of morbidity has been low in Assam, it would have been fruitful to further look into the district level estimates for further analysis. There are limitations of estimating at the district level with only the central sample data as the sample size at the district level are small. Exploring morbidity estimates with pooled data of central and state samples may possibly give us better results.

5. Conclusion

The study shows higher level of prevalence of self-reported morbidity in the state of Kerala, Andhra Pradesh, West Bengal and Punjab. On the other hand, some of the less developed poorer States along with Assam and other northeastern States shows a lower level of self-reported morbidity. Based on morbidity reporting it looks like the status of health of the population in Assam and other northeastern States is better off, however, we need to deliberate why morbidity reporting is very low. It needs deliberation at the policy level to understand the low reporting of morbidity in Assam.

The dual nature of both communicable and non-communicable diseases is inevitable as in the case of India and Assam. Overall, there has been prevalence of NCD*s* across States apart from infectious diseases, CVD*s* and disability. There is a need for provision of basic screening and treatment of both communicable and non-communicable diseases at the primary level both in rural and urban areas. As the data shows prevalence of infectious diseases in the recent round in urban areas along with CVD*s* and NCD*s*, this needs to be taken into consideration and effective policy measures need to be taken both at the public health level in terms of providing clean drinking water, drainage, sanitation and controlling of air pollution in the urban areas. At this point, it requires taking proper health care measures in terms of coping with the dual nature of the disease prevalence. It requires constant monitoring of the disease patterns and identifying the pockets where the dual pattern is high and take necessary policy measures and providing health care facilities and awareness at the local level to overcome this dual nature of the disease pattern.

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Reference

1. Abedin, T., Chowdhury, Z., Afzal, A. R., Yeasmin, F., and Turin, T. C. (2016). Application of Binary Logistic Regression. JNHFB Vol. 5, pp. 8-11.
2. Agrawal, G., & Arokiasamy, P. (2010). Morbidity prevalence and health care utilization among older adults in India. Journal of Applied Gerontology, Vol. 29(2), pp. 155-179.
3. Belcher, D., Neumann, A., Wurapa, F., & Lourie, I. (1976). Comparison of morbidity interviews with a health examination survey in rural Africa. American Journal of Topical Medicine and Hygiene, 751-758.
4. Blacker, C. P. (1947). Stages in population growth. The Eugenics Review, Vol. 39(3), pp. 88-101.
5. Dilip, T. R. (2002). Understanding levels of morbidity and hospitalization in Kerala, India. Bulletin of the World Health Organization, Vol. 80(9), pp. 746-751.
6. Ghosh, S., & Arokiasamy, P. (2010). Emerging patterns of reported morbidity and hospitalisation in West Bengal, India. Global public health, Vol. 5(4), pp. 427-440.
7. Murray, C. J., & Chen, L. C. (1992). Understanding Morbidity Change. Population Council in collaboration with JSTOR , Vol.18, No.3, (481-503).
8. National Sample Survey Office (2020). Health in India. 75th Round, Report No. 586, Ministry of Statistics and Programme Implementation, Government of India, New Delhi.
9. Paul, K., Chaudhary, M., Chowdhary, R., and Sengupta, R. (2019). Changes in levels of morbidity and hospitalisation in Kerala: A district-level analysis (1995-2014). *Clinical Epidemiology and Global Health*, Vol. 8(1), pp. 21-28.
10. Paul, K., and Singh, J. (2017). Emerging trends and patterns of self-reported morbidity in India: Evidence from three rounds of national sample survey. *Journal of Health, Population and Nutrition*, Vol. 36, pp. 32.
11. Prentice, A. M. (2006) "The emerging epidemic of obesity in developing countries". International journal of epidemiology, Vol. 35(1), pp. 93-99.
12. Shariff, A. (1995). Health Transition in India. No. 57 *National Council of Applied Economic Research, New Delhi*.
13. Singh, K. R. (2017). The Self Perceived Morbidity and its Determinants in North East India. *Journal of North East India Studies*, Vol.7(1), pp. 93-114.
14. Sinha, R., & Kumar Kapoor, A. (2010). Cultural practices and nutritional status among premenopausal women of urban setup in India. *The Open Anthropology Journal*, Vol. 3(1).
15. Subramanian, S. V., Subramanyam, M. A., Selvaraj, S., & Kawachi, I. (2009). Are self-reports of health and morbidities in developing countries misleading? Evidence from India. *Social science & medicine*, Vol 68(2), pp. 260-265.
16. Sundararaman, T., and Muraleedaharan, V. R. (2015). Falling Sick, Paying the Price NSS 71st Round on Morbidity and Cost of Healthcare. *Economic & Political Weekly*, Vol. 33.
17. Srinivasan, T., Muraleedharan, V., and Pratap, B. (2017). Morbidity in India since 1944. *Springer*, Vol. 52, pp. 03-35.
18. Yadav, S., & Arokiasamy, P. (2014). Understanding epidemiological transition in India. *Global health action*, Vol. 7(1), pp. 232-248.
19. Yadav, A. K., Gouda, J., & Ram, F. (2016). Self-reported morbidity and burden of disease in Uttar Pradesh, India: Evidence from a national sample survey and the million deaths study. *Journal of Biosocial Science*, Vol. 48(4), pp. 472-485.

Appendix

Table-A1: All-India Reporting of Acute and Chronic Ailment at State level NSS 75th Round (per 1000 population)

States	Reporting of any other ailment in last 15 days (Acute Ailment)	Reporting of any Chronic Ailment
Northern States		
Chandigarh	25	69
Delhi	46	14
Haryana	37	22
Himachal Pradesh	49	54
Jammu & Kashmir	48	24
Punjab	60	53
Rajasthan	28	21
Southern States		
Andaman & Nicobar	19	67
Andhra Pradesh	40	104
Karnataka	25	18
Kerala	74	181
Puducherry	8	15
Tamil Nadu	24	37
Telangana	26	30
Eastern States		
Bihar	19	6
Jharkhand	53	14
Odisha	59	35
West Bengal	49	90
Western States		
D & N Haveli	61	2
Daman & Diu	10	23
Goa	4	56
Gujarat	34	34
Lakshadweep	21	85
Maharashtra	47	41
North Eastern States		
Arunachal Pradesh	29	1
Assam	19	6
Manipur	16	3
Meghalaya	4	0
Mizoram	25	9
Nagaland	7	1
Sikkim	15	19
Tripura	28	4
Central States		
Chhattisgarh	36	13
Madhya Pradesh	24	15
Uttarakhand	27	8
Uttar Pradesh	53	22
India	**39**	**37**

Source: Calculated from unit level data of NSS 75th Round

Table-A2: All-India State Wise Estimated Number of Persons Reporting Acute and Chronic Ailment

States	Estimated Population	Estimate of Reporting any other ailment in last 15 days (Acute Ailment)	Estimate of Reporting of any Chronic Ailment
Northern States			
Chandigarh	960635	24026	66711
Delhi	15804302	731634	219004
Haryana	26416987	9665837	583341
Himachal Pradesh	6733453	332052	364859
Jammu & Kashmir	10099748	485071	245931
Punjab	25759204	1537520	1366439
Rajasthan	66663618	1876724	1405597
Southern States			
Andaman & Nicobar	352592	6840	23634
Andhra Pradesh	49206543	1984418	5123182
Karnataka	55821971	1373979	1025892
Kerala	30284368	2243892	5495556
Puducherry	1109580	8406	16448
Tamil Nadu	69526019	1670550	2577769
Telangana	35331176	930140	1048346
Eastern States			
Bihar	94021155	1805450	550849
Jharkhand	30125694	1595320	433965
Odisha	39389543	2313662.673	1365740.938
West Bengal	86548944	4276567	7795118
Western States			
D & N Haveli	326234	19828	754
Daman & Diu	204783	2048	4748
Goa	1332048	5003	73929
Gujarat	53332969	1805751	1804940
Lakshadweep	54228	1136	4626
Maharashtra	104316956	4889127	4299437
North Eastern States			
Assam	30535739	578434	178633
Arunachal Pradesh	1204025	34857	637
Manipur	2831371	45249	7778
Meghalaya	2949915	10364	153
Mizoram	906694	23015	8137
Nagaland	1545155	10607	2128
Sikkim	538068	8189	10016
Tripura	3537467	98468	12865
Central States			
Chhattisgarh	25067351	905277	332436
Madhya Pradesh	69456433	1672420	1074651
Uttarakhand	8430710	229691	66579
Uttar Pradesh	189787214	10026820	4180606
India	**1140512894**	**44529120**	**41771430**

Source: Calculated from unit-level data of NSS 75th Round

Table-A3: NSS 75th Round Disease list classified under the International Classification of Disease WHO (ICD-10, WHO, 2010)

Infectious Diseases	
Diarrhea/dysentery, Worm infection, Tuberculosis, Disease of skin, Other Sexually transmitted diseases, HIV/AIDS, Fever due to Diphtheria, Whooping cough, Tetanus, Fever with loss of consciousness or altered consciousness, fever with rash/eruptive lesions, Discomfort/pain in eye with redness or swellings/boils, Acute upper respiratory infection, Cough with sputum with or without fever and not diagnosed as TB	
CVDs	
Heart disease, Hypertension, Stroke/hemiplegia	
NCDs	
Jaundice, Bronchial asthma, Diseases of kidney/urinary system, Glaucoma, Cataract, Goiter, Diabetes mellitus, Under-nutrition, Anemia, Cancer, Bleeding disorders, Under-nutrition, Goiter and other diseases of the thyroid, Earache with discharge/bleeding from ear/infections, abnormality in urination, pelvic region/reproductive tract infection, Change/irregularity in menstrual cycle, Pregnancy with complications before or during labor, complications in mother after birth of child, illness in the newborn/sick newborn.	
Disability	
Mental retardation, mental disorder, headache, seizures or known epilepsy, weakness in limb muscles and difficulty in movements, others including impaired cognition, memory loss, confusion, decreased vision, others (including eye movement), Decrease hearing or loss of hearing, diseases of mouth/teeth/gum, joint or bone disease, back or body ache, accidental injury, accidental drowning, burns, poisoning, assault, intentional self-harm.	
Other Disease	
All other fevers (includes malaria, typhoid, and fevers of unknown origin), Pain in abdomen: gastric and peptic ulcers, lump or fluid in abdomen or scrotum, gastrointestinal bleeding, contact with venomous/harm-causing animal and plant, symptoms not fitting into any of above categories, could not even state the main symptom.	

Table-A4: NSS Regions of Assam

NSS region	District
Eastern Plains	Lakhimpur, Dhemaji, Tinsukia, Dibrugarh, Sibsagar, Jorhat, Golaghat
Western Plains	Kokrajhar, Dhubri, Goalpara, Bongaigaon, Barpeta, Kamrup Rural, Nalbari, Chirang, Baksa, Kamrup Metro
Cachar Plains	Karbi Anglong, NC Hills, Cachar, Karimganj, Hailakandi
Central Brahmaputra Plains	Darrang, Morigaon, Nagaon, Sonitpur, Udalguri

Disaggregate Level Estimation and Mapping of Time Spent by Women on Unpaid Activities Via Small Area Modelling by Integrating Survey and Census Data

Sonakhya Samaddar[1], Hukum Chandra[2]

Abstract

The estimates provided in the reports produced from the survey data of NSO are quite useful for inferring results at national and state level. However they fail to provide reliable estimates at district or any other smaller domain due to small sample size and unstable variance. This article focus on usage of Small Area estimation through Fay Herriot model to derive reliable and stable estimates of time spent on unpaid activities by women of Uttar Pradesh at district level in rural areas. This main variable of interest was obtained from the Time Use Survey January-December, 2019 data of NSS. The estimates produced at district level are useful for government to form policies and take suitable steps towards women empowerment and removing the barriers of inequality at very ground level. As an auxiliary variable we took help of the PLFS data of 2018-19 but the resultant district level estimates used from the data were also subjected to sampling error. Hence, to obtain a suitable and more reliable estimate, we employed the method of measurement error model combined with Fay Herriot model. The efficiency of the models employed was checked with help of estimated Mean squared error and Coefficient of Variations. It was well established that our estimates are quite reliable and stable. We disaggregated our findings for rural areas among several socio-economic groups where the sample size was even smaller.

Keywords: National Statistical Office, Periodic Labour Force Survey, Time Use Survey, Unpaid Activities, Small Area Estimation, Fay-Herriot Model, Mean Squared Error estimation, Coefficient of Variation
JEL Codes: C83, J16

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1. Introduction

In India, Periodic Labour Force Survey (PLFS) of the National Statistical Office (NSO) is the primary source of data on employment and unemployment at national and at state level. The survey started from 2017 and is conducted annually. Also the NSO, like many developed countries including USA, Australia, Canada, Germany, Austria, etc. launched Time Use Survey (TUS) for the first time in the country in January, 2019 to gather information on the activities that are performed by the population and the duration of time spent on those activities. The information on time use was collected for persons of age 6 years and above from the households during January-December, 2019. The survey has measured participation and time spent by the persons in paid activities, unpaid care-giving activities, unpaid volunteer work, unpaid domestic service producing activities, learning, socializing, leisure activities, self-care activities, etc. We consolidated all kinds of unpaid activities which are unpaid care-giving activities, unpaid volunteer work and unpaid domestic service producing activities into a single entity and named it as 'Unpaid Activities'. These NSO survey reports are very helpful in providing reliable and meaningful estimates at National as well as at State level.

The report based on PLFS 2018-19 points out that labour force participation rate of women in Uttar Pradesh, considering both principle and subsidiary activities is merely 9.9% with the corresponding figure being 7.3% for Urban and 10.7% for rural areas. These figures are significantly lower than that of the comparable figures for male with labour force participation rate of 50.3% for the whole state, 51.6% for urban areas and 49.9% for rural areas. If women are not actively participating in paid employment, where and how are they spending their time? The answer to this very crucial question was plausibly answerable to some extent with the release of the Time Use Survey Report by NSO in September, 2020. The Time Use Survey report presented the fact that in rural areas of Uttar Pradesh, an average woman would spend 288 minutes or about 5 hours while an average man would spend only 38 minutes in any given day on unpaid activities. While in urban areas the figure stand at 259 minutes for an average woman and 30 minutes for an average man. Also the article highlights that how time usage among women varies across different social groups and is completely unfair across gender. The drastic difference in amount of time a woman spends on an average everyday on unpaid activities further highlights the lingering inequality in the status of women in the Indian society and the immediate emphatic need for the implementation of schemes for woman empowerment.

However, for better implementation and monitoring, the growing interests of the scientists, government organization, policy makers and public agencies are concentrated in obtaining the local level statistical synopses. These local level areas or domains, better known as small areas or small domains are formed by cross-classification of several demographic and topographic variables that includes small topographic areas (e.g. Districts) or small demographic groups (e.g. land category, social groups, religion, age-sex groups) or cross classifying both. On the other hand, in the existing survey data viz. TUS, the small areas may have very small or even zero sample sizes and direct estimation in such cases may lead to large sampling error. The SAE methodology provides a viable and cost-effective solution to this problem of small sample sizes (Rao and Molina 2015). The SAE methods borrow strength from other external data sources viz. areas, time periods etc. to generate precise and representative estimates which in this article was borrowed from PLFS data and Census data of 2011. SAE methodologies are based on model based approaches which might be modelled either at unit level that is for each of the sample units in all of the small domains or at area level where the modelling is done based on the direct aggregate estimate obtained from each of the small areas and the auxiliary information is also available in aggregated form. The most widely used area level model in Small Area estimation is the Fay Herriot model which assumes that the area level aggregated values of the auxiliary variable is available and tries to fit an area level linear mixed model with area random effects. Several researches and application based work has been carried out across the globe to obtain reliable estimates of small domains using the Fay-Herriot modelling approach.

But in many cases the aggregated auxiliary variable that we use in the Fay-Herriot model often comes from another survey data, which in our case is the PLFS data which is also subjected to error in measurement. Ignoring the sampling error of the auxiliary variable while using it in the model based small area estimation methods like Fay-Herriot model may even lead to situation where the estimated values are even worse than that of the direct estimates. Ybarra and Lohr (2008) proposed a new small area estimator that accounts for sampling variability in the auxiliary information and derived its properties. Often the estimated variable of interest obtained from simply using Fay-Herriot model without considering variation of the auxiliary estimate may lead to under estimation of the Mean Squared Error and hence even though the estimates seems stable, in reality they are not. Suppose we have m small areas of interest (say districts) and Y_i denotes the variable of interest which could be mean, total, etc. A primary survey data (in our case the TUS survey) provides direct estimate (simple or weighted mean) as an estimate of Y_i for some or all small areas. The auxiliary data source (PLFS data) provides us with an estimator X_i of the population characteristic X_i which suppose has MSE D_i. In this article we have exploited this extra information about the MSE of X_i as and when required to reach a more reliable and stable estimate of Y_i.

We attempted to come up with an estimate of the average amount of time a woman spend on unpaid activities in rural areas of the Indian state of Uttar Pradesh at district level through simple Fay-Herriot model while using only census data as auxiliary source and Measurement Error adjustment of Fay-Herriot model while using mixed sources (Census data and PLFS data). In addition to that we have also obtained estimates for social groups which include Schedules Caste, Other backward Class and Others for rural region only. We were unable to come up with suitable estimates for the Scheduled Tribes since for numerous district, no data has been collected from the particular social group in both sources of survey data. Also, the census data of 2011 suggests very few population of Scheduled tribes for all the districts of Uttar Pradesh; some district has ST population as low as two! For subcategory of ‘Others’ from rural region, there was no sample drawn from two districts. In such a case, we estimated the target variable with help of only the auxiliary information (using formula 4 and 5 for computing estimate and MSE respectively). Uttar Pradesh is the most highly populated state of India as well as the most highly populated country subdivision in the world. The state accounts for about 16.16% of India’s and about 2.9% of world’s population with an area of 243, 290 square km that equals to 6.88% of India’s total geographical area. It holds the third largest economy of the country but it has a large number of people living below the poverty line. According to the Population Census 2011 about 78% of the people reside in rural areas. The state has a sex ratio of 912 women per 1000 men and literacy rate of 67.68%. Also, around one-fifth of the state’s population are Scheduled Caste. Thus, for such a hugely populated region with moderately low sex ratio and a significantly high rural population, it seemed reasonable to take further look into the time-use analysis of the women of the rural region of the state which could be an indicator for women development. In Section-2, we present the description of the data that we have used, in section-3 we described the methodologies applied which includes proper definition of the Small Area estimation techniques that we have taken into account, in Section-4, we present our result and finally, in Section-5, we have presented a short conclusion.

2. Data Description

In this endeavour, we used two NSO datasets, namely PLFS 2018-19 and TUS 2019-20. As already discussed earlier, this was the second PLFS round and first TUS round of NSO. The unit level data for all the rounds of NSO are available for public usage in the website of the Ministry of Statistics and Program Implementation (http://mospi.nic.in/download-tables-data). The Survey Design and Research Division (SDRD) of the ministry are responsible for development of survey methodologies and publication of reports. The Field Office Division (FOD) is responsible for carrying out the interview process for data collection. Data processing and tabulation was done by Data Quality and Assurance Division (DQAD) and Survey Coordination Division coordinated the entire process pertaining to the survey. In their surveys, NSO uses multistage stratified random sampling to draw a representative sample of households to carry out the interview process. Districts are the strata which eventually cover up the entire nation. The villages for rural areas and Urban Frame Survey Blocks for urban regions are considered as first stage units (FSU) and households are the second or ultimate stage units (SSU). Again each second stage units, NSO provides a multiplier which acts as weights. These are the number of households from the population each household in the sample represents.

NSO collects data from 71 districts of Uttar Pradesh. In the Time Use Survey 2019-20, they collected data from 19649 women of age six years and above from rural areas of Uttar Pradesh with a sampling fraction of 0.00036, with samples collected from each districts varied from 55 to 593. Details about the sample size collected from each of the subgroup (subcategories) are presented in Table-1. It is quite evident that some of the subdomain lacks the adequate amount of sample size needed to produce a stable and precise direct estimate at that level due to the accountability of large sampling error. But district level estimates for each of the subdomain are of utter importance for any policy formulation and decision making. This article aims at achieving the required level of precision through indirect estimation techniques of SAE.

Table-1: Sample Size from different Districts for all the Sub-categories from TUS 2019-20

Sub-category	Total Samples	Minimum	Maximum	Mean	Sampling Fraction
Rural	19649	55	593	277	0.00036
SC	5025	6	187	71	0.00039
OBC	10529	30	348	148	0.00038
Others	3478	4	122	94	0.00039

The Periodic Labour Force Survey, 2018-19 of the NSO had information on 21219 women from Uttar Pradesh with sampling fraction of 0.00025. The sampling fraction for rural region stands at 0.00039. Thus, any sample estimate we use from the data as auxiliary information is subjected to sampling error and their variability needs to be taken care of. Hence, it is not wise to use information from the survey data source without accountability of error measurement directly in the Fay-Herriot model. In this study, wherever we have used any kind of information from the survey data, we have considered the variability of the area level aggregated estimate through application of Measurement Error model.

Let us now discuss the variables that we used for modelling and estimation. Our aim was to find out the time spent on unpaid activities by the women in each of the subcategories and hence for that purpose we chose our target variable as Y_i, the average time spent (in minutes) by the women at district level on unpaid activities as mentioned before. This was obtained as direct estimates weighted by the multipliers from the Time Use Survey, 2019-20. The NSO data was tabulated by dividing the full 1440 minutes of a day into several time slots for each of the person and against each time slot the activities performed by the individual was noted. In some slot a person might perform more than one activity, like taking care of child and self-maintenance at the same time. In such cases each of the activities were allocated equal amount of time in minutes. For a particular person we added up all the minutes in the time slots where any unpaid activities were performed (considering and suitably dividing the time spent on multiple activities). Next, we considered the auxiliary information which was obtained from PLFS 2018-19 data and the variables that we used at area level were X1, the proportion of women in labour force (Labour Force Participation Rate) for principal activities only and X2, the proportion of illiterate women in the subcategory. Both the estimates were obtained by using weights and the variances of the estimates are also weighted estimates. The other two variables we considered were from the Census, 2011 data and did not need any variance estimation. These were just the population counterpart of the information from PLFS data, i.e., X3 is the proportion of women in labour force and X4 is the proportion of illiterate women. We chose either of X1 and X3 depending on the strength of linear relationship with Y and similarly we chose either of the X2 and X4. The advantage of using survey data alongside census data is that the Census data has been collected in 2011 which dates back ten years and might actually fail to represent the actual current scenario while the survey data is more recent and more appropriate to use once the sampling error is taken care of.

3. Methodological Framework

3.1. Fay-Herriot Model (Basic Area Level Model)

Suppose there are *m* small areas of interest where Y_i is the value of interest for area *i* and X_i is the auxiliary information (a single variable or a vector). We first assume X_i is exactly known. Then Fay-Herriot (1979) model is given by

$$y_i = X_i^T \beta + v_i + e_i, \quad i = 1,2,3,..., m \tag{a}$$

where, y_i is the direct estimate of the Y_i obtained from the survey data; v_i and e_i are independent random variables with mean *0* and variance σ_v^2 and ψ_i respectively. β is a vector of unknown regression coefficients. It is to be noted that X_i and β may be scalar or vector and y_i, v_i and e_i are scalar variables in the above mentioned model.

If we exactly know the model parameters β, σ_v^2 and ψ_i, then the best linear unbiased predictor of Y_i is

$$\hat{Y}_{iFH} = \gamma_{iv} y_i + (1 - \gamma_{iv}) X_i^T \beta \tag{1}$$

where $\gamma_{iv} = \dfrac{\sigma_v^2}{\sigma_v^2 + \psi_i}$. It must be noted that $\hat{Y}_{iFH}$ is a convex combination of the direct estimator Y_i and the predicted value $X_i^T \beta$ from the regression model; the degree of dependence on the two terms is determined by the relative sizes of the model variance σ_v^2 and the sampling error variance ψ_i. Also the MSE of the estimator is given by

$$MSE\left(\hat{Y}_{iFH}\right) = E\left(\hat{Y}_{iFH} - Y_i\right)^2 = \gamma_{iv} \psi_i \tag{2}$$

But generally, in practice β and σ_v^2 are not known and must be estimated from the data. They are often substituted by the least square estimates and we obtain the best linear unbiased predictor as

$$\hat{Y}_{iFH} = \hat{\gamma}_{iv} y_i + (1 - \hat{\gamma}) X_i^T \beta \tag{3}$$

where $\hat{\gamma}_{iv} = \dfrac{\hat{\sigma}_v^2}{\hat{\sigma}_v^2 + \psi_i}$. The standard assumptions for small area estimation here is that ψ_i 's are known and hence we use estimated variance of y_i as ψ_i 's.

In case a small area has no sample or only one sample, ψ_i =0 and thus for that area,

$$\hat{Y}_{iFH} = X_i^T \hat{\beta} \tag{4}$$

And

$$MSE\left(\hat{Y}_{iFH}\right) = E\left(\hat{Y}_{iFH} - Y_i\right)^2 = \sigma_v^2 \tag{5}$$

3.2. Presence of Error in the Auxiliary Information

In many cases, especially when using auxiliary information from any other survey data susceptible to sampling error, we use $\hat{X}_i$, an estimate of X_i instead. Suppose it has MSE D_i. The resulting predictor is then given by

$$\hat{Y}_{iS} = \gamma_{iv} y_i + (1 - \gamma_{iv}) \hat{X}_i^T \beta$$

Now assuming $\hat{X}_i$, e_i and v_i are independent of each other,

$$E\left(\hat{Y}_{iS} - Y_i\right) = (1 - \gamma_{iv}) E\left(\hat{X}_i - X_i\right)^T \beta$$

and

$$MSE\left(\hat{Y}_{iS}\right) = \gamma_{iv}\psi_i + (1 - \gamma_{iv})^2 \beta^T D_i \beta$$

Thus, if $\beta^T D_i \beta > \sigma_v^2 + \psi_i$, then $MSE\left(\hat{Y}_{iS}\right) > \psi_i$. In that situation, using $\hat{Y}_{iS}$ is worse than using the direct estimator y_i. Moreover, if we ignore the error in $\hat{X}_i$ for MSE calculation, the reported MSE of $\gamma_{iv}\psi_i$ will be too small and will give a misleading notion of precision.

3.3. Fay Harriot Model with Measurement Error

Let X_i be the true area level value of the auxiliary variables for area *i*. If all components of X_i are known, basic area level Fay-Herriot model works well to give a precise estimate of population parameters. But in case X_i is measured with error, Ybarra and Lohr (2008) suggested to substitute $\hat{X}_i$ for X_i and instead use the model

$$y_i = \hat{X}_i^T \beta + \delta_i\left(\hat{X}_i, X_i\right) + e_i$$

Where, $\delta_i\left(\hat{X}_i, X_i\right) = v_i + \left(\hat{X}_i - X_i\right)^T \beta$. They assumed that v_i is independent of both $\hat{X}_i$ and e_i and that random variables in different small areas are independent.

In addition, it was also assumed that X_i and y_i are independent for each area *i*, as would have been the case if X_i and Y_i were estimated using independent data sources. The above defined model is a measurement error model. These have been used in many settings and are discussed in detail by Fuller (1987), Carroll et al. (1995) and Cheng and Van Ness (1999). Under all the given setup and model specification, the resulting predictor is given by

$$\hat{Y}_{iME} = \gamma_i y_i + (1 - \gamma_i) \hat{X}_i^T \beta,$$

Where,

$$\gamma_i = \frac{\sigma_v^2 + \beta^T D_i \beta}{\sigma_v^2 + \beta^T D_i \beta + \psi_i}$$

And Mean Squared Error of $\hat{Y}_{iME}$ is given by $MSE\left(\hat{Y}_{iME}\right) = \gamma_i \psi_i$. It must be noted that $\gamma_i = \frac{MSE\left(\delta_i\right)}{MSE\left(\delta_i\right) + \psi_i}$ depends on the error i estimating X_i as well as on σ_v^2 and ψ_i . $\hat{Y}_{iME}$, hence relies more strongly on the regression estimate when $\hat{X}_i$ is measured without error. If, however $\hat{X}_i$ is measured imprecisely on the direct estimator Y_i . With increase in sample size for area i, $\Psi i \rightarrow 0$, $\gamma i \rightarrow 1$ and hence, $MSE\ (Y_{iME}) \rightarrow 0$.

When β and σ_v^2 are replaced by consistent estimators $\hat{\beta}$ and $\hat{\sigma}_v^2$, the measurement error estimator is

$$Y_{iME} = \gamma_i y_i + \left(1 - \gamma_i\right) X_i^T \beta \tag{6}$$

Where, $\gamma_i = \frac{\sigma_v^2 + \beta^T D_i \beta}{\sigma_v^2 + \beta^T D_i \beta + \psi_i}$

And the approximate MSE of $\hat{Y}_{iME}$ may be given as follows. Define $\hat{\theta} = \left(\hat{\sigma}_v^2, \hat{\beta}^T\right)^T$ be an estimator of $\theta = \left(\sigma_v^2, \beta^T\right)^T$ with

$$cov\left(\hat{\theta}\right) = \begin{pmatrix} var\left(\hat{\sigma}_v^2\right) & d_m'' \\ d_m & B_m \end{pmatrix} + o\left(m^{\ 1}\right)$$

Assuming $\hat{\theta}$ being independent of $\left(X_i, y_i\right)$ and that sixth central moments of $\hat{\theta}$ are $o\left(m^{\ 1}\right)$, then

$$\begin{aligned} MSE\left(Y_{iME}\right) &= \gamma_i \psi_i + \left(1 - \gamma_i\right)^2 tr\left(D_i + X_i X_i^{'}\right) B_m + \frac{\psi_i^2}{\left(\beta^{'} D_i \beta + \sigma_v^2 + \psi_i\right)^3} \\ &\times E\left(\hat{\sigma}_v^2 + \hat{\beta}^{'} D_i \hat{\beta} - \sigma_v^2 - \beta^{'} D_i \beta\right)^2 + 2E\left(1 - \hat{\gamma}_i\right)^2 \left(\hat{\beta} - \beta\right)^{'} D_i \beta + o\left(m^{\ 1}\right) \end{aligned} \tag{7}$$

In practice, we estimate $MSE\left(\hat{Y}_{iME}\right)$ by using the Jacknife method.

In case a small area has no sample or only one sample, $\psi_i = 0$ and thus for that area according to Ybarra and Lohr (2008),

$$\hat{Y}_{iME} = \hat{X}_i^T \hat{\beta} \tag{8}$$

And

$$MSE\left(\hat{Y}_{iME}\right) = E\left(\hat{Y}_{iFH} - Y_i\right)^2 = \hat{\sigma}_v^2 + \hat{\beta}^T C_i \hat{\beta} \tag{9}$$

4. Results and Discussions

4.1 Selection of Auxiliary Variable(s)

We have considered two sources for collection of auxiliary information which are Periodic Labour Force Survey data of 2018-19 and Census data of 2011. Census data of 2011 has a wide time difference with the data from Time Use Survey. But since, we have mainly used rates/percentages and not any absolute numbers from Census Data, it was assumed that growth rate of population both in numerator and denominator was uniform for a small geographic region. Since our variable of interest is time spent on unpaid activities by women which mostly depends on the data related to women and the kind of activities they perform, we thought about including only those variables which are expected to be related and linked to these parameters of interest. The two basic interests of variables we decided on were the labour force participation rate of women and illiteracy rate of women for various districts among each subcategory. This information was obtained from both sources of data. However, while selecting variable from PLFS data, which was sampled, we found that for subcategories like SC population or any other social group, there were no female representatives for many districts and in those cases, we considered taking the overall labour force participation rate including both male and female. For some cases, in fact, no variable obtained from the PLFS data was proved to have significant connection with our variable of interest and hence we used only census data in those cases and also, there was not any need for the usage of Measurement Error Model.

Details about the selected variables for each subcategory are given in Table-3 along with the *p*-value of the overall significance of the fitted linear model. We considered several criteria for variable selection. The first thing we considered was the Pearson correlation coefficient and its test for significance (whether significantly different from 0). This information even if sufficient to provide information about one-to-one linear relationship may not be able to show the true scenario in presence of other variable. We then went for multiple linear regression model taking two variables at a time. This was due to the fact that we can take either two auxiliary variable from PLFS data, or two auxiliary variable from Census data, or labour force information from PLFS and illiteracy information from Census or illiteracy information from PLFS and labour force information from Census. Among the four variables we used, X1 and X2 corresponds to PLFS data while X3 and X4 corresponds to Census data. The model that gave us the lowest *p*-value and all significant variables was finally chosen to be optimal.

Table-2: Selected Auxiliary Variables for Modelling each Subcategory

Subcategory	Variables	*p*-value
Rural	X1:Percentage of Rural women in labour force;	0.034
SC	X3: Percentage of Rural, SC women in labour force	0.025
OBC	X1: Percentage of Rural, OBC People in labour force	0.065
Others	X3:Percentage of Rural women in labour force in the district	0.0074

Table-2 shows us that for subcategory Rural and Social Group of OBC in rural region, we have used auxiliary information from another survey data (PLFS) which is prone to sampling error and thus, it is required to use Measurement Error model (mix) in these three cases. We used equation (6) and (7) for computing estimate and the estimated MSE in these cases. For the other two subcategory of Social Group of SC and Social Group of others, we went forward with simple application of basic area level Fay-Herriot model and used equation (3) for computing estimates.

4.2 Diagnostic Measures

In this section, we shall discuss the required diagnostic measures we have used to check for the validity of the model. We started with checking for normality and skewness of the error terms (v_i) mentioned in equation (a) which was achieved by visual inspection of histogram, qq plot and residual diagram. The bell shaped histogram with an appropriately fitted normal curve above it is expected to actually come from a Normal distribution. A plot of quantiles of the given data against quantiles of the normal distribution is supposed to lie on a straight line if the data under consideration is actually coming from a Normal population. The plot of residual of the observed variable must be distributed evenly around *0* to provide intuitive reasoning for Normality assumption. Fig. 1, 2, 3 and 4 provides us with visual inspection of the Normality of error for four subcategories and we observe that they fairly look good to be considered normally distributed.

In addition to visual inspection, we have also resorted to statistical testing for the Normality of errors for each of the subcategories. A Shapiro-Wilk test was employed for this diagnostic where the null hypothesis is that the underlined distribution is Normal. Thus a high *p*-value indicates that the data is actually coming from a Normal distribution. Table-3 gives us corresponding *p*-value for each of the subcategories.

Table-3: *p*-value from the Shapiro-Wilk test

Subcategory	p-value
Rural	0.48
SC	0.21
OBC	0.45
Others	0.67

Since we observe that all the p-values from the Shapiro-Wilk test are greater than 0.05, hence at 5% level of significance, our variables of interest follows Normal distribution.

The reliability as well as the validity of the Fay-Herriot as well as the Measurement Error based Fay-Herriot model for small area estimates are evaluated by considering a set of commonly used diagnostics measures. Following Brown et al. (2001) and Chandra et al. (2011), these diagnostics are based on the argument that model-based small area estimates should be (a) consistent with unbiased direct survey estimates, i.e., they should provide an approximation to the direct survey estimates that is consistent with these values being "close" to the expected values of the direct estimates; and (b) more precise than direct survey estimates, as evidenced by lower mean squared error estimates, i.e., the model-based small area estimates should have mean squared errors significantly lower than the variances of corresponding direct survey estimates. We have selected the following measures viz. the bias diagnostic, the percent coefficient of variation (CV) diagnostic and the 95 percent confidence interval (CI) diagnostic.

The bias diagnostic is used to examine the validity whereas the CV and CI examine the precision of the model-based small area estimates. The bias diagnostic measure is established following the idea of Chandra et al. (2011). Being unbiased of the true values of the target population, the direct survey estimates' regression on the true population values should appear to be linear and relate to the identity line. The regression of the direct survey estimates on the model-based small area estimates should be analogous if the model-based estimates are adjacent to these true population values. Therefore, the direct survey estimates in the *y*-axis vs. model-based estimates in the *x*-axis are plotted and we observed the departure of the model-based estimates from the fitted values of the regression line. The bias diagnostic plots are given in Fig.6, in which direct survey estimates (Y-axis) are plotted against corresponding model based FH or FHME estimates (X-axis) and tested for divergence of the fitted least squares regression line (thick line) from the line of equality Y = X line (thin line). Figure 6 reveals that the model-based small area estimates are not as much of extreme to the direct survey estimates, indicating the typical SAE outcome of shrinking more extreme values towards the average. The R2 values of the fitted model for each of the subcategories are 0.95, 0.93, 0.86 and 0.80 respectively for Rural, SC, OBC and Others. Overall from the bias diagnostics (Fig. 5), we can observe that the direct estimates are not highly deviated from the small area estimates and hence they are consistent.

In addition to this, we also applied Goodness of Fit (GoF) diagnostic for checking consistency. This test helps us to detect whether direct estimates and model-based estimates are statistically different from each other. The null hypothesis of the test is that direct estimates and model-based estimates are statistically equivalent. The test statistic of GoF is computed using Wald statistic for all the models that we have use

$$W = \sum \frac{(\mathrm{DirectEstimate_d} - \mathrm{ModelBasedEstimate_d})^2}{\mathrm{V(DirectEstimate)_d} + \mathrm{MSE(ModelBasedEstimate)_d}}$$

The value of the test statistic *W* is compared against the value from Chi-squared distribution with degree of freedom as the no. of small areas under consideration. We are taking here 5% level of significance for all comparisons. The result from Table-4 shows that *W* is much less than the cut-off value for all the models suggesting that the model-based estimates are consistent with direct survey estimates.

Table-4: **Wald Test Statistic values for Consistency check (Others had samples from 69 districts)**

Subcategory	W	Cut-off Value
Rural	12.09	91.67
SC	22.59	91.67
OBC	15.24	91.67
Others	24.74	89.39

Magnitude to which the model-based (FH/FHME) estimates improved in precision than the direct estimates. Model based estimates with small CVs are considered reliable. Here, we have compared the model based model estimates with their direct estimates counterpart through three measures, MSE, CV and Confidence interval (95%). Figure 6 shows us the comparison of the percentage coefficient of variation and there we can observe a significant improvement. It can see that for the social groups, where there was very small sample size for some of the districts, the small area methods have given much reliable and precise estimates as compared to the direct estimates. The ranges of variation in the CVs for the direct estimates are also significantly higher than that of the small area estimates. Finally, we can observe from the confidence intervals (Fig. 7) of both of the estimates that the 95% CI given by small area methods are narrower than that obtained by the direct estimates for all the subcategories. Detailed tables giving us all the district estimates along with CVs and 95% CIs for both methods of estimation are provided in table-7 through 12 for all the subcategories.

Table-5: Summary of the distribution of percentage coefficients of variation (% CV) for the direct and model-based estimates for various Subcategories

Values	**Rural**		**SC**		**OBC**		**Others**	
	Direct	SAE	Direct	SAE	Direct	SAE	Direct	SAE
Minimum	2.95	2.76	4.76	4.37	3.67	3.38	6.20	5.46
Q1	3.84	3.44	7.25	5.90	4.93	4.33	8.68	6.53
Median	4.28	3.78	8.39	6.57	5.86	4.90	10.11	7.21
Mean	4.76	4.00	9.31	6.60	6.58	5.21	12.10	7.35
Q3	5.38	4.52	9.96	7.09	7.04	5.72	13.95	8.14
Maximum	12.10	6.57	21.84	9.70	19.77	9.23	29.46	9.66

4.3 Discussion of Results

Since we have concluded that the model based estimates are indeed reliable and useful, henceforth all our discussions shall be based on the model based estimates only. We have presented four maps (fig. 8 through 11) for each of the subcategories showing the distribution across districts of Uttar Pradesh the amount of time, in minutes a woman spend on unpaid activities. We are also presenting a table summarizing the percentage of time spent on unpaid activities.

Table-6: Summary of Time (in mins.) Women spend on Unpaid Activities across districts of Uttar Pradesh

Values	Rural	SC	OBC	Others
Minimum	268.6	259.1	289.4	233.9
Q1	310.2	315.8	313.2	289.0
Median	326.4	327.2	331.6	308.0
Mean	326.0	329.8	331.6	305.0
Q3	341.1	343.9	343.6	318.2
Maximum	384.8	393.1	387.6	349.5

It can be observed that for the overall rural areas, an average woman would spend around 23% of her time on unpaid activities which is more than 5 hours. There are 3 districts in overall rural region where women are spending more than one-fourth or 25% of their day on unpaid activities and out of 71 districts, there are 69 in which they are spending on an average more than 20% of their day. The categorical comparison shows a clear picture that the situation is much worse for women in SC and OBC category than for the others. The article (https://www.livemint.com/news/india/your-caste-and-class-determines-how-you-spend-time-11602657834829.html) highlights how women in SC, ST and OBC category gets to spend less time to spend on self-care and spends adequate amount of time of household activities on a whole National level.

This goes in synchronization with our observations about the different districts of Uttar Pradesh where we observe that on an average women in SC and OBC category spend much larger amount of their time on unpaid activities than women in Others category. While for SC and OBC, there are 9 and 8 districts respectively where women spend more than one-fourth of their day on unpaid works, there are no districts in Others category where the time spent is so high (for Others, there are 53 districts where women spend more than 20% of their time). Also, for OBC women in rural areas, in all districts out of 71 districts, an average women spent more than 20% of her time on the unpaid activities.

Also, it must be observed that the women spend maximum time at general rural level as well as if we segregate by social groups in the southern part of the state. Districts in the southern part of the state such as Lalitpur, Jhansi, Jalaun etc. has always portrayed highest time usage on unpaid works among women. On an average, we observe that the western part of the state has shown lesser time usage than the eastern part at overall rural level. For SC and OBC category also, there are very few districts in western part than that of the other parts, especially the eastern part where women are spending a great amount of time on uneconomic activities. While for the others category, there are no district in western part where women are spending considerable time. Hence, there is also variability in time usage among different parts of the states as is observable from the maps and tables. To our advantage, the SAE techniques have provided us with a suitable way to make a comparison between districts at rural as well as at segregated levels. We can particularly identify a few districts in the

Southern region as well the Central part like Lalitpur, Jhansi, Hamirpur, Barabanki, Gonda and Pratapgarh where it can be observed that women are spending significant amount of time on unpaid works. At overall rural level, Lalitpur, Barbanki and Chandrauli shows that women are spending on an average more than 6 hours of their time on unpaid works while for SC category, Lalitpur, Pratapgarh, Basti, Agra, Jhansi, Gautam Buddha Nagar, Gonda, Chandauli and Lucknow are the districts where women are spending on an average more than six hours of their time on unpaid activities. For women in OBC category, again we observe that in districts like Jalaun, Bijnor, Shahjahanpur and Barabanki, the average time women are spending on unpaid works is even more than 370 minutes while for others, the highest time usage on unpaid works was observed with districts of Jhansi, Banda and Fatehpur where it is more than 340 minutes. While for the districts like Aligarh and Varanasi, the time usage is really less at overall rural level. For SC, OBC category also, Aligarh displays lesser time usage and for Others, Varanasi, Budaun and Kasganj shows least time usage on unpaid works by women where it is less than 300 minutes or 5 hours but definitely not less than 4.5 hours. This whole observation only confirms and further states that for rural areas, the gender equality is still a far-fetched concept especially for the women belonging to SC and OBC groups, where they are spending a great portion of their whole day on unpaid works.

5. Conclusion

In this article we have defined the basic model and assumptions of Fay-Herriot model used in small area estimation and we have also discussed the situation where its usage may give misleading results and proposed suitable corrective measures. The main objective of the whole endeavour was to estimate precisely the amount of time an average woman from Uttar Pradesh spend on unpaid activities from each of the district, at rural level and for three social groups therein. The information regarding this was collected from Time Use Survey data published by NSO conducted in the year January- December, 2019. The auxiliary information required for modelling the data was obtained from PLFS data 2018-19, again published by NSO and Census data of 2011. Where modelling was solely based on Census data, we used basic area level Fay-Herriot model and for the scenarios where we used PLFS data, we have employed Measurement Error model for correcting estimated MSE values. The model based estimates were compared with the direct estimates in term of precision and reliability through MSEs, CVs and CIs. It was observed that undoubtedly, the model based estimates gave better performance than the direct estimates and they are very reliable to draw conclusion even in the situation where we have very limited sample size for some districts.

The estimates thus obtained were seen to be varying across districts of Uttar Pradesh for all the subcategories and special attention on part of the government might be given to districts where women spent a large amount of their time on unpaid chores. The study brought into focus some important aspects related to women empowerment and equality in terms of usage of their time on activities they perform in any day. For all the subcategories under consideration, there are significantly large numbers of districts in rural areas where women are spending more than 4.5 hours on unpaid works and among the social groups therein, there are many districts with women working for more than 5 to 6 hours daily without any payment. The goal 5 of seventeen sustainable development goals aimed at reducing gender inequality and improving the situation of women empowerment might be given special and harder push according to the situation where women are actually spending a great deal of work which are not economically measurable. This not only puts hindrance on the path of women empowerment but also shows us scope to improve national GDP where involvement of women in paid activities has the potential for improvement.

The Government of India is placing considerable emphasis on micro level planning for achieving a balanced development including women empowerment. The district is an important domain for planning process in the country and therefore availability of district level statistics is vital to monitoring of policy and planning. This study produces reliable statistics at district level through SAE techniques that can be used in prioritization and targeting of efforts and investments. By implementing SAE technique, we are able to address the small sample size problem in producing the cost effective and reliable disaggregate level estimates and confidence intervals from existing survey data by combining auxiliary information from different published sources with direct survey estimates. The estimates and spatial maps generated by this study can be used by different Departments and Ministries in Government of India as well as International organizations in their policy planning to formulate effective action plans relevant to sustainable development goal 5 aimed for removing gender inequality.

Table-7: Time Spent (in Minutes) on Unpaid Activities by Rural Women

District	Sample Size	Direct Estimation				Model Based Estimation			
		Estimate	CV (%)	95% CI		Estimate	CV (%)	95% CI	
				Lower	Upper			Lower	Upper
Saharanpur	344	306.5	4.0	282.6	330.4	312.1	3.6	290.1	334.0
Muzaffarnagar	440	327.8	3.4	306.2	349.4	326.4	3.1	306.7	346.1
Bijnor	436	354.4	3.2	332.2	376.7	348.1	3.0	327.8	368.3
Moradabad	503	310.6	3.1	291.9	329.3	312.2	2.8	294.8	329.6
Rampur	160	339.3	4.7	308.2	370.4	333.7	4.0	307.5	359.9
Amroha	170	322.4	5.4	288.2	356.7	320.6	4.4	292.9	348.3
Meerut	180	281.1	4.9	253.9	308.2	291.3	4.3	267.0	315.6
Baghpat	158	305.1	5.9	270.1	340.1	311.0	4.8	282.0	339.9
Ghaziabad	177	315.0	5.8	279.0	351.0	317.5	4.6	288.7	346.3
Gautam Buddha Nagar	55	361.6	6.4	316.1	407.1	340.9	4.9	307.9	374.0
Bulandshahr	424	313.1	3.7	290.5	335.7	315.5	3.3	295.1	335.9
Aligarh	390	266.1	4.3	243.5	288.6	278.0	3.9	257.0	299.0
Hathras	73	251.7	12.1	192.0	311.4	294.7	6.6	256.7	332.6
Mathura	306	293.1	4.2	269.0	317.1	298.7	3.7	277.1	320.2
Agra	299	354.4	3.6	329.4	379.5	345.9	3.3	323.5	368.2
Firozabad	138	366.4	5.4	327.6	405.2	347.9	4.5	317.5	378.3
Mainpuri	145	338.4	5.7	300.3	376.5	329.2	4.6	299.2	359.1
Budaun	365	299.0	4.1	275.1	322.9	303.4	3.6	281.8	325.0
Bareilly	332	308.2	3.8	285.1	331.3	310.3	3.4	289.5	331.1
Pilibhit	198	351.7	4.2	323.0	380.4	342.0	3.7	317.2	366.8
Shahjahanpur	301	348.9	3.2	327.3	370.5	343.2	2.9	323.4	363.0
Lakhimpur Kheri	550	299.6	3.0	282.3	316.9	302.7	2.8	286.3	319.1
Sitapur	431	330.2	4.1	303.8	356.6	328.5	3.6	305.4	351.5
Hardoi	510	308.2	3.0	290.2	326.1	309.8	2.8	293.0	326.6
Unnao	328	340.2	3.4	317.6	362.8	339.6	3.1	319.0	360.2
Lucknow	198	332.4	5.2	298.7	366.0	333.3	4.4	304.9	361.7
Rae Bareli	301	311.7	3.9	288.0	335.3	315.9	3.5	294.5	337.2
Farrukhabad	278	339.8	4.0	313.4	366.2	335.3	3.5	312.1	358.4
Kannauj	253	330.2	4.3	302.7	357.7	327.8	3.7	303.7	351.8
Etawah	144	338.0	5.8	299.7	376.4	331.1	4.7	300.5	361.6
Auraiya	81	340.8	6.3	298.9	382.8	329.7	4.9	297.7	361.6
Kanpur Dehat	251	307.4	4.2	282.3	332.5	310.1	3.7	287.6	332.6
Kanpur Nagar	209	335.4	4.7	304.8	366.0	329.2	4.0	303.2	355.2
Jalaun	169	350.3	5.2	314.5	386.2	353.9	4.6	322.1	385.6
Jhansi	118	362.4	7.3	310.5	414.2	354.1	5.4	316.8	391.4
Lalitpur	163	394.2	4.7	358.0	430.5	384.8	4.6	349.8	419.7
Hamirpur	79	372.9	7.8	316.0	429.8	355.4	5.8	315.1	395.7
Mahoba	114	366.6	6.7	318.7	414.4	359.9	5.8	318.9	401.0
Banda	150	370.9	5.4	332.0	409.9	355.3	4.4	324.4	386.1
Chitrakoot	92	315.5	8.7	261.8	369.3	325.1	5.8	288.1	362.1
Fatehpur	321	338.2	4.3	309.9	366.6	338.7	3.8	313.6	363.8

District	Sample Size	Direct Estimation				Model Based Estimation			
		Estimate	CV (%)	95% CI		Estimate	CV (%)	95% CI	
				Lower	Upper			Lower	Upper
Pratapgarh	306	360.4	3.8	333.2	387.6	350.6	3.5	326.8	374.4
Kaushambi	307	338.2	4.0	311.6	364.7	334.8	3.5	311.6	358.1
Allahabad	488	307.5	3.0	289.6	325.4	309.6	2.8	292.8	326.4
Barabanki	370	376.6	3.5	350.6	402.5	366.7	3.2	343.4	390.0
Faizabad	227	343.3	3.6	318.9	367.6	340.7	3.3	318.8	362.6
Ambedkar Nagar	240	296.5	4.0	273.0	320.0	302.9	3.6	281.4	324.4
Sultanpur	471	299.0	3.7	277.2	320.8	303.2	3.4	283.3	323.2
Bahraich	236	366.1	4.3	335.3	396.9	351.6	3.9	324.7	378.5
Shravasti	82	287.8	8.4	240.2	335.4	307.7	6.1	270.9	344.6
Balrampur	240	294.7	4.9	266.2	323.1	301.5	4.2	276.8	326.2
Gonda	452	353.9	3.3	330.9	377.0	349.1	3.1	328.0	370.1
Siddharth Nagar	593	319.4	4.7	290.2	348.6	321.8	4.0	296.6	346.9
Basti	290	348.8	4.2	320.2	377.4	341.3	3.7	316.8	365.8
SantKabir Nagar	162	309.0	6.2	271.2	346.8	315.8	4.9	285.5	346.1
Maharajganj	335	307.6	4.0	283.2	332.0	312.7	3.6	290.7	334.6
Gorakhpur	358	303.9	3.9	280.6	327.2	308.7	3.5	287.7	329.8
Kushinagar	400	317.2	3.9	292.9	341.5	318.8	3.5	297.2	340.4
Deoria	246	338.2	4.5	308.7	367.7	334.9	3.8	309.8	360.0
Azamgarh	510	353.7	4.7	321.1	386.2	343.4	4.0	316.4	370.3
Mau	213	295.5	5.6	263.3	327.7	306.7	4.6	279.2	334.2
Ballia	383	330.3	3.7	306.2	354.3	327.8	3.3	306.4	349.3
Jaunpur	450	318.0	4.2	291.8	344.2	318.0	3.7	295.1	340.9
Ghazipur	488	322.9	3.4	301.2	344.7	323.4	3.1	303.6	343.2
Chandauli	134	383.5	4.5	349.5	417.6	360.9	4.0	332.5	389.4
Varanasi	321	255.7	4.4	233.9	277.6	268.6	4.0	247.8	289.5
Sant Ravi Das Nagar	98	327.4	6.2	287.6	367.2	323.9	4.8	293.6	354.2
Mirzapur	440	298.2	3.7	276.6	319.8	303.6	3.4	283.7	323.6
Sonbhadra	185	325.9	4.9	294.5	357.3	324.0	4.1	297.7	350.3
Etah	113	274.4	7.3	235.3	313.5	295.9	5.4	264.8	327.0
Kasganj	177	340.2	4.9	307.3	373.1	333.3	4.2	306.2	360.5

Table-8: Time Spent on Unpaid Activities by Rural SC Women

District	Sample Size	Direct Estimation				Model Based Estimation			
		Estimate	CV (%)	95% CI		Estimate	CV (%)	95% CI	
				Lower	Upper			Lower	Upper
Saharanpur	69	317.3	8.3	265.9	368.7	323.1	6.5	282.2	363.9
Muzaffarnagar	104	289.9	6.7	251.7	328.2	301.9	5.6	268.8	335.0
Bijnor	107	315.3	7.2	270.6	360.1	320.4	5.9	283.2	357.6
Moradabad	104	310.7	6.4	272.0	349.4	311.6	5.5	278.0	345.1
Rampur	44	322.0	9.4	262.8	381.2	319.9	7.0	276.1	363.6
Amroha	41	331.1	9.9	266.8	395.3	328.9	7.0	283.7	374.0
Meerut	34	281.4	11.6	217.3	345.4	310.2	7.5	264.3	356.0
Baghpat	71	305.0	8.0	257.4	352.6	315.6	6.2	277.2	354.1
Ghaziabad	53	338.9	10.6	268.6	409.1	338.9	7.2	291.0	386.8
Gautam Buddha Nagar	14	422.1	9.1	346.9	497.4	369.3	6.7	320.5	418.1
Bulandshahr	110	318.3	7.0	274.7	361.9	321.8	5.7	285.6	357.9
Aligarh	61	213.0	12.0	162.8	263.2	259.0	7.8	219.4	298.6
Hathras	17	281.7	21.8	161.1	402.2	316.3	9.0	260.8	371.8
Mathura	64	303.9	9.0	250.4	357.3	315.0	6.6	274.0	356.0
Agra	96	390.0	5.8	345.4	434.6	366.5	5.1	329.6	403.3
Firozabad	27	367.4	13.8	268.3	466.4	338.4	8.1	284.5	392.4
Mainpuri	33	373.7	12.9	279.1	468.3	340.9	8.0	287.5	394.3
Budaun	75	321.2	8.3	269.0	373.3	314.1	6.8	272.3	355.9
Bareilly	51	300.4	9.7	243.0	357.8	307.7	7.2	264.5	350.9
Pilibhit	43	344.1	8.9	283.8	404.4	329.3	6.9	284.8	373.9
Shahjahanpur	89	275.9	6.8	239.3	312.6	285.2	5.8	252.8	317.6
Lakhimpur Kheri	178	302.7	4.8	274.5	331.0	305.0	4.4	278.9	331.1
Sitapur	127	353.7	6.9	306.0	401.5	339.3	5.8	300.6	377.9
Hardoi	136	326.0	5.4	291.5	360.5	324.2	4.8	293.6	354.8
Unnao	104	320.2	5.6	285.3	355.1	323.0	4.9	292.3	353.8
Lucknow	13	470.9	7.3	403.1	538.7	393.1	6.0	346.8	439.4
Rae Bareli	57	289.9	8.3	242.5	337.3	306.5	6.4	268.2	344.7
Farrukhabad	74	314.7	8.4	262.7	366.7	315.8	6.6	275.0	356.6
Kannauj	57	380.7	8.1	320.6	440.8	352.1	6.4	308.0	396.2
Etawah	58	372.2	8.1	313.2	431.1	354.6	6.4	310.3	398.9
Auraiya	6	337.5	18.8	213.3	461.6	336.6	8.7	279.1	394.0
Kanpur Dehat	85	313.0	7.2	268.8	357.3	321.8	5.8	285.0	358.6
Kanpur Nagar	61	330.6	8.9	273.2	388.0	334.0	6.6	290.9	377.1
Jalaun	16	319.4	16.7	214.8	424.0	335.4	8.2	281.4	389.3
Jhansi	39	400.0	9.8	323.3	476.7	367.7	7.0	317.4	418.0
Lalitpur	38	396.5	9.4	323.5	469.5	360.8	6.9	312.1	409.5
Hamirpur	34	400.4	11.1	313.1	487.7	358.9	7.3	307.3	410.5
Mahoba	30	364.5	13.3	269.3	459.7	345.1	7.9	291.9	398.4
Banda	45	364.6	10.7	288.2	441.1	345.1	7.3	295.8	394.4
Chitrakoot	24	349.8	15.6	242.8	456.8	339.5	8.3	284.3	394.7
Fatehpur	91	341.9	7.4	292.3	391.5	341.8	5.9	302.0	381.5
Pratapgarh	78	385.0	7.6	328.0	442.0	363.4	6.0	320.6	406.2

District	Sample Size	Direct Estimation				Model Based Estimation			
		Estimate	CV (%)	95% CI		Estimate	CV (%)	95% CI	
				Lower	Upper			Lower	Upper
Kaushambi	81	331.1	7.9	279.7	382.6	331.5	6.4	290.2	372.7
Allahabad	163	324.2	5.0	292.3	356.1	326.9	4.5	298.1	355.8
Barabanki	88	336.5	7.8	284.9	388.0	333.2	6.2	292.9	373.6
Faizabad	39	379.0	10.0	304.7	453.3	350.8	7.0	302.7	398.8
Ambedkar Nagar	62	307.5	8.3	257.4	357.6	323.1	6.3	283.0	363.1
Sultanpur	75	267.7	9.8	216.4	319.0	295.7	6.9	255.6	335.9
Bahraich	56	327.2	7.6	278.5	376.0	320.2	6.4	280.2	360.2
Shravasti	22	242.9	20.7	144.1	341.6	294.1	9.7	238.2	350.1
Balrampur	49	256.5	11.3	199.8	313.2	283.7	8.0	239.4	328.0
Gonda	58	422.8	7.4	361.5	484.2	369.4	6.2	324.5	414.4
Siddharth Nagar	163	294.2	10.3	234.7	353.7	310.6	7.2	266.6	354.6
Basti	55	406.3	8.8	336.3	476.2	363.6	6.6	316.8	410.5
Sant Kabir Nagar	70	313.7	9.3	256.5	371.0	321.8	6.8	279.2	364.4
Maharajganj	119	317.7	6.3	278.4	357.1	323.1	5.3	289.3	356.9
Gorakhpur	79	319.3	7.3	273.9	364.8	323.8	5.9	286.6	360.9
Kushinagar	73	316.0	9.4	257.6	374.5	321.4	6.8	278.3	364.5
Deoria	79	321.1	9.9	258.7	383.4	327.2	6.9	282.7	371.8
Azamgarh	187	345.4	7.7	293.4	397.4	342.7	6.0	302.1	383.4
Mau	85	351.4	6.3	308.1	394.6	349.3	5.3	312.9	385.7
Ballia	144	332.4	6.5	290.2	374.6	334.6	5.4	299.1	370.0
Jaunpur	93	317.3	8.6	263.6	371.0	327.2	6.4	285.9	368.6
Ghazipur	138	336.4	6.4	294.4	378.4	338.1	5.3	302.7	373.6
Chandauli	30	407.1	7.1	350.4	463.8	373.6	5.8	331.0	416.1
Varanasi	53	279.4	9.5	227.3	331.6	305.2	6.8	264.5	345.8
Sant Ravi Das Nagar	21	319.8	12.9	239.1	400.5	324.0	7.8	274.4	373.6
Mirzapur	145	274.5	7.2	235.5	313.4	292.4	5.9	258.7	326.0
Sonbhadra	60	364.4	8.1	306.4	422.4	352.4	6.4	308.4	396.4
Etah	38	291.6	12.3	221.4	361.9	310.1	7.8	262.8	357.4
Kasganj	42	379.8	8.4	317.3	442.2	346.1	6.6	301.0	391.2

Table-9: Time Spent on Unpaid Activities by Rural OBC Women

District	Sample Size	Direct Estimation				Model Based Estimation			
		Estimate	CV (%)	95% CI		Estimate	CV (%)	95% CI	
				Lower	Upper			Lower	Upper
Saharanpur	216	308.6	5.2	276.8	340.3	316.3	4.5	288.3	344.2
Muzaffarnagar	262	355.0	4.3	324.8	385.2	349.9	3.9	323.0	376.8
Bijnor	199	391.1	4.4	357.8	424.5	374.8	4.1	345.0	404.6
Moradabad	297	293.5	4.2	269.4	317.5	298.6	3.9	276.0	321.3
Rampur	50	393.8	6.3	345.3	442.3	363.5	5.3	325.4	401.6
Amroha	109	333.2	6.8	288.9	377.6	328.1	5.5	292.6	363.7
Meerut	108	285.5	6.1	251.3	319.6	298.8	5.1	269.2	328.5
Baghpat	67	270.6	9.9	218.4	322.9	307.5	7.2	263.8	351.2
Ghaziabad	72	294.0	9.8	237.3	350.7	311.5	6.6	271.5	351.5
Gautam Buddha Nagar	41	347.5	7.7	295.0	400.0	331.7	6.0	292.7	370.7
Bulandshahr	205	337.2	4.9	304.6	369.7	336.7	4.3	308.4	365.0
Aligarh	232	284.2	5.4	254.2	314.2	295.8	4.6	269.2	322.5
Hathras	30	246.6	19.8	151.1	342.2	302.0	8.9	249.0	354.9
Mathura	157	306.9	5.8	271.9	341.8	313.1	4.8	283.4	342.9
Agra	153	360.4	4.9	325.7	395.1	350.6	4.3	321.0	380.3
Firozabad	78	376.9	6.7	327.1	426.8	353.4	5.4	316.0	390.9
Mainpuri	60	337.9	7.8	286.5	389.2	328.0	6.0	289.6	366.4
Budaun	217	305.9	5.3	274.3	337.5	312.0	4.6	283.9	340.2
Bareilly	247	318.6	4.2	292.2	344.9	320.1	3.8	296.0	344.2
Pilibhit	144	350.7	4.9	316.8	384.6	343.2	4.3	314.0	372.4
Shahjahanpur	161	389.7	3.7	361.3	418.0	377.9	3.5	351.6	404.1
Lakhimpur Kheri	250	293.4	4.8	265.8	321.0	303.5	4.2	278.6	328.5
Sitapur	226	306.2	6.6	266.9	345.6	318.9	5.2	286.1	351.6
Hardoi	312	308.9	3.7	286.6	331.1	312.5	3.4	291.8	333.1
Unnao	140	378.8	4.5	345.2	412.5	366.8	4.2	336.8	396.8
Lucknow	137	319.0	6.6	278.0	360.1	328.7	5.4	294.2	363.3
Rae Bareli	228	317.7	4.5	289.8	345.5	322.5	4.0	297.3	347.7
Farrukhabad	156	354.0	5.0	319.1	389.0	344.8	4.4	315.1	374.6
Kannauj	136	330.0	5.4	294.8	365.2	328.2	4.6	298.3	358.0
Etawah	60	333.7	9.0	274.8	392.6	335.1	6.5	292.4	377.7
Auraiya	68	347.5	6.8	300.9	394.2	338.7	5.5	302.2	375.3
Kanpur Dehat	134	298.4	5.9	264.2	332.7	307.8	4.9	278.2	337.4
Kanpur Nagar	111	345.2	6.4	302.1	388.2	337.2	5.2	302.8	371.6
Jalaun	84	380.4	6.0	335.4	425.5	374.1	6.5	326.2	422.1
Jhansi	48	303.1	14.4	217.6	388.6	342.9	9.2	281.4	404.4
Lalitpur	77	365.2	7.5	311.8	418.5	365.7	6.9	316.1	415.2
Hamirpur	38	340.8	11.5	263.9	417.7	358.4	9.2	293.6	423.3
Mahoba	61	354.4	8.9	292.7	416.0	343.1	6.3	300.7	385.6
Banda	67	354.5	7.2	304.5	404.4	341.7	5.6	304.4	379.0
Chitrakoot	49	307.0	12.6	231.4	382.6	333.6	7.2	286.3	381.0
Fatehpur	148	340.1	7.5	289.9	390.3	340.1	5.8	301.6	378.6
Pratapgarh	207	356.2	4.6	323.7	388.6	346.5	4.2	318.2	374.7

District	Sample Size	Direct Estimation					Model Based Estimation			
		Estimate	CV (%)	95% CI			Estimate	CV (%)	95% CI	
				Lower	Upper				Lower	Upper
Kaushambi	188	347.6	5.1	312.6	382.5		341.6	4.4	311.9	371.4
Allahabad	239	308.3	4.2	283.0	333.5		312.0	3.8	289.0	335.1
Barabanki	208	404.3	4.3	370.5	438.1		387.6	4.3	355.2	420.0
Faizabad	145	337.5	4.3	309.2	365.8		335.5	3.8	310.2	360.7
Ambedkar Nagar	148	295.1	5.1	265.3	324.8		299.7	4.6	272.5	326.9
Sultanpur	296	297.3	4.3	272.1	322.6		300.4	4.0	276.5	324.2
Bahraich	141	386.7	5.5	345.2	428.2		369.4	4.9	334.0	404.8
Shravasti	33	307.3	12.9	229.8	384.8		335.9	7.3	287.5	384.3
Balrampur	142	311.8	6.2	274.1	349.4		318.7	5.1	286.8	350.7
Gonda	272	344.4	4.4	315.0	373.8		342.4	3.9	316.2	368.6
Siddharth Nagar	348	329.0	5.6	293.1	364.8		327.5	4.8	296.9	358.1
Basti	121	343.6	6.0	303.2	384.0		337.0	4.9	304.3	369.7
SantKabir Nagar	44	399.8	9.2	327.8	471.7		353.0	6.4	308.5	397.4
Maharajganj	148	313.9	6.2	275.9	351.8		319.9	5.0	288.5	351.2
Gorakhpur	177	307.4	5.5	274.0	340.7		313.2	4.7	284.6	341.8
Kushinagar	199	337.8	5.3	302.7	372.9		334.8	4.5	305.1	364.4
Deoria	121	348.7	5.4	311.9	385.5		343.3	4.6	312.4	374.2
Azamgarh	235	359.2	4.9	324.4	394.0		347.7	4.4	317.9	377.5
Mau	83	264.0	9.9	212.9	315.2		289.4	7.1	248.8	329.9
Ballia	138	326.7	5.9	289.1	364.3		325.3	4.9	294.1	356.5
Jaunpur	243	313.8	5.9	277.5	350.1		315.2	5.0	284.1	346.2
Ghazipur	216	330.8	4.8	299.9	361.8		330.5	4.2	303.4	357.6
Chandauli	76	388.7	6.9	336.2	441.3		357.4	5.5	318.7	396.1
Varanasi	176	289.9	5.2	260.3	319.5		298.1	4.5	271.7	324.6
Sant Ravi Das Nagar	56	331.1	8.5	275.9	386.3		325.2	6.3	285.3	365.2
Mirzapur	213	317.1	5.0	286.3	347.9		317.5	4.4	290.0	345.0
Sonbhadra	108	300.0	6.6	261.4	338.7		306.0	5.7	272.1	340.0
Etah	51	275.6	10.8	217.1	334.2		309.5	6.7	268.8	350.2
Kasganj	122	342.8	6.0	302.3	383.2		343.9	5.1	309.6	378.2

Table-10: Time Spent on Unpaid Activities by Rural Other Women

District	Sample Size	Direct Estimation				Model Based Estimation			
		Estimate	CV (%)	95% CI		Estimate	CV (%)	95% CI	
				Lower	Upper			Lower	Upper
Saharanpur	57	283.9	8.7	235.2	332.5	283.8	7.0	245.1	322.4
Muzaffarnagar	74	289.2	7.8	244.9	333.5	289.8	6.3	253.8	325.8
Bijnor	119	323.7	6.2	284.3	363.0	311.7	5.5	278.3	345.1
Moradabad	69	339.1	7.3	290.5	387.7	319.8	6.2	280.9	358.6
Rampur	58	322.1	8.1	270.8	373.3	311.6	6.5	271.7	351.4
Amroha	18	244.4	19.1	152.9	335.8	289.0	8.6	240.6	337.5
Meerut	38	268.1	11.5	207.9	328.2	281.7	7.7	239.3	324.1
Baghpat	19	404.3	15.6	280.5	528.2	310.3	8.5	258.5	362.2
Ghaziabad	51	316.3	10.0	254.6	378.1	304.0	7.2	261.1	346.8
Gautam Buddha Nagar	0					297.7	9.2	244.0	351.5
Bulandshahr	103	258.5	8.4	216.0	301.1	275.6	6.4	240.9	310.4
Aligarh	55	330.2	9.3	270.3	390.2	313.5	6.8	271.6	355.5
Hathras	24	213.6	23.9	113.4	313.9	275.0	9.3	225.1	324.9
Mathura	51	305.4	8.8	253.0	357.8	306.3	6.5	267.0	345.6
Agra	49	263.3	10.5	209.2	317.5	279.0	7.3	238.8	319.1
Firozabad	27	322.3	13.4	237.4	407.2	297.3	8.4	248.6	346.0
Mainpuri	51	309.9	10.1	248.5	371.2	297.0	7.5	253.4	340.7
Budaun	71	252.7	10.2	202.0	303.5	273.8	7.6	233.1	314.6
Bareilly	34	255.2	15.5	177.7	332.8	284.2	8.6	236.5	332.0
Pilibhit	0					291.0	9.4	237.2	344.8
Shahjahanpur	44	322.9	7.3	276.5	369.3	309.2	6.2	271.6	346.8
Lakhimpur Kheri	90	316.5	6.4	277.0	356.1	309.0	5.5	275.5	342.5
Sitapur	41	322.6	10.1	258.9	386.2	308.2	7.2	264.7	351.8
Hardoi	58	269.4	10.6	213.5	325.3	283.4	7.4	242.6	324.3
Unnao	71	285.2	10.4	226.9	343.5	296.9	7.1	255.5	338.3
Lucknow	48	343.2	9.6	278.9	407.6	318.6	6.9	275.3	361.9
Rae Bareli	14	292.0	20.4	175.0	409.1	307.6	8.5	256.7	358.6
Farrukhabad	47	328.4	9.2	268.9	387.9	307.9	7.0	265.6	350.1
Kannauj	55	283.3	10.7	223.8	342.9	286.9	7.6	244.3	329.5
Etawah	24	264.4	18.8	167.1	361.8	285.3	9.1	234.2	336.4
Auraiya	7	279.9	24.2	147.0	412.8	288.4	9.7	233.7	343.0
Kanpur Dehat	32	331.1	9.7	267.9	394.3	311.2	7.2	267.2	355.2
Kanpur Nagar	36	298.6	9.6	242.7	354.5	296.9	7.2	255.3	338.6
Jalaun	69	319.1	9.9	257.2	381.1	312.1	7.0	269.2	355.0
Jhansi	19	430.9	14.6	307.2	554.5	343.9	8.2	288.8	399.0
Lalitpur	25	344.2	14.0	250.1	438.4	332.0	7.9	280.3	383.7
Hamirpur	7	384.0	27.9	173.8	594.2	324.5	8.7	269.0	380.0
Mahoba	12	336.6	9.3	275.5	397.8	329.9	6.8	286.2	373.5
Banda	33	413.6	9.9	333.1	494.1	349.0	7.0	301.1	396.9
Chitrakoot	18	302.1	17.3	199.4	404.8	320.3	8.3	268.3	372.2
Fatehpur	31	392.9	8.7	325.5	460.2	349.4	6.6	304.1	394.7
Pratapgarh	21	321.5	15.9	221.4	421.6	313.9	8.1	263.9	364.0

District	Sample Size	Direct Estimation				Model Based Estimation			
		Estimate	CV (%)	95% CI		Estimate	CV (%)	95% CI	
				Lower	Upper			Lower	Upper
Kaushambi	34	312.6	11.2	244.1	381.1	322.4	7.4	275.8	368.9
Allahabad	82	264.0	7.9	223.0	304.9	283.6	6.2	249.3	317.9
Barabanki	57	333.7	9.4	272.3	395.1	321.3	6.8	278.7	363.8
Faizabad	32	344.1	8.2	289.1	399.1	325.6	6.3	285.2	365.9
Ambedkar Nagar	18	283.9	13.3	210.2	357.7	299.8	7.9	253.4	346.1
Sultanpur	97	309.2	8.7	256.6	361.8	308.7	6.5	269.2	348.2
Bahraich	33	345.8	13.1	256.9	434.7	318.3	8.3	266.8	369.8
Shravasti	4	360.0	29.5	152.1	567.9	322.0	9.5	261.8	382.2
Balrampur	43	281.2	12.2	214.1	348.3	304.1	7.8	257.4	350.9
Gonda	87	366.9	7.4	313.5	420.3	339.2	6.0	299.0	379.3
Siddharth Nagar	54	316.0	12.5	238.8	393.2	316.9	7.6	269.6	364.2
Basti	97	328.2	8.6	273.0	383.5	317.2	6.5	276.8	357.5
Sant Kabir Nagar	48	238.8	13.4	176.2	301.4	277.5	7.8	234.8	320.2
Maharajganj	63	270.2	10.5	214.5	325.9	296.3	7.1	254.9	337.6
Gorakhpur	101	285.7	8.2	240.0	331.5	292.7	6.3	256.3	329.0
Kushinagar	109	274.9	7.5	234.4	315.5	286.7	6.0	253.0	320.4
Deoria	42	318.9	12.3	242.1	395.8	306.4	7.7	260.2	352.6
Azamgarh	85	356.8	16.5	241.6	471.9	313.3	8.3	262.2	364.3
Mau	32	268.0	17.2	177.5	358.5	296.8	8.4	247.8	345.7
Ballia	89	327.2	7.2	281.0	373.3	318.2	5.9	281.5	354.9
Jaunpur	112	330.7	6.9	286.0	375.5	322.0	5.7	285.9	358.1
Ghazipur	122	305.6	7.7	259.6	351.6	308.1	6.1	271.2	344.9
Chandauli	28	357.3	9.6	289.9	424.7	327.6	6.9	283.3	371.8
Varanasi	92	202.4	9.0	166.5	238.3	233.9	6.8	202.6	265.1
Sant Ravi Das Nagar	21	323.1	11.7	249.1	397.1	310.3	7.5	264.8	355.7
Mirzapur	73	290.1	8.5	241.5	338.6	300.5	6.4	262.6	338.4
Sonbhadra	17	369.7	14.4	265.6	473.9	339.2	8.1	285.5	392.9
Etah	24	239.4	15.3	167.4	311.4	275.1	8.4	229.8	320.4
Kasganj	12	182.4	28.3	81.3	283.5	274.9	9.3	224.5	325.2

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References

1. Brown, G., Chambers, R., Heady, P., & Heasman, D. (2001). Evaluation of small area estimation methods: An application to unemployment estimates from the UK LFS. Proceedings of statistics Canada symposium 2001. Achieving data quality in a statistical agency: A methodological perspective.
2. Rao J., Molina I. (2015), Small Area Estimation. John Wiley & Sons, Inc.
3. Census. (2011). Primary census abstracts, registrar general of India, Ministry of home affairs, Government of India, https://censusindia.gov.in/census.website/data/census-tables.
4. Chandra, H., Salvati, N., & Sud, U. C. (2011). Disaggregate-level estimates of indebtedness in the state of Uttar Pradesh in India-an application of small area estimation technique. Journal of Applied Statistics, 38(11), 2413-2432.
5. Chandra H, Aditya K, & Sud U. (2018). Localised estimates and spatial mapping of poverty incidence in the state of Bihar in India—an application of small area estimation techniques. Plos one, 13(6), e0198502.
6. Datta, G. S., & Lahiri, P. (2000). A unified measure of uncertainty of estimated best linear unbiased predictors in small area estimation problems. Statistica Sinica, 10, 613-627.
7. Datta, G., Kubokawa, T., Molina, I., & Rao, J. N. K. (2011). Estimation of mean squared error of model based small area estimators. TEST, 20(2), 367-388.
8. Editorial (2020). NSO's time use survey report shows invisiblization of female labour as unpaid caregivers. https://economictimes.indiatimes.com/industry/miscellaneous/nsos-time-use-survey-report-shows-invisiblization-of-female-labour-as-unpaid-caregivers/time-use-survey/slideshow/78428894.cms
9. Fay, R. E., & Herriot, R. (1979). Estimates of income for small places: An application of James stein procedures to census data. Journal of the American Statistical Association, 74, 269-277.
10. Ghosh Jayati, Chandrasekhar CP, (2020), It's all work and no pay for most women in India. https://www.thehindubusinessline.com/opinion/columns/c-p-chandrasekhar/nsso-time-use-survey-reveals-striking-facts-about-how-men-and-women-in-india-spend-time/article32775037.ece
11. Guha S, Chandra H (2021). Measuring and Mapping Disaggregate Level Disparities in Food Consumption and Nutritional Status via Multivariate Small Area Modelling. Social Indicators Research, ISSN 0303-8300, Volume 154, Number 2
12. Islam, S., & Chandra, H. (2019). Small area estimation combining data from two surveys. Communications in Statistics—Simulation and Computation. https://doi.org/10.1080/03610 918.2019.1588308.
13. Morales, D., Pagliarella, M. C., & Salvatore, R. (2015). Small area estimation of poverty indicators under partitioned area-level time models. SORT, 39(1), 19-34.
14. PLFS (2018-19). Ministry of Statistics and Programme Implementation http://mospi.nic.in/unit-level-data-periodic-labour-force-survey-plfs-july-2018-june-2019.
15. Prasad, N. G. N., & Rao, J. N. K. (1990). The estimation of the mean squared error of small-area estimators. Journal of the American Statistical Association, 85, 163-171.
16. Rao J. (2014). Small Area Estimation. Wiley Stats Ref: Statistics Reference Online, 1-8.
17. Time Use Survey (2019-20). Ministry of Statistics and Programme Implementation http://mospi.nic.in/time-use-survey-0.
18. Ybarra, L.M. and Lohr, S. L. (2008). Small area estimation when auxiliary information is measured with error. Biometrika, 95, 919-931.
19. UNDP. (2015). Sustainable Development Goals. https://www.undp.org/content/undp/en/home/sustainable-development-goals.html.

Appendix

Figure-1: Model Diagnostic Plots for Rural

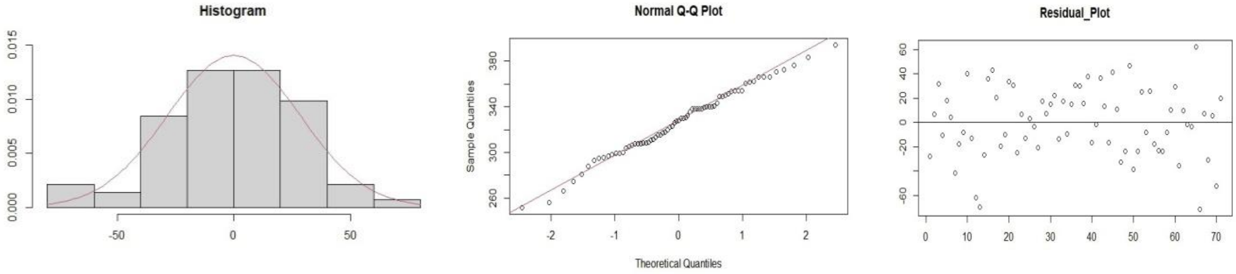


Figure-2: Model Diagnostic Plots for SC

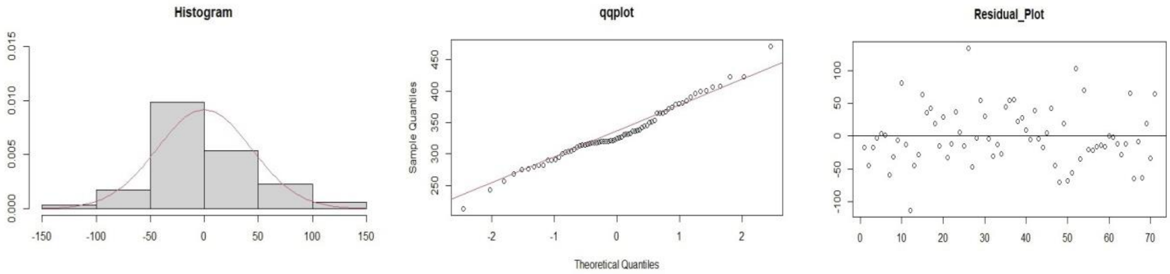


Figure- 3: Model Diagnostic Plots for OBC

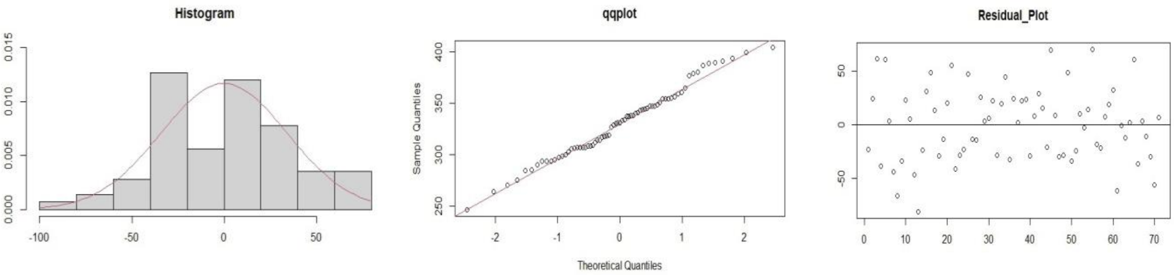


Figure-4: Model Diagnostic Plots for Others

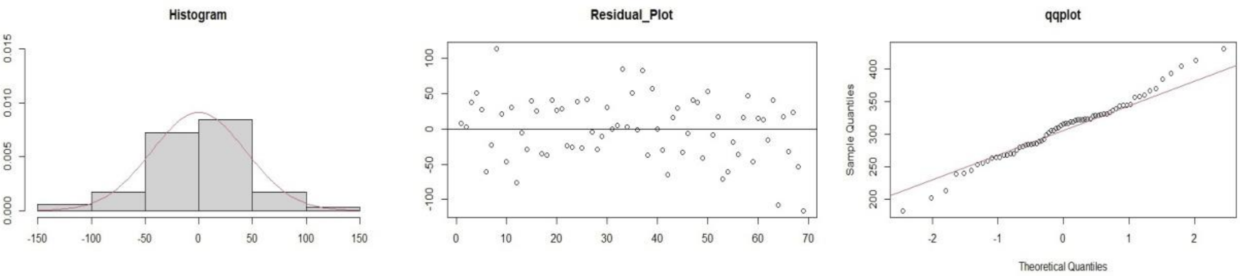


Figure-5: Bias Diagnostic plot with y = x line (thin line) and regression line (solid line) for Time Spent on Unpaid Activities for rural areas in Uttar Pradesh: Model based Estimates versus direct estimates

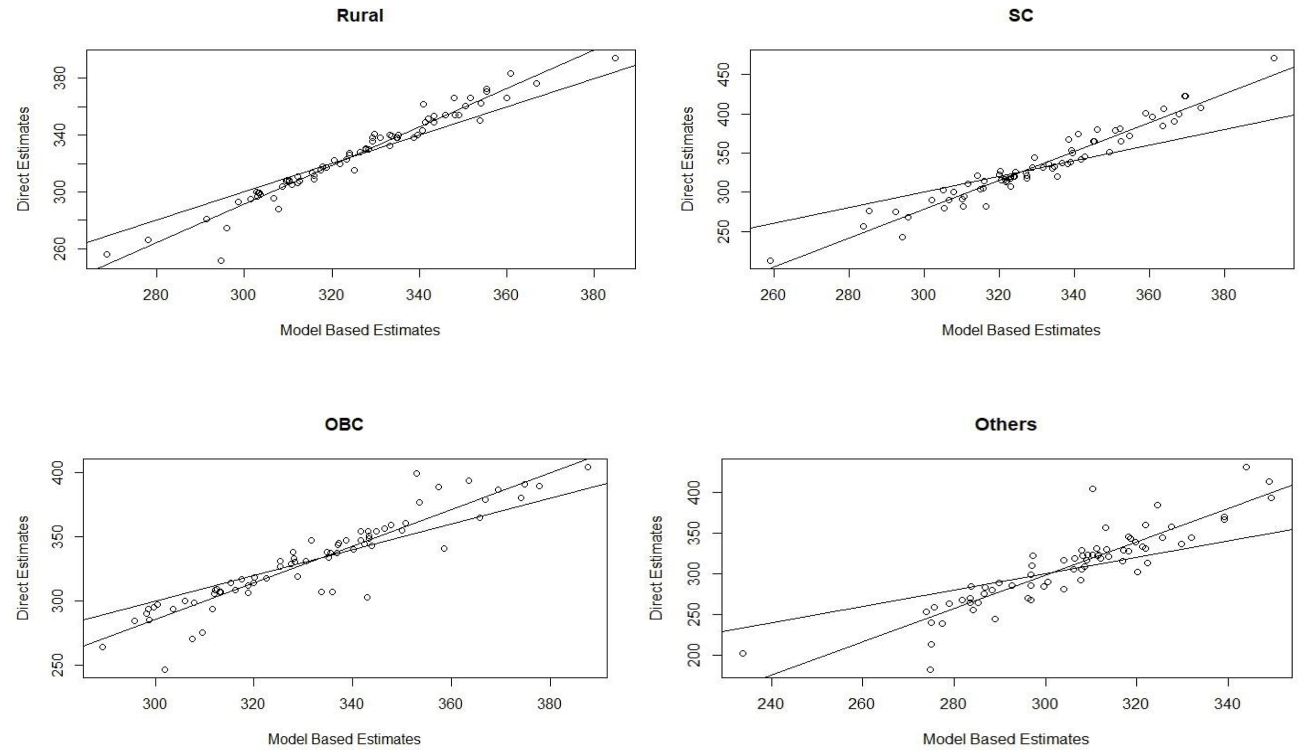


Figure-6: Comparison of Percentage of CV between Direct and Indirect Estimates; red lines indicates CVs of direct estimates and blue dotted lines are CVs of model based estimates

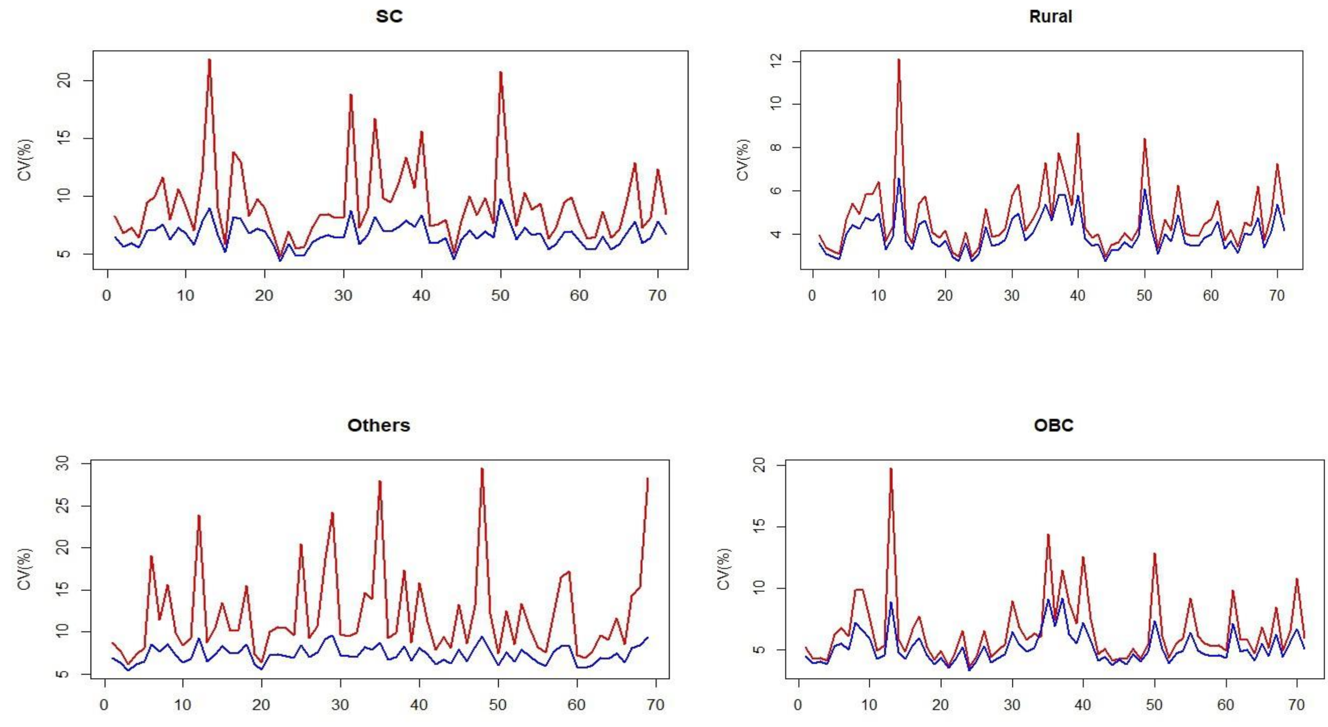


Figure-7: Comparison of Confidence Interval between Direct and Indirect Estimates; red lines indicate CIs of direct estimates and blue dotted lines are CIs of model-based estimates; red dots indicate direct point estimates and blue dots indicates model based point estimates.

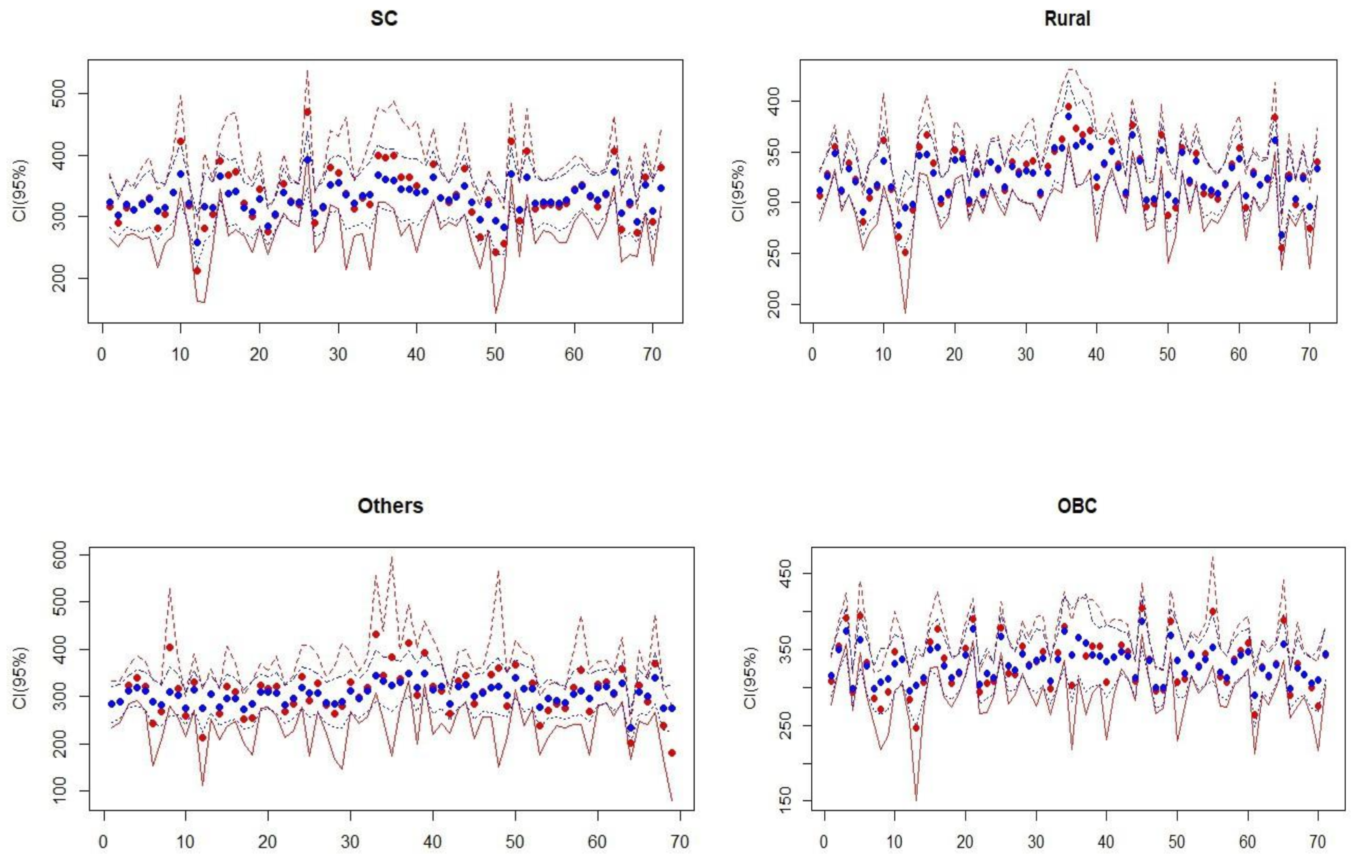


Figure-8: **Time Spent on Unpaid Activities, Rural**

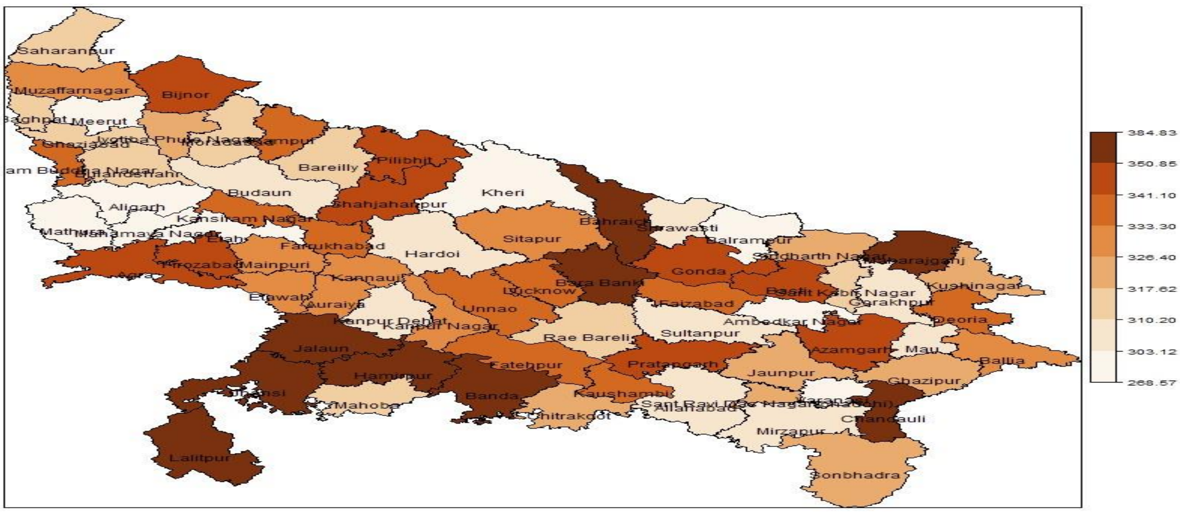


Figure-9: Time Spent on Unpaid Activities, SC

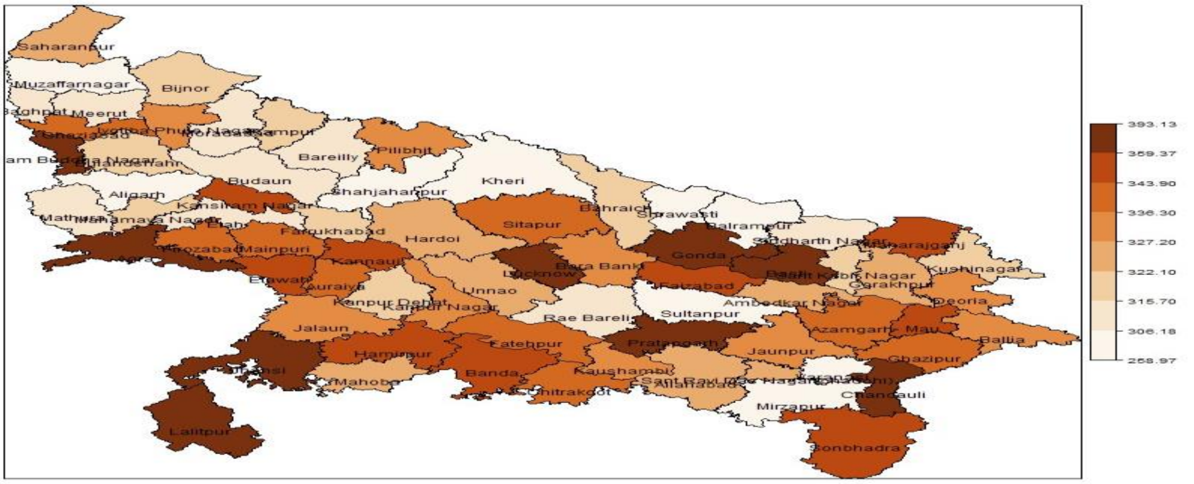


Figure -10: Time Spent on Unpaid Activities, OBC

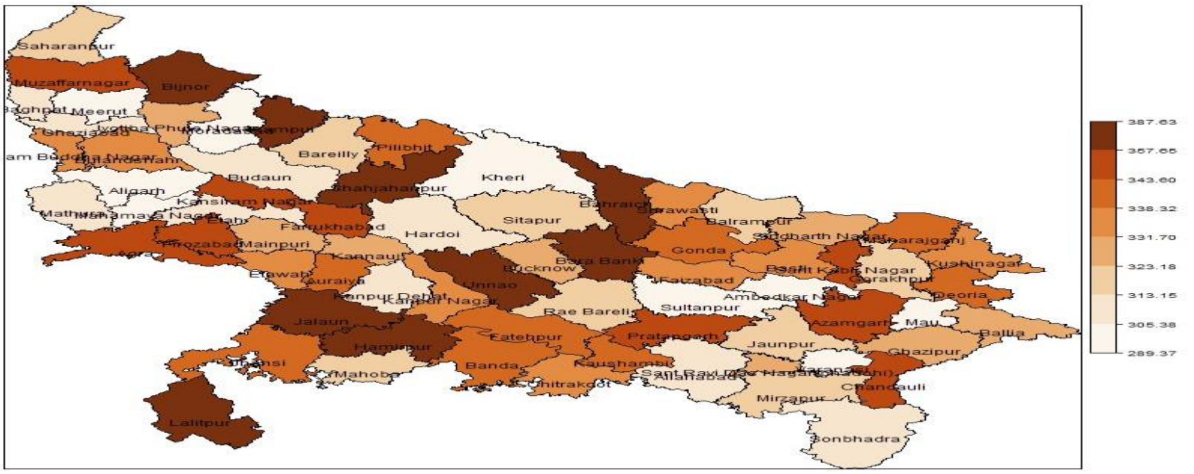
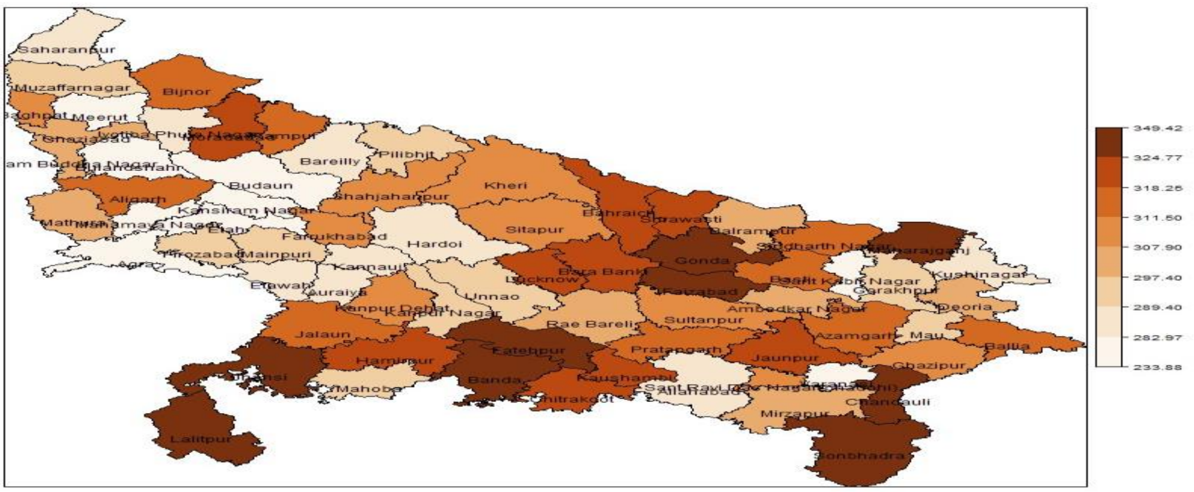


Figure-11: Time Spent on Unpaid Activities, Others



PART-II

Highlights of Report Released by National Statistical Office (NSO)

The 'Highlights' are Reproduced from Related Report Prepared by Survey Design and Research Division (SDRD) of NSO. For details, the Reader may refer to the Related Main Report.

Highlights I: Annual Report of Periodic Labour Force Survey (PLFS), July 2020 – June 2021

Periodic Labour Force Survey (PLFS) 2020-2021

Survey Period

July 2020 to June 2021

Survey Coverage

Surveyed

12,562 First Stage Units (FSUs)	Rural: 6,930 villages Urban: 5,632 urban blocks
1,00,344 Households	55,389 in rural areas 44,955 in urban areas
4,10,818 Persons	2,36,279 in rural areas 1,74,539 in urban areas

The survey covered the whole of the Indian Union *except* the villages in Andaman and Nicobar Islands which remained extremely difficult to access throughout the year.

Approaches for presenting Labour Force Indicators

Approaches followed for presenting Labour Force Indicators

usual status (ps+ss) Reference period: 1 year	current weekly status (CWS) Reference period: 1 week

Some of the key results at the all-India level for the period July 2020 - June 2021 emerging from PLFS are highlighted below.

A. Households and Population

Percentage of Households with major source of income (household type)

Rural Households (%)

Household Type

Self-Employment	*Regular wage/salary Earning*	*Casual Labour*	*Others*	*All*
54.8	13.0	24.2	8.1	100.0

Urban Households (%)

Household Type

Self-Employment	*Regular wage/salary Earning*	*Casual Labour*	*Others*	*All*
33.2	42.5	12.5	11.8	100.0

Literacy rate for persons of age 7 years and above

Literacy Rate for persons of age 7 years and above in India: 79.2%

Rural:	**Urban:**
male: 83.2% female: 67.7%	male: 92.2% female: 83.3%

B. Labour Force in Usual Status (ps+ss)

LFPR
for persons of
all ages

Labour Force Participation Rate (LFPR) in usual status (ps+ss) in India: 41.6%

Rural:	**Urban:**
male: 57.1%	male: 58.4%
female: 27.7%	female: 18.6%

LFPR
for persons of
age 15-29
years

Labour Force Participation Rate (LFPR) in usual status (ps+ss) for persons of age 15-29 years in India: 41.4%

Rural:	**Urban:**
42.0%	39.9%

LFPR
for persons of
age 15 years
and above

Labour Force Participation Rate (LFPR) in usual status (ps+ss) for persons of age 15 years and above in India: 54.9%

Rural:	**Urban:**
57.4%	49.1%

C. Workforce

WPR
in usual status
for persons of
all ages

Worker Population Ratio (WPR) in usual status (ps+ss) in India: 39.8%

Rural	**Urban**
male: 54.9%	male: 54.9%
female: 27.1%	female: 17.0%

WPR
in usual status
for persons of
age 15-29
years

Worker Population Ratio (WPR) in usual status (ps+ss) for persons of age 15-29 years in India: 36.1%

Rural:	**Urban:**
37.5%	32.6%

WPR
in usual status
for persons of
age 15 years
and above

Worker Population Ratio (WPR) in usual status (ps+ss) for persons of age 15 years and above in India: 52.6%

Rural:	**Urban:**
55.5%	45.8%

Status in employment among workers in usual status (ps+ss)

Share (%) of self-employed among workers in usual status (ps+ss)

Rural male: 59.7	Rural female:64.8	Urban male:39.9	Urban female:38.4

Share (%) of regular wage/ salaried employees among workers in usual status (ps+ss)

Rural male:13.6	Rural female:9.1	Urban male:45.3	Urban female:50.1

Share (%) of casual labour among workers in usual status (ps+ss)

Rural male:26.8	Rural female:26.2	Urban male:14.9	Urban female:11.5

Industry of work (NIC - 2008) of the workers in usual status(ps+ss)

Some industry work with share (%) of workers in usual status (ps+ss) in rural areas

Agriculture Sector	Rural male: 53.8	Rural female: 75.4	Rural person:60.8
Construction Sector	Rural male: 15.6	Rural female: 5.9	Rural person:12.4
Trade, hotel and restaurant Sector	Rural male: 9.7	Rural female: 3.5	Rural person:7.7
Manufacturing Sector	Rural male: 7.7	Rural female: 7.4	Rural person:7.6

Industry of work (NIC - 2008) of the workers in usual status (ps+ss)

Some industry of work with share (%) of workers in usual status (ps+ss) in urban areas

Trade, hotel and restaurant Sector	Urban male: 27.4	Urban female: 16.2	Urban person: 24.8
Manufacturing Sector	Urban male: 19.5	Urban female: 23.0	Urban person: 20.3
Construction Sector	Urban male: 13.1	Urban female: 4.4	Urban person: 11.1
Transport, storage & communications	Urban male: 12.2	Urban female: 3.7	Urban person: 10.2

Occupation (Division of NCO-2004) of workers in usual status (ps+ss)

Some Occupation Divisions with share (%) of workers in usual status (ps+ss) in rural areas

Division 1: Legislators, senior officials and managers	rural male: 6.3	rural female: 3.2
Division 2: Professionals	rural male: 2.0	rural female: 1.5
Division 3: Technicians and associate professionals	rural male: 1.9	rural female: 3.2

Occupation (Division of NCO-2004) of workers in usual status (ps+ss)

Some Occupation Divisions with share (%) of workers in usual status (ps+ss) in urban areas

Division 1: Legislators, senior officials and managers	urban male: 18.1	urban female: 12.2
Division 2: Professionals	urban male: 8.8	urban female: 12.3
Division 3: Technicians and associate professionals	urban male: 5.8	urban female: 10.2

Informal Sector

Informal Sector

Percentage of Workers in usual status (ps+ss) Engaged in Informal Non-Agriculture sector in India:

Male:	Female:	Person:
75.3	56.7	71.4

Conditions of Employment

Conditions of Employment

Percentage of regular wage/salaried employees in the non-agriculture sector who had no job contract in India

Male:	Female:	Person:
65.2	61.5	64.3

Percentage of regular wage/salaried employees in the non-agriculture sector who were not eligible for paid leave in India

Male:	Female:	Person:
49.3	43.7	47.9

Percentage of regular wage/salaried employees in the non-agriculture sector who were not eligible for any social security in India

Male:	Female:	Person:
53.1	55.8	53.8

D. Earnings from employment, hours worked and hours available for additional work

Earnings from employment, hours worked and hours available for additional work

Estimates derived based on

- Data collected in first visit schedule in rural areas; and
- Data collected in first visit and revisit schedule in urban areas during for each of the survey periods July – September 2020, October-December 2020, January – March 2021 and April – June 2021

Information on earnings collected for

- Self-employed persons in current weekly status (CWS) for last 30 days
- Regular wage/salaried persons in current weekly status (CWS) for last calendar month
- Casual labour during each day of reference week

Range of earnings from employment of regular wage/salaried employees In CWS

Range of earnings for regular wage/salaried employees in CWS during preceding calendar month in the quarters July – September 2020, October- December 2020, January – March 2021 and April – June 2021

Rural male	₹14.3 thousand - ₹ 16.1 thousand
female	₹9.4 thousand -₹ 10.7 thousand
Urban male	₹21.1 thousand - ₹ 21.4 thousand
female	₹16.0 thousand - ₹ 16.7 thousand

Range of earnings from employment by casual labour engaged in work other than public works

Average wage earnings per day by casual labour engaged in work other than public works during the reference week of the quarters July – September 2020, October- December 2020, January – March 2021 and April – June 2021

Rural	male	₹326 - ₹ 348
	female	₹212 -₹229
Urban	male	₹406 - ₹416
	female	₹266 - ₹281

Range of earnings from employment of self-employed workers in CWS

Average gross earnings during last 30 days from self-employment work by self-employed workers in CWS in the quarters July – September 2020, October- December 2020, January – March 2021 and April – June 2021

Rural	male	₹9.8 thousand - ₹ 10.5 thousand
	female	₹4.4 thousand - ₹4.6 thousand
Urban	male	₹15.9 thousand - ₹ 17.0 thousand
	female	₹7.0 thousand - ₹ 7.2 thousand

Hours actually worked during the reference week by workers in

Average hours actually worked in a week by a worker in CWS during July 2020 – June 2021: 42.0 hours – 46.5 hours

Rural:	**Urban:**
41.9 hours – 45.2 hours	42.3 hours – 50.0 hours

Hours available for additional work by the workers in CWS

Percentage of workers (range) in CWS who reported that they were available for additional work during July 2020 – June 2021

Rural:	Urban:
2.1 % -3.3%	1.3 % -2.1%

Hours available for additional work (range) in a week for workers in CWS who reported that they were available for additional work during July 2020 – June 2021

Rural:	Urban:
10.4 hours -13.0 hours	9.1 hours -14.0 hours

E. Unemployment Rate in usual status (ps+ss)

Unemployment Rate (UR) in usual status for persons of all ages

Unemployment Rate in usual status (ps+ss) for persons of all ages in India: 4.2%

Rural	Urban
male: 3.9%	male: 6.1%
female: 2.1%	female: 8.6%

Unemployment Rate (UR) in usual status for educated persons of all age 15 years and above

Unemployment Rate in usual status (ps+ss) for educated (*highest level of education secondary and above*) persons of age 15 years and above in India:9.1%

Rural:	Urban:
8.3%	10.2%

Unemployment Rate (UR) in usual status for persons of age 15 -29 years

Unemployment Rate in usual status (ps+ss) for youth persons of age 15 -29 years in India: 12.9%

Rural:	Urban:
male: 11.6%	male: 16.6%
female:8.2%	female:24.9%

Highlights II: Migration in India, 2020-2021

Indicators in the report are based on data collected in Periodic Labour Force Survey (PLFS)

Survey Period

July 2020 to June 2021

Major concepts

Main concepts

Migrants	Migrants are those whose last usual place of residencies different from the present place of enumeration. Usual place of residence is the place (village/town) where the person stayed continuously for a period of 6 months or more or intends to stay for 6 months of more.
Temporary visitors in the household	For the purpose of this survey, temporary visitors in the household are those persons who arrived after March 2020 and stayed in the household continuously for a period of 15 days or more but less than 6 months.

Survey Coverage

Surveyed

12,562 First Stage Units (FSUs)	Rural: 6,930 villages Urban: 5,632 urban blocks
1,00,344 Households	55,389 in rural areas 44,955 in urban areas
4,10,818 Persons	2,36,279 in rural areas 1,74,539 in urban areas

The survey covered the whole of the Indian Union *except* the villages in Andaman and Nicobar Islands which remained extremely difficult to access throughout the year.

Sample number

Migrants Surveyed

113,998 migrants	59,019 in rural areas	rural male: 7,238
		rural female: 51,781
	54,979 in urban areas	urban male: 17,654
		urban female: 37,325

Sample number

Surveyed number of Temporary visitors for whom the present place of residence (where he/she was residing temporarily) differed from their usual place of residence

2,401 temporary visitorsresiding temporarily in a place different from usual place of residence	1,550 in rural areas	rural male: 960
		rural female: 590
	851 in urban areas	urban male: 450
		urban female: 401

Some of the key results relating to migration and temporary visitors[1] at the all-India level from PLFS for the period July 2020 - June 2021 are highlighted below.

A. Migration rate

Migration rate

Migration rate (percentage of migrants in the population) in India: 28.9%

Rural: 26.5%	Urban: 34.9%
male: 5.9% female: 48.0%	male: 22.5% female: 47.8%

B. Location of last usual place of residence for migrants in rural areas

Location of last usual place of residence

Percentage distribution of migrants by location of last usual place of residence for migrants in rural areas

Category of migrants	location of last usual place of residence		
Male migrants in rural areas	Rural areas: 44.6%	Urban areas: 51.6%	Another country:3.9%
Female migrants in rural areas	Rural areas: 88.8%	Urban areas: 11.0%	Another country: 0.2%

[1] *temporary visitors residing temporarily in a place different from usual place of residence*

C. Location of last usual place of residence for migrants in urban areas

Location of last usual place of residence

Percentage distribution of migrants by location of last usual place of residence for migrants in urban areas

Category of migrants	location of last usual place of residence		
Male migrants in urban areas	Rural areas: 53.7%	Urban areas: 44.1%	Another country: 2.3%
Female migrants in urban areas	Rural areas: 54.0%	Urban areas: 45.6%	Another country: 0.4%

D. Internal migrants in rural areas

Internal migrants in rural areas

Percentage of internal migrants in rural areas from rural and urban areas

Percentage of male migrants in rural areas	From rural areas: 46.4%	From urban areas: 53.6%
Percentage of female migrants in rural areas	From rural areas: 89.0%	From urban areas: 11.0%

E. Internal migrants in urban areas

Internal migrants in urban areas

Percentage of internal migrants in urban areas from rural and urban areas

Percentage of male migrants in urban areas	From rural areas: 54.8%	From urban areas: 45.2%
Percentage of female migrants in urban areas	From rural areas: 54.3%	From urban areas: 45.7%

F. Reason for migration among male migrants

Reason for migration among male migrants

Some main reasons for migration among male migrants

reason for migration	percentage of male migrants
in search of employment/ better employment	22.8%
for employment/ work (to take up employment/ to take up better employment/ business/ proximity to place of work/ transfer)	20.1%
migration of parent/earning member of the family	17.5%
loss of job/closure of unit/lack of employment opportunities	6.7%

G. Reason for migration among female migrants

Reason for migration among female migrants

Some main reasons for migration among female migrants

reason for migration	percentage of female migrants
marriage	86.8%
migration of parent/earning member of the family	7.3%
housing problem	0.8%
for employment/ work (to take up employment/ to take up better employment/ business/ proximity to place of work/ transfer)	0.7%

H. Temporary visitors

Temporary Visitors

Percentage of temporary visitors in the populationresiding temporarily in a place different from usual place of residence: 0.7%

Rural: 0.7%	Urban: 0.6%
male: 0.9% female: 0.5%	male: 0.6% female: 0.6%

खण्ड-III हिंदी

सर्वेक्षण

राष्ट्रीय सांख्यिकी कार्यालय की पत्रिका

भाग-PDOS-XXXVII सं० 3 और 4
अंक संख्या 113वां
सितंबर, 2022

सत्यमेव जयते

राष्ट्रीय सांख्यिकी कार्यालय
सांख्यिकी और कार्यक्रम कार्यान्वयन मंत्रालय
भारत सरकार
नई दिल्ली

सर्वेक्षण

भाग-PDOS-XXXVII सं॰ 3 और 4

एनएसओ द्वारा जारी की गई रिपोर्ट की मुख्य बातें

(मुख्य बातें एनएसओ के एस.डी.आर.डी.प्रभाग द्वारा तैयार की गई सम्बंधित रिपोर्ट से उद्धृत की गई हैं। विवरण के लिए पाठक सम्बंधित मुख्य रिपोर्ट देख सकते हैं)

मुख्य बातें I: आवधिक श्रमबल सर्वेक्षण (पीएलएफएस) की वार्षिक रिपोर्ट

आवधिक श्रमबल सर्वेक्षण (पीएलएफएस) 2020-2021

सर्वेक्षण अवधि

जुलाई 2020 से जून 2021

सर्वेक्षण कवरेज

सर्वेक्षण किया गया

12,562 फर्स्ट स्टेज उनिट्स (एफएसयु)	ग्रामीण: 6,930 गांवों नगरीय: 5,632 नगरीय खंडो
1,00,344परिवारों	55,389 ग्रामीण क्षेत्रों में 44,955 नगरीय क्षेत्रों में
4,10,818 वयक्तियों	2,36,279 ग्रामीण क्षेत्रों में 1,74,539 नगरीय क्षेत्रों में

इस सर्वेक्षण में पूरे भारतीय संघ को शामिल किया गया अंडमान और निकोबार द्वीप समूह के उन गाँवों को छोड़कर जिन तक पहुँच पाना पूरे वर्ष तक बेहद कठिन था|

श्रम बल संकेतक पेश करने के आधार

श्रम बल संकेतक पेश करने के लिए अपनाया गया आधार

सामान्य स्थिति (पीएस+एसएस) सन्दर्भ अबधि: 1 वर्ष	वर्तमान साप्ताहिक स्थिति(सीडब्ल्यूएस) सन्दर्भ अबधि: 1 सप्ताह

अखिल भारतीय स्तर पर जुलाई 2020 - जून 2021 की अबधि के लिए पीएलएफएस से प्राप्त कुछ मुख्य परिणाम निम्नलिखित हैं।

(क) परिवार एवं जनसंख्या

परिवारों के आय का प्रमुख स्त्रोत का प्रतिशत (परिवारों के प्रकार)

ग्रामीण परिवारों (%)

परिवारों के प्रकार

स्व.नियोजन	नियमित मजदूरी/वेतन	आकस्मिक मजदूरी	अन्य	सब
54.8	13.0	24.2	8.1	100.0

नगरीय परिवारों (%)

परिवारों के प्रकार

स्व.नियोजन	नियमित मजदूरी/वेतन	आकस्मिक मजदूरी	अन्य	सब
33.2	42.5	12.5	11.8	100.0

साक्षरता दर 7 वर्ष और उससे अधिक उम्र के व्यक्तियों में

भारत में साक्षरता दर 7 वर्ष और उससे अधिक उम्र के व्यक्तियों में: 79.2%

ग्रामीण	नगरीय
पुरूषों में: 83.2% महिलाओं में: 67.7%	पुरूषों में: 92.2% महिलाओं में: 83.3%

(ख) श्रमबल सामान्य स्थिति (पीएस+एसएस) में

एलएफपीआर
सभी उम्र के
व्यक्तियों में

भारत में लेबर फोर्स पार्टिसपैशन रेट (एलएफपीआर) सामान्य स्थिति (पीएस+एसएस) में: 41.6%

<u>ग्रामीण</u>	<u>नगरीय</u>
पुरूषों में: 57.1%	पुरूषों में: 58.4%
महिलाओं में: 27.7%	महिलाओं में: 18.6%

एलएफपीआर
15-29 वर्ष उम्र के
व्यक्तियों में

भारत के 15-29 वर्ष उम्र के व्यक्तियों में सामान्य स्थिति (पीएस+एसएस) में एलएफपीआर: 41.4%

ग्रामीण क्षेत्रों में:	नगरीय क्षेत्रों में:
42.0%	39.9%

एलएफपीआर
15 वर्ष एवं उससे
अधिक उम्र के
व्यक्तियों में

भारत के 15 वर्ष एवं उससे अधिक उम्र के व्यक्तियों में सामान्य स्थिति (पीएस+एसएस) में एलएफपीआर: 54.9%

ग्रामीण क्षेत्रों में:	नगरीय क्षेत्रों में:
57.4%	49.1%

(ग) कार्यबल

डब्ल्यूपीआर
सभी उम्र के
व्यक्तियों में

कामगार जनसंख्या अनुपात (डब्ल्यूपीआर) सामान्य स्थिति में (पीएस+एसएस) में: 39.8%

ग्रामीण	नगरीय
पुरूषों में: 54.9%	पुरूषों में: 54.9%
महिलाओं में: 27.1%	महिलाओं में: 17.0%

डब्ल्यूपीआर
15-29 वर्ष उम्र के
व्यक्तियों में

15-29 वर्ष उम्र के व्यक्तियों में भारत में डब्ल्यूपीआर सामान्य स्थिति (पीएस+एसएस) में: 36.1%

ग्रामीण क्षेत्रों में:	नगरीय क्षेत्रों में:
37.5%	32.6%

डब्ल्यूपीआर 15
वर्ष एवं उससे
अधिक उम्र के
व्यक्तियों में

15 वर्ष एवं उससे अधिक उम्र के व्यक्तियों में भारत में डब्ल्यूपीआर सामान्य स्थिति (पीएस+एसएस) में: 52.6%

ग्रामीण क्षेत्रों में:	नगरीय क्षेत्रों में:
55.5%	45.8%

सामान्य स्थिति (पीएस+एस एस) में कामगारों के बीच रोजगार स्थिति

सामान्य स्थिति (पीएस+एसएस) में कामगारों के बीच स्व-रोजगार का शेयर(%)

<u>ग्रामीण</u>	<u>ग्रामीण</u>	<u>नगरीय</u>	<u>नगरीय</u>
पुरूषों में: 59.7	महिलाओं में: 64.8	पुरूषों में: 39.9	महिलाओं में: 38.4

सामान्य स्थिति (पीएस+एसएस) में कामगारों के बीच नियमित मजदूरी/वेतनभोगी कर्मचारियों का शेयर(%)

<u>ग्रामीण</u>	<u>ग्रामीण</u>	<u>नगरीय</u>	<u>नगरीय</u>
पुरूषों में: 13.6	महिलाओं में: 9.1	पुरूषों में: 45.3	महिलाओं में: 50.1

सामान्य स्थिति (पीएस+एसएस) में कामगारों के बीच आकस्मिक मजदूरों का शेयर(%)

<u>ग्रामीण</u>	<u>ग्रामीण</u>	<u>नगरीय</u>	<u>नगरीय</u>
पुरूषों में: 26.8	महिलाओं में: 26.2	पुरूषों में: 14.9	महिलाओं में: 11.5

सामान्य स्थिति (पीएस+एसएस) में कामगारों का कार्य उद्योग (एनआईसी - 2008)

सामान्य स्थिति (पीएस+एसएस) में कुछ कार्य उद्योग (एनआईसी -2008) में कामगारों का शेयर (%)

<u>ग्रामीण क्षेत्रों में</u>

कृषि क्षेत्र में	<u>ग्रामीण</u> पुरूषों में: 53.8	<u>ग्रामीण</u> महिलाओं में: 75.4	<u>ग्रामीण</u> व्यक्तियों में: 60.8
'निर्माण' सेक्टर में	<u>ग्रामीण</u> पुरूषों में: 15.6	<u>ग्रामीण</u> महिलाओं में: 5.9	<u>ग्रामीण</u> व्यक्तियों में: 12.4
ट्रेड, होटल और रेस्टुरेन्ट सेक्टर में	<u>ग्रामीण</u> पुरूषों में: 9.7	<u>ग्रामीण</u> महिलाओं में: 3.5	<u>ग्रामीण</u> व्यक्तियों में: 7.7
'विनिर्माण' क्षेत्र में	<u>ग्रामीण</u> पुरूषों में: 7.7	<u>ग्रामीण</u> महिलाओं में: 7.4	<u>ग्रामीण</u> व्यक्तियों में: 7.6

कथन. 13

सामान्य
स्थिति
(पीएस+एसएस
) में कामगारों
का कार्य
उद्योग
(एनआईसी -

सामान्य स्थिति (पीएस+एसएस) में कुछ कार्य उद्योग (एनआईसी -2008) में कामगारों का शेयर (%)

<u>नगरीय क्षेत्रों में</u>

ट्रेड, होटल और रेस्टुरेन्ट सेक्टर में	<u>नगरीय</u> पुरूषों में: 27.4	<u>नगरीय</u> महिलाओं में: 16.2	<u>नगरीय</u> व्यक्तियों में: 24.8
'विनिर्माण' क्षेत्र में	<u>नगरीय</u> पुरूषों में: 19.5	<u>नगरीय</u> महिलाओं में: 23.0	<u>नगरीय</u> व्यक्तियों में: 20.3
'निर्माण' सेक्टर में	<u>नगरीय</u> पुरूषों में: 13.1	<u>नगरीय</u> महिलाओं में: 4.4	<u>नगरीय</u> व्यक्तियों में: 11.1
ट्रैन्स्पर्टैशन, स्टॉरिज एण्ड कम्यूनिकेशन	<u>नगरीय</u> पुरूषों में: 12.2	<u>नगरीय</u> महिलाओं में: 3.7	<u>नगरीय</u> व्यक्तियों में: 10.2

सामान्य स्थिति (पीएस+एसएस) में कामगारों का उपजीविका (एनसीओ 2004 के प्रभाग)

सामान्य स्थिति (पीएस+एसएस) में कुछ उपजीविका (एनसीओ 2004 के प्रभाग) में कामगारों का शेयर (%)

<u>ग्रामीण क्षेत्रों में</u>

प्रभाग 1: विधिकारों, वरीय कर्मचारियों एवं प्रबंधकों	<u>ग्रामीण</u> पुरूषों में: 6.3	<u>ग्रामीण</u> महिलाओं में: 3.2
प्रभाग 2 : पेशेवरों	<u>ग्रामीण</u> पुरूषों में: 2.0	<u>ग्रामीण</u> महिलाओं में: 1.5
प्रभाग 3: टेक्नेशियन एवं सहयोगी पेशेवरों	<u>ग्रामीण</u> पुरूषों में: 1.9	<u>ग्रामीण</u> महिलाओं में: 3.2

सामान्य स्थिति (पीएस+एसएस) में कामगारों का उपजीविका (एनसीओ 2004 के प्रभाग)

सामान्य स्थिति (पीएस+एसएस) में कुछ उपजीविका (एनसीओ 2004 के प्रभाग) में कामगारों का शेयर (%)

<u>नगरीय क्षेत्रों में</u>

प्रभाग 1: विधिकारों, वरीय कर्मचारियों एवं प्रबंधकों	<u>नगरीय</u> पुरूषों में: 18.1	<u>नगरीय</u> महिलाओं में: 12.2
प्रभाग 2 : पेशेवरों	<u>नगरीय</u> पुरूषों में: 8.8	<u>नगरीय</u> महिलाओं में: 12.3
प्रभाग 3: टेक्नेशियन एवं सहयोगी पेशेवरों	<u>नगरीय</u> पुरूषों में: 5.8	<u>नगरीय</u> महिलाओं में: 10.2

अनौपचारिक क्षेत्र

गैर-कृषि अनौपचारिक क्षेत्र में सामान्य स्थिति (पीएस+एसएस) में कामगारों का शेयर(%)

भारत में गैर-कृषि अनौपचारिक क्षेत्र में नियुक्त सामान्य स्थिति (पीएस+एसएस) में कामगारों का प्रतिशत (%)**:**

पुरुष कामगारों में:	महिला कामगारों में:	व्यक्ति कामगारों में:
75.3	56.7	71.4

सामान्य स्थिति (पीएस+एसएस) में कामगारों के रोजगार की अवस्था

<u>सामान्य स्थिति (पीएस+एसएस) में कामगारों के रोजगार की अवस्था</u>

भारत में, गैर-कृषि क्षेत्र में नियमित मजदूरी/वेतन भोगी कर्मचारियों जिनके पास कोई लिखित नौकरी संविदा नहीं था उनका प्रतिशत (%):

पुरूषों में:	महिलाओं में:	व्यक्तियों में:
65.2	61.5	64.3

भारत में, गैर-कृषि क्षेत्र में नियमित मजदूरी/वेतन भोगी कर्मचारियों जो वेतन युक्त अबकाश के योग्य नहीं थे उनका प्रतिशत (%):

पुरूषों में:	महिलाओं में:	व्यक्तियों में:
49.3	43.7	47.9

भारत में, गैर-कृषि क्षेत्र में नियमित मजदूरी/वेतन भोगी कर्मचारियों जो किसी सामाजिक सुरक्षा हितलाभ के पात्र नहीं थे उनका प्रतिशत (%):

पुरूषों में:	महिलाओं में:	व्यक्तियों में:
53.1	55.8	53.8

(घ) कामगारों के आय, कितने घंटे काम किया एवं अतिरिक्त कार्यों के लिए उपलब्ध घंटे

कामगारों के आय, कितने घंटे काम किया एवं अतिरिक्त कार्यों के लिए उपलब्ध घंटे

एस्टीमटेस आधारित है

- ग्रामीण क्षेत्रों में किए गए अनुसूची के पहले दौरे पर इकट्ठे किए गए आंकड़ों; और
- नगरीय क्षेत्रों में अनुसूची के पहले दौरे पर और पुनः दौरे पर इकट्ठे किए गए आंकड़ों जो जुलाई - सितम्बर 2020, अक्टूबर - दिसंबर 2020, जनवरी - मार्च 2021 एवं अप्रैल - जून 2021 अवधियों के लिए थे

रोजगार से आय पर सुचना इकट्ठी की गयी

- वर्तमान साप्ताहिक स्थिति (सीडब्ल्यूएस) में स्व-रोजगार व्यक्तियों के लिए आय पर सुचना पिछले 30 दिनों के लिए
- वर्तमान साप्ताहिक स्थिति (सीडब्ल्यूएस) में नियमित मजदूरी/वतनभोगी व्यक्तियों के लिए आय पर सुचना पूर्ववर्ती केलेण्डर माह के लिए
- आकस्मिक श्रमिक के लिए आय पर सुचना संदर्भ हफ्ते के प्रतिदिन के लिए

वर्तमान साप्ताहिक स्थिति (सीडब्ल्यूएस) में नियमित मजदूरी/वेतनभोगी कर्मचारियों के बीच आय की रेंज

वर्तमान साप्ताहिक स्थिति (सीडब्ल्यूएस) में नियमित मजदूरी/वेतनभोगी कर्मचारियों के बीच, पूर्ववर्ती केलेण्डर माह के दौरान हुई आय की रेंज सर्वेक्षण अवधि के जुलाई - सितम्बर 2020, अक्टूबर - दिसंबर 2020, जनवरी - मार्च 2021 एवं अप्रैल - जून 2021 के बीच में

ग्रामीण	
पुरूषों में	₹ 14.3 हजार - ₹ 16.1 हजार
महिलाओं में	₹ 9.4 हजार - ₹ 10.7 हजार
नगरीय	
पुरूषों में	₹ 21.1 हजार - ₹ 21.4 हजार
महिलाओं में	₹ 16.0 हजार - ₹ 16.7 हजार

आकस्मिक श्रमिक (पब्लिक वर्क्स के अलावा अन्य कार्य में) की औसतन

आकस्मिक श्रमिक (पब्लिक वर्क्स के अलावा अन्य कार्य में) की औसतन प्रतिदिन की आय सर्वेक्षण अवधि के जुलाई - सितम्बर 2020, अक्टूबर - दिसंबर 2020, जनवरी - मार्च 2021 एवं अप्रैल - जून 2021 के बीच में

ग्रामीण पुरूषों में	₹326 - ₹ 348
ग्रामीण महिलाओं में	₹212 - ₹ 229
नगरीय पुरूषों में	₹406 - ₹ 416
नगरीय महिलाओं में	₹266 - ₹ 281

सीडब्ल्यूएस में स्व-कार्यरत कामगारों दवारा किए गए स्व-कार्यरत कार्य से औसतन कुल आय की रेंज

सीडब्ल्यूएस में स्व-कार्यरत कामगारों दवारा किए गए स्व-कार्यरत कार्य से औसतन कुल आय की रेंज सर्वेक्षण अवधि के जुलाई - सितम्बर 2020, अक्टूबर - दिसंबर 2020, जनवरी - मार्च 2021 एवं अप्रैल - जून 2021 के बीच में

ग्रामीण पुरूषों में	₹ 9.8 हजार - ₹ 10.5 हजार
ग्रामीण महिलाओं में	₹ 4.4 हजार - ₹ 4.6 हजार
नगरीय पुरूषों में	₹ 15.9 हजार - ₹ 17.0 हजार
नगरीय महिलाओं में	₹ 7.0 हजार - ₹ 7.2 हजार

सीडब्ल्यूएस में कामगार द्वारा औसतन साप्ताहिक कितने घंटे कार्य किया गया

वर्तमान साप्ताहिक स्थिति (सीडब्ल्यूएस) में सर्वेक्षण अवधि जुलाई 2020 से जून 2021 के दौरान कामगार द्वारा औसतन साप्ताहिक काम किया गया: 42.0 घंटे – 46.5 घंटे

ग्रामीण क्षेत्रों में:	नगरीय क्षेत्रों में:
41.9 घंटे - 45.2 घंटे	42.3 घंटे - 50.0 घंटे

सीडब्ल्यूएस में कामगारों का अतिरिक्त कार्यों के लिए उपलब्ध

वर्तमान साप्ताहिक स्थिति (सीडब्ल्यूएस) में अतिरिक्त कार्य की उपलब्धता दर्ज करवाने वाले कामगारों की प्रतिशत की रेंज सर्वेक्षण अवधि जुलाई 2020 से जून 2021 के दौरान

ग्रामीण क्षेत्रों में:	नगरीय क्षेत्रों में:
2.1 % -3.3%	1.3 % -2.1%

सीडब्ल्यूएस में जिन कामगारों ने अतिरिक्त कार्य की उपलब्धता दर्ज करवायी थी उस में एक हफ्ते में अतिरिक्त कार्य की लिए उपलब्ध समय की रेंज सर्वेक्षण अवधि जुलाई 2020 से जून 2021 के दौरान

ग्रामीण क्षेत्रों में:	नगरीय क्षेत्रों में:
10.4 घंटे -13.0 घंटे	9.1 घंटे -14.0 घंटे

(ङ) बेरोजगार दर सामान्य स्थिति (पीएस+एसएस) में

बेरोजगार दर सभी उम्र के व्यक्तियों पर

भारत में सामान्य स्थिति (पीएस+एसएस) में बरोजगार दर: 4.2%

ग्रामीण	नगरीय
पुरूषों में: 3.9%	पुरूषों में: 6.1%
महिलाओं में: 2.1%	महिलाओं में: 8.6%

बेरोजगार दर 15 बर्षो और उससे उपर के उम्र के शिक्षित व्यक्तियों में

भारत में 15 बर्षो और उससे उपर के उम्र के शिक्षित (माध्यमिक एवं उसके उच्चतर का अधिकतम शिक्षा का स्तर) व्यक्तियों में सामान्य स्थिति (पीएस+एसएस) में बरोजगार दर: 9.1%

ग्रामीण क्षेत्रों में	नगरीय क्षेत्रों में
8.3%	10.2%

बेरोजगार दर युवा (15-29 वर्ष उम्र के) व्यक्तियों में

भारत में बरोजगार दर युवा (15-29 वर्ष उम्र के) व्यक्तियों में: 12.9%

ग्रामीण	नगरीय
पुरूषों में: 11.6%	पुरूषों में: 16.6%
महिलाओं में: 8.2%	महिलाओं में: 24.9%

मुख्य बातें II: भारत में प्रवसन, (2020-2021)

इस रिपोर्ट में संकेतक आवधिक श्रमबल सर्वेक्षण(पीएलएफएस) में एकत्रित आंकड़ों पर आधारित हैं

सर्वेक्षणअ
-

जुलाई 2020 से जून 2021

प्रमुख अवधारणा एं

प्रमुख अवधारणाएं

प्रवासी	प्रवासी वे हैं जिनकी अंतिम सामान्य निवास स्थल वर्तमान गणना स्थल से भिन्न है| सामान्य निवास स्थान वह स्थान (गाँव/ नगर) है जहाँ व्यक्ति 6 महीने या उससे अधिक की अवधि के लिए लगातार रहा या 6 महीने से अधिक समय तक रहने का इरादा रखता है।
परिवार में आगंतुक	इस सर्वेक्षण के लिए, अस्थायी आगंतुक वे व्यक्ति हैं जो मार्च 2020 के बाद आए और लगातार 15 दिनों या उससे अधिक लेकिन 6 महीने से कम की अवधि के लिए परिवार में रहे।

सर्वेक्षण कवरेज

सर्वेक्षण किया गया

12,562 फर्स्ट स्टेज इकाई (एफ एस यु)	ग्रामीण: 6,930 गांव नगरीय: 5,632 नगरीय खंड
1,00,344 परिवार	55,389 ग्रामीण क्षेत्रों में 44,955 नगरीय क्षेत्रों में
4,10,818 व्यक्ति	2,36,279 ग्रामीण क्षेत्रों में 1,74,539 नगरीय क्षेत्रों में

इस सर्वेक्षण में पूरे भारतीय संघ को शामिल किया गया है अंडमान और निकोबार द्वीप समूह के उन गाँवों को छोड़कर जिन तक पहुँचपाना पूरे वर्ष बेहद कठिन था।

नमूना संख्या

प्रवासियों का सर्वेक्षण किया गया

113,998 प्रवासी	59,019 ग्रामीण क्षेत्रों में	ग्रामीण पुरूष: 7,238
		ग्रामीण महिला: 51,781
	54,979 नगरीय क्षेत्रों में	नगरीय पुरूष: 17,654
		नगरीय महिला: 37,325

नमूना संख्या

सर्वेक्षण किए गए अस्थायी आगंतुकों की संख्या जिनके लिए निवास का वर्तमान स्थल (जहां वह अस्थायी रूप से रह रहे थे) उनके सामान्य निवास स्थल से भिन्न थे

2,401 अस्थायी आगंतुक जो अस्थायी रूप से उनके सामान्य निवास स्थल से भिन्न स्थल पे रह रहे थे	1,550 ग्रामीण क्षेत्रों में	ग्रामीण पुरूष: 960
		ग्रामीण महिला: 590
	851 नगरीय क्षेत्रों में	नगरीय पुरूष: 450
		नगरीय महिला: 401

जुलाई 2020 – जून 2021 की अवधि में किए गए पीएलएफएस से अखिल भारतीय स्तर पर प्रवासी और अस्थायी आगंतुकों[1] से संबंधित कुछ प्रमुख परिणाम नीचे दिए गए हैं।

क. प्रवसन दर

प्रवसन दर

प्रवसन दर (जनसंख्या में प्रवासियों का प्रतिशत) भारत में: 28.9%

<u>ग्रामीण</u>: 26.5%	<u>नगरीय:</u> 34.9%
पुरूषों में: 5.9% महिलाओं में: 48.0%	पुरूषों में: 22.5% महिलाओं में: 47.8%

ख. ग्रामीण क्षेत्रों में प्रवासियों के अंतिम सामान्य निवास स्थल का अवस्थिति

अंतिम सामान्य निवास स्थल का अवस्थिति

ग्रामीण क्षेत्रों में प्रवासियों के अंतिम सामान्य निवास स्थल का अवस्थिति के अनुसार प्रतिशत वितरण

प्रवासियों के प्रकार	अंतिम सामान्य निवास स्थल का अवस्थिति		
ग्रामीण क्षेत्रों में पुरुष प्रवासी	ग्रामीण क्षेत्रों: 44.6%	नगरीय क्षेत्रों: 51.6%	दूसरे देश: 3.9%
ग्रामीण क्षेत्रों में महिला प्रवासी	ग्रामीण क्षेत्रों: 88.8%	नगरीय क्षेत्रों: 11.0%	दूसरे देश: 0.2%

[1] *अस्थायी आगंतुक जो अस्थायी रूप से उनके सामान्य निवास स्थल से भिन्न स्थल पे रह रहे थे*

ग. नगरीय क्षेत्रों में प्रवासियों के अंतिम सामान्य निवास स्थल का अवस्थिति

अंतिम सामान्य निवास स्थल का अवस्थिति

नगरीय क्षेत्रों में प्रवासियों के अंतिम सामान्य निवास स्थल का अवस्थिति के अनुसार प्रतिशत वितरण

प्रवासियों के प्रकार	अंतिम सामान्य निवास स्थल का अवस्थिति		
नगरीय क्षेत्रों में पुरूष प्रवासी	ग्रामीण क्षेत्रों: 53.7%	नगरीय क्षेत्रों: 44.1%	दूसरे देश: 2.3%
नगरीय क्षेत्रों में महिला प्रवासी	ग्रामीण क्षेत्रों: 54.0%	नगरीय क्षेत्रों: 45.6%	दूसरे देश: 0.4%

घ. ग्रामीण क्षेत्रों में आंतरिक प्रवासी

ग्रामीण क्षेत्रों में आंतरिक प्रवासी

ग्रामीण और नगरीय क्षेत्रों से ग्रामीण क्षेत्रों में आंतरिक प्रवासियों का प्रतिशत

ग्रामीण क्षेत्रों में पुरुष प्रवासियों का प्रतिशत	ग्रामीण क्षेत्रों से: 46.4%	नगरीय क्षेत्रों से: 53.6%
ग्रामीण क्षेत्रों में महिला प्रवासियों का प्रतिशत	ग्रामीण क्षेत्रों से: 89.0%	नगरीय क्षेत्रों से: 11.0%

ङ. नगरीय क्षेत्रों में आंतरिक प्रवासी

नगरीय क्षेत्रों में आंतरिक प्रवासी

ग्रामीण और नगरीय क्षेत्रों से नगरीय क्षेत्रों में आंतरिक प्रवासियों का प्रतिशत

नगरीय क्षेत्रों में पुरुष प्रवासियों का प्रतिशत	ग्रामीण क्षेत्रों से: 54.8%	नगरीय क्षेत्रों से: 45.2%
नगरीय क्षेत्रों में महिला प्रवासियों का प्रतिशत	ग्रामीण क्षेत्रों से: 54.3%	नगरीय क्षेत्रों से: 45.7%

च. पुरुष प्रवासियों में प्रवसन का कारण

पुरुष प्रवासियों में प्रवसन का कारण

पुरुष प्रवासियों में प्रवसन के कुछ मुख्य कारण

प्रवासन के कारण	पुरुष प्रवासियों का प्रतिशत
रोजगार/बेहतर रोजगार की खोज में	22.8%
रोजगार/काम के लिए (रोजगार/बेहतर रोजगार/व्यवसाय/कार्य स्थल से निकटता/स्थानांतरण)	20.1%
माता-पिता/परिवार के कमाने वाले सदस्य का प्रवसन	17.5%
नौकरी छूटना/इकाई बंद होना/रोजगार के अवसरों की कमी	6.7%

छ. महिला प्रवासियों में प्रवसन के कारण

महिलाप्रवासियों में प्रवसन का कारण

महिला प्रवासियों में प्रवसन के कुछ मुख्य कारण

प्रवासन के कारण	महिला प्रवासियों का प्रतिशत
विवाह	86.8%
माता-पिता/परिवार के कमाने वाले सदस्य का प्रवसन	7.3%
आवास की समस्या	0.8%
रोजगार/काम के लिए (रोजगार/बेहतर रोजगार/ व्यवसाय/ कार्यस्थल से निकटता/स्थानांतरण)	0.7%

ज. अस्थायी आगंतुक

अस्थायी आगंतुक

जनसंख्या में अस्थायी आगंतुकों का प्रतिशत जो अस्थायी रूपसे उनके सामान्य निवास स्थल से भिन्न स्थल पे रह रहे थे: 0.7%

ग्रामीण: 0.7%	नगरीय: 0.6%
पुरुष: 0.9%	पुरुष: 0.6%
महिला: 0.5%	महिला: 0.6%

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