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## DEPENDENCY THROUGH AGE COMPOSITION IN POPULATION OF THE STATES IN INDIA - CENSUS DATA ANALYSIS

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**Abstract:** The anticipated change in the demographic composition will result in a reduction of the workers compared to the elderly persons. The needs of children are mainly covered through transfers from the parents and the needs of elderly persons mainly through public transfers from the population which is active in the labour market. The relative sizes of these groups are surly extent of burden. The relative changes in the age-groups will act supply chain in the social structure. An increase in economic dependency will require more reallocation from workers to the dependent population. In the light of this, dependency ratio, age-specific dependency or support ratio has been calculated for the states in India for last 3 census years. The states have also been compared.

**Index Terms** – age specific dependency ratio, support ratio, age group, combined rank, ranking, dependency ratio

### I. INTRODUCTION

In the European Union, about 70 million persons will reach age 60 between 2020 and 2029, while only about 55 million will turn 20, about the average age at which young people enter the labour force (Loichinger *et al* 2015). This anticipated change in the demographic composition will result in a reduction of working individuals compared to dependent persons. Dependency ratios are used as indicators. A large part of any population is usually economically dependent. The dependent population consists most notably of children and retired elderly persons. An increase in economic dependency will require more reallocation from working persons to the dependent population. It has been argued by many others before that dependency measures based on chronological age alone are not a good way to capture population actual dependency situation. Age-specific economic characteristics vary greatly. In this context, age-specific dependency ratio (ASDR) may be one of the indicators which is a particular case of support Ratio (Ghara 2020). Economic dependency ratios are a set of indicators which provide aggregate information on the degree of economic dependency. Demographic dependency ratios which are based on fixed threshold ages. The support ratios measure the capacity of the active population to provide for the dependent.

A refined approach for the specification of the dependent population has been taken in Cutler *et al.* (1990). This is clearly a refinement compared to the demographic dependency ratio that makes no distinction between different groups in the dependent population (e.g. between children and retirees) and within the working age population. The dependency ratio is an age-population ratio of those typically not in the labor force (the dependent part ages 0 to 14 and 65+) and those typically in the labor force (the productive part ages 15 to 64). It is used to measure the pressure on the effective working population. The dependency ratio is essential for governments, economists, bankers, business, industry, universities and all other major economic segments which can benefit from understanding the impacts of changes in population structure. A higher ratio indicates more financial stress on working people, social security and possible political instability. While the strategies of increasing fertility and of allowing immigration especially of younger working age people have been formulas for lowering dependency ratios, future job reductions through automation may impact the effectiveness of those strategies. The inverse of the dependency ratio, the inverse dependency ratio can be interpreted as how many independent workers have to provide for one dependent person (pension & expenditure on children). High dependency ratios can also lead to long-term economic changes within the population such as saving rates, investment rates, the housing markets, and the consumption patterns. The investments in housing markets will decrease since the labor force is decreasing due to a high dependency population. Low dependency ratios promote economic growth while high dependency ratios decrease economic growth. A solution to decreasing the dependency ratio within a country is to promote immigration for younger people. Encouraging women to work will help decrease the dependency ratio. Because more women are getting higher education, it is less likely for them to have children, causing the fertility rates to decrease as well. The dependency ratio is high due to significantly high crude birth rates putting pressure onto the smaller working-age population to take care of all of them. The dependency ratio starts to decrease because fertility and mortality rates start to decrease which shows that the proportion of adults to the young and elderly are much larger. Dependency ratios are a measure of the age structure of the population. They relate the number of individuals that are likely to be “dependent” on the support of others for their daily living – youths and the elderly – to the number of those individuals who are capable of providing such support. Dependency ratios are stochastic of unknown nature.

Dependency ratios affect the global environment where social policy operates and the types of needs that it will be called to meet. Their evolution is a function of mortality, fertility rates and migration. Education has become one of the indicators of life outcomes such as employment, income and social status and is a hard predictor of attitudes, employability and wellbeing. In this paper it has been tried the way how dependency played a crucial role to measure and think about dependency within the population. It also determines where people switch from being dependent to independent and then again from independent to dependent, directly influencing the choice of policy responses. The large states of India have been compared based on dependency.

## II. DATA

Census data for the years 1991, 2001 and 2011 has been considered. Table C-series and Table No- 13 has been downloaded from Census digital library. All seventeen states of in India – Andhra Pradesh, Assam, Bihar, Goa, Gujarat, Haryana, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh and West Bengal have been considered. Data for Male, Female and Total for the ages 0 to 100+ (101 rows) have been considered for all 17 states. For ASDR, the ages have been segregated into different age groups – 0-5, 6-9, 10-15, 16-17, 18-23, 24-44, 45-64, 65-79, 80+.

## III. RESULTS

Define  $Dep(X_i)$  assigns a value of one to individuals below a certain age (usually 14) and above a certain age (usually 65), and zero otherwise.

$Sup(X_i)$  takes on the value of one if the age of individual  $i$  falls between those age boundaries and zero otherwise.

$$Dependency\ Ratio\ (DR) = \frac{\sum Dep(X_i)}{\sum Sup(X_i)}$$

Likewise, support ratios are calculated by relating the ability to support others to total dependency:

$$Inverse\ Dependency\ Ratio\ (IDR) = \frac{\sum Sup(X_i)}{\sum Dep(X_i)}$$

$$Age\ Specific\ Dependent\ Ratio\ (ASDR) = \frac{\sum_2 Sup(X_i)}{\sum_1 Sup(X_i)}$$

where  $\sum_1$  and  $\sum_2$  are the present age-group and the previous age-group respectively.

A low dependency ratio means that there are sufficient people working who can support the dependent population. A lower ratio could allow for better pensions and better health care for citizens. A higher ratio indicates more financial stress on working people and possible political instability. ASDR may be looked as stochastic in nature.

Table -1 showing dependency ratio(DR) of total population –the states in India for the census year 1991, 2001 & 2011

State	DR91	DR01	DR11
ANDHRA PRADESH	65.89	57.74	57.13
ASSAM	77.14	69.89	47.19
BIHAR	81.30	85.91	58.83
GOA	49.01	42.69	81.05
GUJARAT	66.08	59.21	40.60
HARYANA	81.41	70.01	51.65
HIMACHAL PRADESH	69.19	59.33	54.01
JAMMU & KASHMIR		66.92	62.98
JHARKHAND		76.46	67.87
KARNATAKA	67.77	58.13	47.84
KERALA	55.36	49.97	46.61
MADHYA PRADESH	66.57	75.85	62.96
MAHARASHTRA	76.47	61.44	50.12
ORISSA	67.32	62.58	53.49
PUNJAB	66.35	60.43	47.76
RAJASTHAN	80.26	80.03	65.68
TAMIL NADU	54.72	48.24	43.17
UTTAR PRADESH	80.85	83.48	69.18
UTTARANCHAL		70.81	58.11
WEST BENGAL	68.16	61.17	48.40
INDIA	71.02	67.31	48.77

Note : Census data for Jammu & Kashmir, Jharkhand and Uttaranchal are not available for 1991

It is interesting to note that minimum DR in the state of Goa for the years 1991 and 2001, but for 2011 it is Gujarat. The maximum DR are in the state of Haryana, Bihar and Goa for the year 1991, 2001 and 2011 respectively. The minimums are decreasing. Therefore, social dependency are declining and it at most 41 per 100 employed/working. Goa is a state of importance shifted from minimum to maximum during 20 years gap. In all states, DRs are decreasing. The states are not sustainable towards social stability and well-being, healthcare, etc.. The correlation are highly significant and more than 0.80 between 1991 & 2001, but it is about 0.28 between 2001 & 2011. The social stability and well being are changing from 2001 onwards.

Table – 2 showing age-specific dependency ratios (ASDR) of total population for the states in Census 1991

STATE\Age Group	6-9	10-15	16-17	18-23	24-44	45-64	65-79	80+
ANDHRA PRADESH	77.01	130.47	22.93	374.25	242.37	38.82	58.96	3.28
ASSAM	70.67	122.67	25.63	323.23	234.10	31.67	57.04	6.59
BIHAR	66.68	127.37	18.27	395.14	250.90	38.08	59.20	5.30
GOA	74.11	178.07	31.41	332.52	228.70	37.86	55.70	5.34
GUJARAT	67.78	145.60	25.36	342.98	236.22	35.89	57.56	6.89
HARYANA	65.51	143.66	24.92	315.16	225.25	30.89	88.68	5.22
HIMACHAL PRADESH	66.04	158.96	28.67	275.22	231.25	40.58	69.09	7.92
KARNATAKA	71.35	140.17	24.26	356.61	233.27	37.26	62.82	5.44
KERALA	69.31	162.63	29.18	356.33	232.44	37.80	70.60	7.77
MADHYA PRADESH	65.23	139.04	24.71	354.09	247.31	38.76	59.18	5.48
MAHARASHTRA	63.87	128.93	22.19	367.65	239.70	38.07	60.90	6.47
ORISSA	70.29	134.18	24.53	349.18	241.15	40.66	60.21	5.16
PUNJAB	65.53	150.85	28.31	311.48	231.32	37.01	70.54	6.55
RAJASTHAN	67.89	133.90	20.27	360.06	233.57	37.72	61.75	3.90
TAMIL NADU	75.35	151.35	27.04	349.27	245.78	43.23	54.47	4.61
UTTAR PRADESH	64.38	131.90	21.91	342.71	233.14	40.21	63.43	5.76
WEST BENGAL	73.69	132.49	24.00	345.77	254.85	35.23	54.34	7.29

ASDR figures are interesting in 1991. For the age group 6-9, it may be noted that there are drop-out among the children admitted in all the states and it is about 69% support in the states, minimum ASDR in Maharashtra and maximum ASDR in Andhra Pradesh. For the age group 10-15, it may be noted that all primary enrolled students entered into secondary education; it is better in Goa and lesser in Assam. For the age group 16-17, it is better to state that all secondary passed students are not enrolled in higher secondary level; only 25% enrolled, it is not a perfect support. It is maximum in Goa and minimum in Bihar. For the age-group 18-23, the support is perfect and maximum in Bihar & minimum in Himachal Pradesh. For the age group 24-44, the support is very good or persons with higher education get employed in all the states. It is maximum in West Bengal and minimum in Haryana. For the age group 45-59, it may be stated that not all persons are remained employed, about 37% are leaving jobs within the age group. It is maximum in Tamil Nadu and minimum in Haryana. For the age group 60-79, about 62% are enjoying retire-mental benefits/ social security privileges. It is maximum in Haryana and minimum in West Bengal. For the age group 80 + , only 5% are the support or only about 5% persons are further dependent in terms of full social protections with maximum in Himachal Pradesh and minimum in Andhra Pradesh.

Table -3 showing age-specific dependency ratios (ASDR) of total population for the states in Census 2001

STATE\Age Group	6-9	10-15	16-17	18-23	24-44	45-64	65-79	80+
ANDHRA PRADESH	86.26	142.74	25.97	341.41	255.02	38.34	61.85	4.22
ASSAM	76.91	136.09	24.52	312.28	264.26	32.53	56.69	6.47
BIHAR	72.54	128.51	18.83	346.86	256.75	38.20	63.03	5.89
GOA	67.17	169.59	32.09	369.83	274.81	39.81	56.45	6.45
GUJARAT	69.01	152.90	28.34	317.42	254.10	35.98	58.28	6.76
HARYANA	73.94	152.40	27.48	286.51	244.63	31.64	75.80	8.11
HIMACHAL PRADESH	72.37	168.93	29.19	295.05	250.63	40.41	68.48	9.59
JAMMU & KASHMIR	87.82	154.15	27.16	268.58	241.00	36.84	60.23	6.46
JHARKHAND	75.82	134.26	21.07	322.40	263.58	38.66	51.89	5.83
KARNATAKA	74.70	161.24	26.52	331.94	250.40	38.69	61.34	6.01
KERALA	60.38	178.14	32.00	320.84	282.30	43.55	68.21	8.82
MADHYA PRADESH	70.73	141.44	23.08	315.33	254.71	34.73	69.36	5.69
MAHARASHTRA	68.03	166.72	27.15	312.89	261.14	36.04	74.87	5.91
ORISSA	75.84	148.06	25.05	326.39	266.78	37.72	68.98	5.46
PUNJAB	79.69	158.56	28.96	307.04	242.87	36.97	75.39	8.19
RAJASTHAN	71.34	134.36	23.57	306.23	242.06	36.06	66.56	6.13
TAMIL NADU	72.37	162.33	30.90	335.50	264.65	43.29	60.13	5.75
UTTAR PRADESH	74.14	134.94	22.06	305.95	240.12	37.84	68.37	6.04
UTTARANCHAL	74.24	152.82	27.72	271.85	231.58	40.73	66.46	6.72
WEST BENGAL	79.28	148.17	25.28	315.62	281.36	36.16	57.56	8.81

ASDR figures are interesting in 2001. For the age group 6-9, it may be noted that there are drop-out or not all children are admitted in the north east states and it is more than 73% support in the states, minimum in Kerala and maximum ASDR in Jammu & Kashmir. For the age group 10-15, it may be noted that all primary enrolled students entered into secondary education; it is better in Kerala and lesser in Jharkhand. For the age group 16-17, it is better to state that all secondary passed students are not enrolled in higher secondary level, it is not a perfect support. It is maximum in Goa and minimum in Jharkhand. For the age-group 18-23, the support is perfect and maximum in Goa & minimum in Jammu & Kashmir. For the age group 24-44, the support is very good or persons with higher education get employed in all the states. It is maximum in Kerala and minimum in Uttaranchal. For the age group 45-59, it may be stated that not all persons are remained employed; more than 38% are leaving jobs within the age group. It is maximum in Kerala and minimum in Haryana. For the age group 60-79, about 65% are enjoying retire-mental benefits/ social security privileges. It is maximum in Haryana and minimum in Jharkhand. For the age group 80 + , only about 6% are the support or only about 6% persons are further dependent in terms of full social protections with maximum in Himachal Pradesh and minimum in Odissa.

Table – 4 showing age-specific dependency ratios (ASDR) of total population for the states in Census 2011

STATE\Age Group	6-9	10-15	16-17	18-23	24-44	45-64	65-79	80+
ANDHRA PRADESH	75.89	168.06	30.87	329.63	277.16	40.38	69.73	5.78
ASSAM	71.61	147.72	27.74	314.19	268.79	37.35	52.65	8.32
BIHAR	75.55	135.79	21.27	301.76	265.41	37.50	70.10	5.92
GOA	67.98	158.45	31.67	367.38	335.99	45.61	63.98	7.87
GUJARAT	69.98	158.51	30.51	316.37	271.49	41.76	54.69	8.50
HARYANA	68.65	162.85	32.15	307.33	247.00	37.61	67.96	9.13
HIMACHAL PRADESH	71.45	161.90	32.74	311.28	284.62	44.64	63.25	11.96
JAMMU & KASHMIR	64.54	151.95	28.77	294.85	264.43	37.03	60.33	9.29
JHARKHAND	72.56	148.64	24.30	304.00	260.84	39.51	60.39	5.31
KARNATAKA	67.72	165.66	31.65	339.83	272.19	41.50	64.56	7.28
KERALA	68.87	164.73	30.69	306.93	334.02	56.86	62.72	11.08
MADHYA PRADESH	72.14	154.31	27.95	300.50	248.56	38.95	63.86	8.11
MAHARASHTRA	68.68	164.57	31.71	330.55	270.49	40.72	69.36	7.92
ODISHA	72.45	160.73	28.11	321.35	277.38	43.32	65.80	6.88
PUNJAB	72.32	166.16	35.01	311.35	259.36	42.80	68.78	9.68
RAJASTHAN	70.33	157.83	27.92	296.15	232.26	39.37	62.93	7.46
TAMIL NADU	70.33	166.76	31.84	327.07	317.08	46.77	61.11	6.69
UTTAR PRADESH	77.21	156.87	28.46	268.34	224.28	38.54	69.48	8.40
UTTARAKHAND	73.56	164.04	31.71	285.32	233.70	41.32	68.73	8.76
WEST BENGAL	72.87	167.68	30.92	322.20	269.67	43.47	55.10	9.24

As per ASDR for 2011, for the age group 6-9, it may be noted that there are drop-out or not all children are admitted in the north east states and it is more than 71% support in the states, minimum in Jammu & Kashmir and maximum ASDR in Uttarakhand. For the age group 10-15, it may be noted that all primary enrolled students entered into secondary education; it is better in West Bengal and lesser in Jharkhand. For the age group 16-17, it is better to state that all secondary passed students are not enrolled in higher secondary level, only 30% support. It is maximum in Punjab and minimum in Uttar Pradesh. For the age-group 18-23, the support is perfect and maximum in Goa & minimum in Uttar Pradesh. For the age group 24-44, the support is very good or persons with higher education get employed in all the states. It is maximum in Goa and minimum in Uttar Pradesh. For the age group 45-59, it may be stated that not all persons are remained employed, more than 42% are leaving jobs within the age group. It is maximum in Kerala and minimum in Jammu & Kashmir. For the age group 60-79, about 63% are enjoying retire-mental benefits/ social security privileges. It is maximum in Uttar Pradesh and minimum in Gujarat. For the age group 80 + , only about 8% are the support or only about 8% persons are further dependent in terms of full social protections with maximum in Himachal Pradesh and minimum in Jharkhand.

In each year, the states are ranked based on ASDR values. The combined rank has been calculated. Lower is the combined rank better is the state. For 1991, better state is Kerala, Tamil Nadu, Himachal Pradesh, etc. and the weaker state is Haryana. For 2001, better state is Kerala, Goa, Himachal Pradesh, etc. and the weaker state is Rajasthan. For 2011 census, better state is Punjab, Himachal Pradesh, Andhra Pradesh, West Bengal, etc. and the weaker state is Jharkhand.



Table-5 showing the ranks of the combined ranks of the states

State\Year	Combined Rank			Rank based on Combined Rank		
	1991	2001	2011	1991	2001	2011
ANDHRA PRADESH	70	81	56	8	9	3
ASSAM	88	100	116	16	16	17
BIHAR	72	98	107	12	15	15
GOA	63	60	66	7	2	7
GUJARAT	76	92	89	9	13	13
HARYANA	91	89	88	17	12	12
HIMACHAL PRADESH	58	61	55	3	3	2
JAMMU & KASHMIR		92	122		14	20
JHARKHAND		102	120		17	19
KARNATAKA	68	76	74	5	7	9
KERALA	44	43	64	1	1	6
MADHYA PRADESH	68	110	110	6	19	16
MAHARASHTRA	82	85	68	13	11	8
ORISSA	68	78	75	4	8	10
PUNJAB	74	63	53	11	4	1
RAJASTHAN	89	116	120	14	20	18
TAMIL NADU	58	65	62	2	5	5
UTTAR PRADESH	79	109	98	15	18	14
UTTARANCHAL		85	77		10	11
WEST BENGAL	76	75	60	10	6	4

Note : Census data for Jammu & Kashmir, Jharkhand and Uttaranchal are not available for 1991

#### IV. REMARKS

The states in India have been compared based on age specific dependency ratio or support ratio. Kerala, Himachal Pradesh were the better states in the past census and weaker states in India with respect to support ratio for all 3 census years are Haryana, Rajasthan and Jammu & Kashmir. It is to note that social security are more in the states like Haryana, Himachal Pradesh and least in Odissa and Jharkhand. Further determinants may be looked into for more better comparison of the states. Goa has acquire social stability after 2001 and all other states are gradually losing social stability and well-being.

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