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Multidimensional tool for assessment of social protection framework - a life cycle approach: conceptualisation, construction and comparison

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Multidimensional tool for assessment of social protection framework - A life cycle approach: Conceptualisation, Construction and Comparison

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Abstract

With the objective of introducing a holistic approach for review and assessment of social protection framework, the Multidimensional Social Protection Index (MSPI) is conceptualised in this paper. While developing the proposed MSPI 'human life cycle' has been kept at the centre. Accordingly, three sub-indices representing different life phases namely Young Social Protection Index (YSPI), Adult Social Protection Index (ASPI) and Elderly Social Protection Index (ESPI) are constituted. For ascertaining these sub-indices, social protection programs covering important areas like livelihood, education and health are evaluated by assessing their three dimensions viz. adequacy, coverage and efficacy. For this purpose, a set of indicators are framed. A detailed stepwise methodology for construction of MSPI is presented herein. The study is extended to compute MSPI for Indian states on the basis of selected social protection programs to gauge its practical applicability. Using a seven-step computation methodology presented in this paper, MSPI scores for Indian states are estimated and demonstrated herein with stepwise calculation. Further, a robustness check of MSPI is also conducted; the results reveal that MSPI scores estimated under different scenario are not significantly different and thus endorse the robustness of MSPI and its given methodology. Therefore, this study advocates that MSPI is quantifiable, practically implementable and a robust tool which would enable policy makers in developing benchmarks, assessing gaps, optimising allocation of resources and designing appropriate social protection programs.

Keywords: adequacy, coverage, efficacy, life-cycle phases, multi-dimensional social protection index, etc.

JEL Classification: I31, I38, J18

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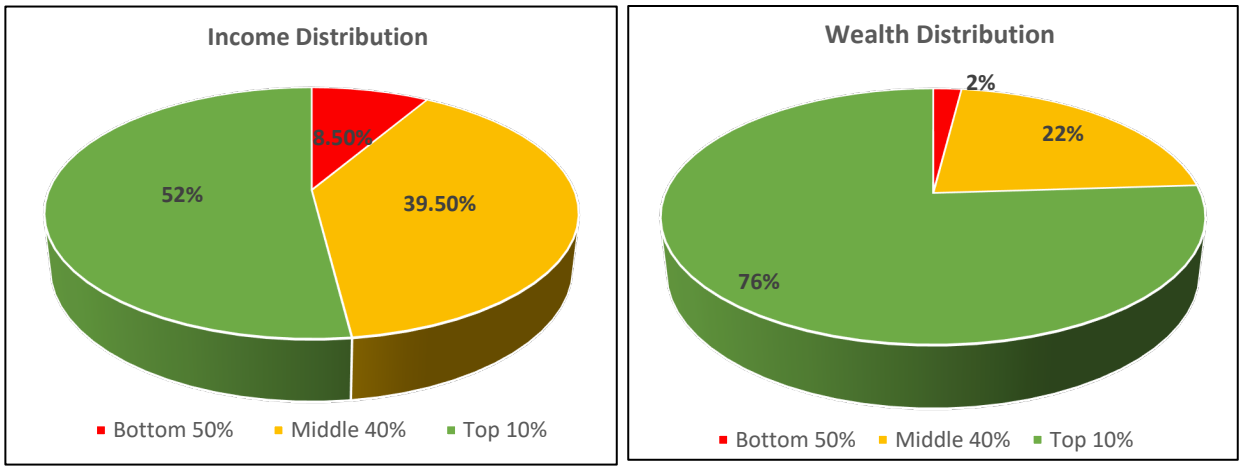
1. INTRODUCTION:

In more than 190 countries in the world, there are different languages, religion, caste, attires etc. But the two sections in any of the societies which are unarguably common are rich and poor. Nearly in every country, one can find the social divide between rich and poor people. Since the days of human civilisation many efforts were made to bridge the gap between rich and poor and bring the equity in society. Unfortunately, despite the slew of measures undertaken, the gap between rich and poor has widened over the period. The bottom 50% of global population owns only 2% of wealth and earns 8.5% of total income (measured at Purchasing Power Parity) whereas the top 10% of global population owns 76% of household wealth and captures 52% of total income in 2021. (world inequality report 2022).

Figure 1: Uneven distribution of wealth and income in world society



Source : world inequality report 2022; wir2022.wid.world/methodology

This inequal distribution of wealth and income ultimately results into social exclusions which may lead to severe social problems impacting generations. Thus, it is very important to make efforts to uplift the economically disadvantaged section of the society and narrow down such gaps to the maximum possible extent. Now the question is how to do it?

One of the ways to address this issue is providing 'social protection'[1] to such needy people. Prima-facie, this solution looks simple and easily implementable. However, the world social protection report suggests that the percentage of world population covered by at least one social protection benefit is 45%, implying complete social protection benefit coverage is much lower. Further, the same report highlighted that % of population covered by at least one social

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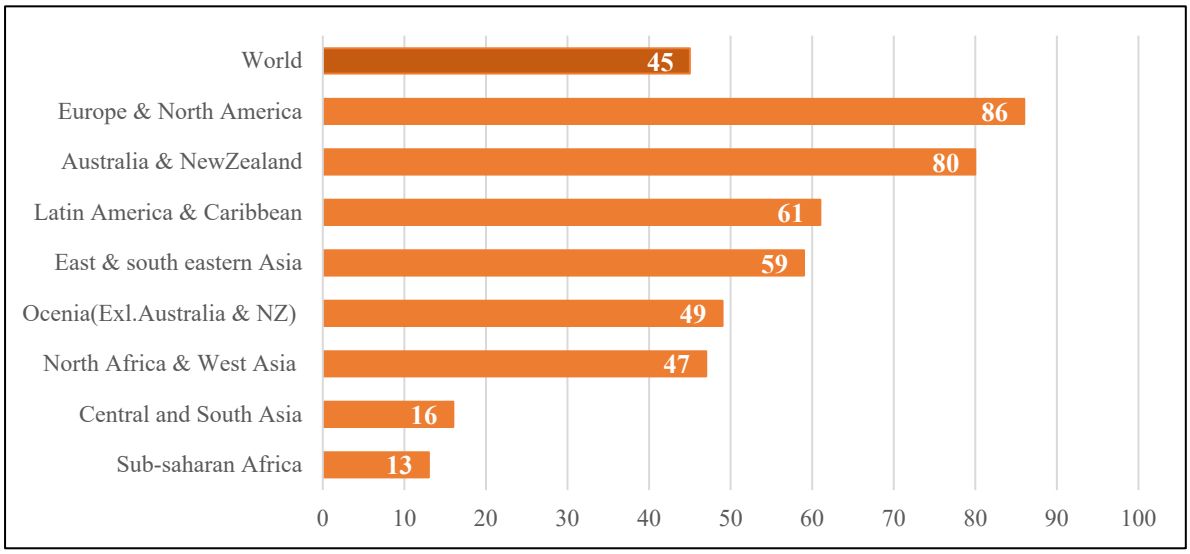
1. Social protection is a set of measures undertaken either to uplift people from economically disadvantaged section or preventing them from falling into it. Social protection policies, broadly understood as social insurance, social assistance and labour market policies, protect people from adverse market effects and lifecycle contingencies while playing important roles for production, reproduction and redistribution". (Mkandawire,2004; UNRISD, 2010, 2016).

protection benefit in Sub-Saharan Africa, Central and South Asia is much lower than the world's average coverage.

Figure 2: **Proportion of population covered by at least one social protection benefit, 2016(%)**



Sources: ILO's world social protection database

The progress in extending the social protection has been uneven across and within the geographies (Figure 2). Thus, it becomes critical to pay serious attention in the area of social protection. The world now has started acknowledging the importance of social protection and inclusion of social protection in the Sustainable Development Goals (SDGs) targets signifies the same.

SDG target 1.3 has laid down the target for comprehensive social protection structure for each country. It states that *"to implement nationally appropriate social protection systems and measures for all, including floors, and by 2030 achieve substantial coverage of the poor and the vulnerable"*. Other SDG targets like SDG target 3.8[2] and SDG target 8.10[3] also indirectly emphasis on social protection. Such explicit and implicit mention of social protection endorse the increasing importance of the subject.

In short, the need for and importance of social protection in creating equitable and inclusive society is unarguable and widely recognised. Thus, most of the countries run some or the other form of social protection programs for their citizens. These programs offered by Governments are usually aimed at addressing the needs of livelihood, healthcare and education. However, these efforts in many cases have failed to deliver the desired results, sometimes because of budgetary constraints and sometimes because of the improper implementation and leakages.

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2. SDG target 3.8: 'Achieve universal health coverage, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all. 3. SDGs target 10.4: 'Adopt policies, especially fiscal, wage and social protection policies, and progressively achieve greater equalities'

Sufficient budget to run social protection programs as usual will remain a challenge specially for low- and middle-income countries. So, should these countries delay or defer the expansion and extensions of such initiatives of social importance till the problem of fund gets resolved? Definitely not! A well-designed and robust Social Protection system may help to overcome the budgetary shortcomings. However, designing a robust social protection framework with budgetary constraints is always a challenge for economists and policy makers. Another challenge is to make the on-going programs effective enough to derive the optimum results.

Both of these concerns may be addressed to the maximum extent with the help of comprehensive assessment and regular monitoring of the existing social protection framework. It is pertinent to mention that the social protection programs can't be run and reviewed in isolation as there exists a strong interconnectedness among such programs and their outcomes are also interlinked. Hence, a holistic approach is required while reviewing them. A prudent assessment of social protection framework along with the demographic profile enables policy makers to identify critical areas and to allocate the resources optimally.

It is pertinent to mention that primary research including a detailed review of available literature reveals the absence of standard mechanisms for a comprehensive evaluation of social security programs. Therefore, in order to address the difficulties in assessment, a measuring methodology for evaluation of social protection framework and its application are being proposed in the present research study. The objectives of the research study:

(i) To conceptualise a multidimensional index for assessment of Social Protection framework.

(ii) To define the methodology for constructing such index using life cycle approach.

(iii) To gauge the practical applicability of MSPI by examining MSPI computation methodology in the Indian context.

(iv) To conduct robustness check of the MSPI.

After the given introduction, this researcher paper is organised as follows: In the second section, the review of related literature is presented. The third section contains theoretical construct which includes conceptualisation of MSPI and mathematical construct of an index. Section 4 deals with the application of MSPI over Indian states using selected social protection program. At Section 5, the robustness check is conducted by computing MSPI score for Indian states under different scenarios, lastly conclusions are mentioned at section 6.

2. REVIEW OF RELATED LITERATURE:

While reviewing the work related to human development, social protection, index construction etc, many reports and research articles have been studied and some of them are listed below.

Noorbakhsh F. (1998) examines the components and structure of UNDP's Human Development Index and suggests modifications on components and structure of HDI. These result in a set of alternative indices, based on the same components, for measuring human development.

Alkire, S. (2002), discussed the usefulness and limitations of using dimensions of human development. It has been argued that one fundamental reason for a serious account of dimensions is to give secure epistemological and empirical evidence to the multidimensional objective of human development. Poverty, which is-to-be-reduced, and well-being, which is-to-be-enhanced.

McGillivray M. and Noorbakhsh F. (2004) have surveyed various well-being indices and studied various issues related to such indices that include choice of components, component weights, scale equivalence, non-linearity and correlations among components. It was argued that in order to have practical relevance of such well-being indices, universal set of components chosen on the basis of universal elementary capabilities may be retained, however, the variables on which these components are based and their weights are varied across countries and over time.

Decancq K. and Lugo M. A. (2008) presented a unifying framework to compare the different approaches used to construct multidimensional well-being indices and to analyse the role of the dimension weights in each of them. In this paper, it is stated that through interaction with choices about the transformation and aggregation of the different attributes, the weights play a crucial role in determining the trade-offs between the dimensions and hence setting weights reflects important value judgements about the exact notion of well-being.

Alkire, S. (2010), presented the construct of Multidimensional Poverty Index (MPI). It is described that the MPI is constructed using three dimensions viz. Health, Education and Standard of living and these dimensions are gauged using 10 indicators. Further, it is stated that while constructing the Index equal weight approach had been adopted; each dimension is given 1/3rd of weightage and indicators under each dimension is also assigned equal weight.

Yang, Lin (2018) introduces the 'preference index approach'. It propounded a preference-sensitive multidimensional index by bringing together 'equivalence approach' and the 'distance function' in welfare economic theory. On applying this approach to British Household preference Survey (BHPS), it is found that when the preference heterogeneity is considered, the well-being indices look different.

Borga Liyousew G. and D'Ambrosio Conchita (2021) studied the impact of social-protection schemes on multidimensional poverty with reference to Ethiopia, India, and Peru. They find positive impact on asset formation, livestock holding, and some living standard indicators in short-term and also find positive impacts are sustained even in the medium and longer-term.

Stern, S., Harmacek, J., Htitich, M., and Krylova,P (2021) describes the methodology adopted for developing the social progress index which is composed of multiple-dimensions of social progress that includes components like Basic Human needs, Foundations of well-being and opportunity.

ILO's reports on World Social Protection (2017-19) provides details regarding the current state of social protection systems around the world in terms of their coverage, benefits, and

expenditures, following a life-cycle approach. The report advocates that there is an urgent need in many countries to take measures towards ensuring social security for their citizens as 71% of world population has none or only partial access to social security. Importantly, this report highlighted that the lack of quality and up-to-date social protection data is a major constraint in identifying and addressing gaps in social protection. It also states that standardized information regarding key policy characteristics of social security programmes, such as the number of people covered, benefit levels and costs, financing sources, frequency and quality of the provision offered, is lacking in many countries. Thus, the literature related to social security and measurement techniques were studied. It has been observed that the social security programs have evolved substantially in developed countries compared to low-middle income countries and consequently there is more research in the area of social protection in developed countries. However, literature related to evaluation of social security framework on the basis of standardised assessment mechanism is limited. Further, literature related to social progress/well-being indicators and their methods of measurements are reviewed with the objective of developing a model for assessment of safety net. The following studies and reports provide important insights - UNDP's report on Human Development Index, Mercer's report on Melbourne Mercer Global Pension Index (MMGPI), NITI Aayog's report on SDG India – Index, and some research articles discussed hereunder.

UNDPs Human Development Report (2020) is the latest in the series of global Human Development Reports since 1990 and these reports are based on Human Development Index (HDI). HDI measure a country's broader development rather than GDP/GNP as a measure for human development. It is a composite index measuring human development using four indicators viz life expectancy, mean years of schooling completed and expected years of schooling upon entering the education system, and per capita income. These indicators broadly represent development in terms of health, education and income and indicate the relevant dimensions of human development.

The 'Report on Sustainable Development Goal (SDG)– India Index and Dashboard 2020-21 by Niti Ayog, provides meaningful insight about social, economic and environmental status of India and its states. To track the progress of each state towards achieving SDGs, an Index was constructed by Niti Ayog in 2018 and it has since been evolving. The latest version SDG India Index 3.0 is presented in the aforementioned report along with the methodology of constructions and results.

Mercer CFA Institute Global Pension Index Report (2020 and 2021) provides meaningful insight about the pension systems of around 43 countries in the world. It also explains the methods used for formulating this Global Pension Index. The report stated that this index has been developed using three sub-indices – adequacy, sustainability and integrity to measure each retirement income system against more than 50 indicators and the overall index value for each system represents the weighted average of the three sub-indices. It is also mentioned that

the weightings used are 40 % for the adequacy sub-index, 35 % for the sustainability sub-index and 25 % for the integrity sub-index, all of which have remained unchanged since the first Index in 2009.

Thus, there is extensive body of knowledge on evaluating the status of well-being of the society. Many studies were conducted to formulate the standard mechanism for measuring the human development as well as regarding social security. This review of literature reveals the gap in terms of adequate studies on developing a standardise framework for evaluating the social safety net comprehensively. Thus, this study attempts to formulate and develop a standard methodology for comprehensive assessment of social security framework.

(3). THEORETICAL CONSTRUCT:

3. 1 Conceptualisation of MSPI

(i) Life cycle stages in MSPI:

Human needs vary significantly over the life span and they are exposed to different kind of risks at each phase of life. This holds true irrespective of economic, social and political status and structure of country or an individual. Identifying the risk at various phases of life cycle and formulating the risk mitigation programs (social protection programs) accordingly, seems a more prudent way of overcoming such risks. Beveridge, W. (1942) propounded the concept of offering basic social protection to citizens from the 'cradle to the grave' which formed the foundation of welfare state reforms in UK post 1945. Later, this concept i.e. '*designing social protection framework addressing the risk and vulnerabilities linked to life cycle phases right from birth to death'* took a centre stage in framing social protection policies and framework. Rationally also, instead of adopting one-size-fits-all or straight-jacket approach, it is better to have a strategy which may cater to the needs of citizen in accordance with their life-cycle phases and protect them from vulnerabilities associated with respective life cycle phases.

Therefore, to enable strategists to formulate such programs, it is important to assess the social protection programs considering the life cycle phases. Taking this into account, the MSPI considers life cycle phases to construct a meaningful barometer for the assessment of prevailing social protection programs. For the purpose of avoiding the complexities in estimating the different programs targeted at different life phases, the chronological age stage approach has been adopted. The entire life span of an individual can be broadly classified as Young, Adult and Old. The rationale of population division depending on chronological age is primarily based on the widely accepted definition of 'Dependency Ratio'. It is defined as the ratio of the number of children (0-14 years old) and older persons (65 years or over) to the working-age population (15-64 years old)[1]. This ratio is critical in estimating the extent of social support requirements arising out of changing age composition of population. Thus, it is essential to consider the age classifications as used in case of dependency ratio for forming the age groups to construct sub-indices of MSPI.

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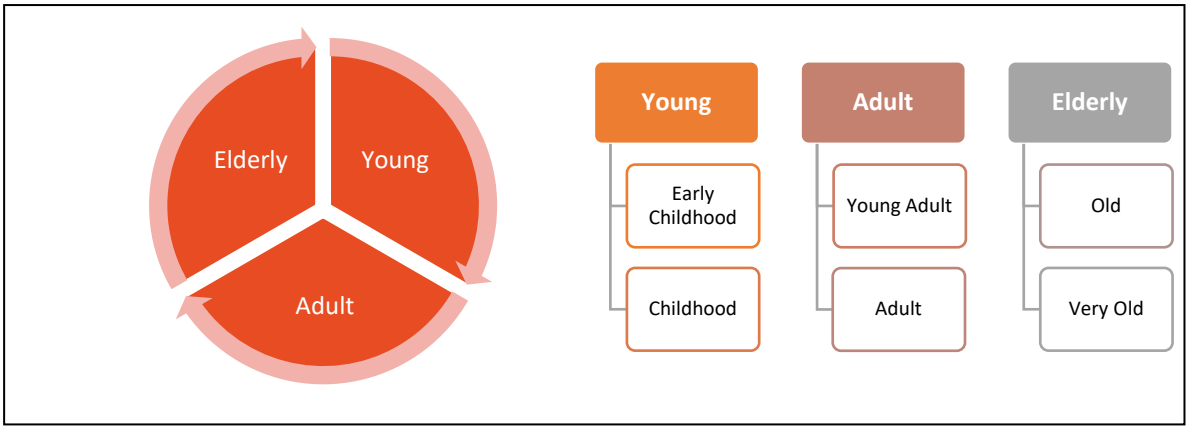
1. Definition is referred from United Nations Department of Economic and Social Affairs (DESA)

For constructing MSPI, these categories are further sub-divided into six phases based on the chronological age of an individual and are termed as early childhood, childhood, young adult, adult, old and very old.

Younghood is the initial phase of life and in MSPI, Children in the age group of 0-14 years forms the cohort of Youngs. This age group is further classified as Early Childhood (0 to 6 years) and Childhood (7 years to 14 years). Second phase of life is attaining the Adulthood which has been again divided as two parts as Young Adult (15 years to 40 years) and Adult (41 years to 59 years). Elderly phase is the last phase of life cycle. Elderly has also been seen as Old (60 years to 79 years) and 80+years as very old.

Figure 3: Life cycle stages in MSPI



(ii) Sub-indices and Dimensions

The objective of MSPI is evaluating the various social protection programs covering complete life span. On the basis of three broader life cycle phases (discussed in section above), the MSPI has also been divided into three sub-indices, namely -Young Social Protection Index (YSPI), Adult Social Protection Index (ASPI) and Elderly Social Protection Index (ESPI).

YSPI is the sub index for assessing the social protection framework targeted towards safeguarding the early life cycle phase (younghood).

Adult Social Protection Index (ASPI) and Elderly Social Protection Index (ESPI) are the sub-indices constituted for assessing the status of the social protection at the stages of life later to childhood. For these stages, livelihood is considered as domain where social protection is essential.

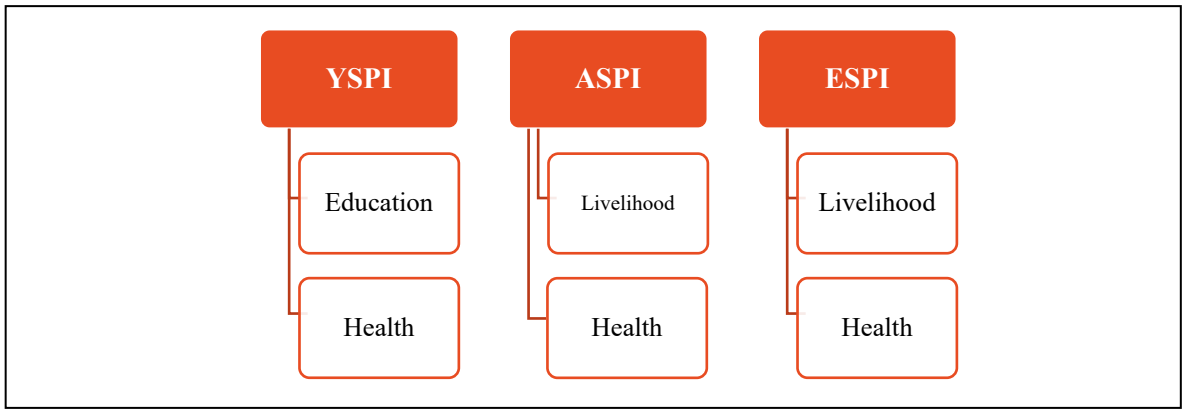
(iii) Domain area for social protection:

As discussed in this paper earlier, the risk and vulnerability vary over the life cycle, it is very essential to identify the various aspects of life where social protection is needed at given phase of life. For MSPI, such aspects of life are termed as 'Domain area'. Assessing the programs, on classifying them in accordance with domain area will prove to be helpful in allocating the resources as per the urgency and the extent of intervention required in the specific domain area.

At the early stages of life, an individual is prone to acute infection/diseases, stunted growth due to lack of nutritious food, lack of access to education implying that during the younghood health/nutritious food and education are the domain areas. During the adulthood and also during the elderly phase, the most important aspect is continuation of livelihood. Any disruption to livelihood may result in suffering of the entire family which would be particularly aggravated in case of families where there is sole bread-winner. Further, like young phase, access to health services is very important during the adult and elderly phase. Therefore, during these stages 'livelihood' and 'health' are considered as domain where social protection is essential.

An individual requires Health assistance at each stage of life. Hence, Health is taken as essential domain for social protection during adulthood and elderly phase of life.

Figure 4: Sub-indices and Domain



(iv) Dimensions:

The success of social protection programs basically depends on three aspects (i) level of benefits provided by the program (ii) extent of population covered under the program and (iii) effective implementation of programs. Hence, it is judicious to evaluate the social protection framework on the similar lines. Therefore, while conceptualising the MSPI, a three-dimensional approach has been adopted. This three-dimensional approach is termed as 'ACE' where **A** represents **A**dequacy, **C** stands for **C**overage and **E** denotes **E**fficacy. 'ACE' as dimensions are deliberated in detaile as below:

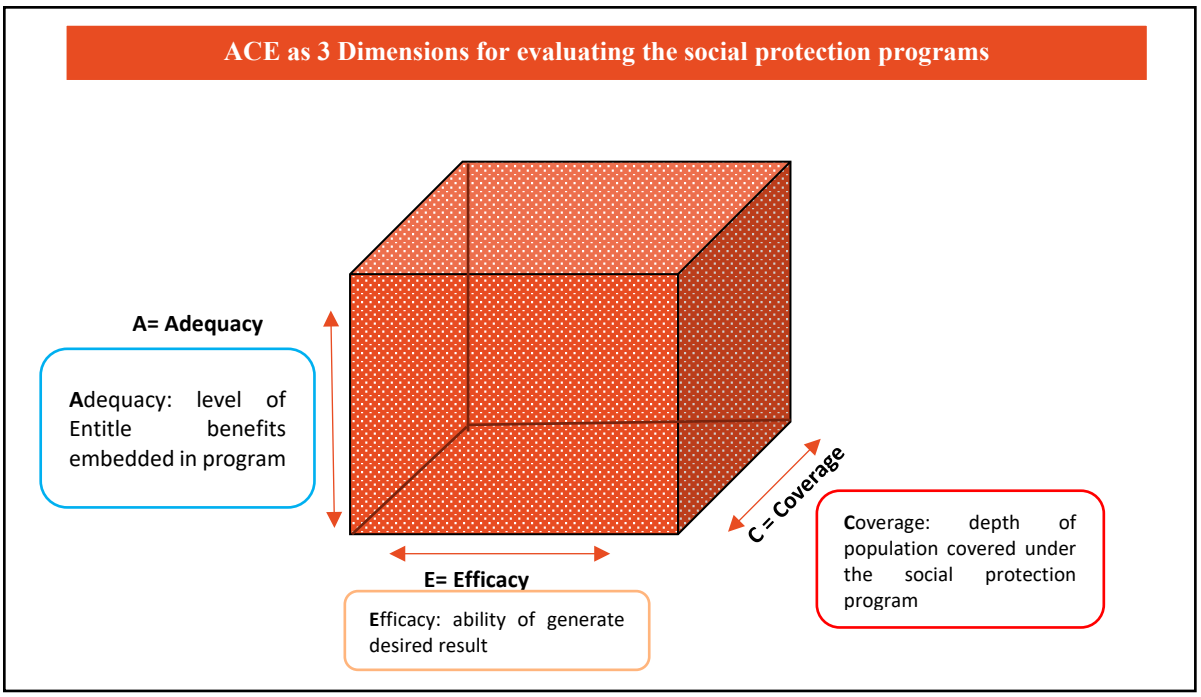
Adequacy: Under the 'Adequacy' dimension, the level of benefits embedded in the social protection program is to be gauged against at least the minimum acceptable level of such benefits assumed to be provided to achieve the underlying objective of the social protection program. For example: if social protection program is designed with an objective of providing an income support to certain section of society then such income support needs to be at least equal to the average consumption expenditure so that the given support may be adequate enough to take care of the expenses incurred for necessary consumption. Delivering the desired benefit adequately to the target audience is the core objective while designing a social protection program but achieving it in reality has always been challenging. Determining

adequacy is a complex process as defining benchmarks/standards for evaluation of level of benefit offered by the program is intricate and varies from program to program. However, it is important to evaluate such programs in terms of their adequacy as quantum of resources to be allocated for the current and future plans and programmes depend on the degree of adequacy offered through prevailing arrangements. Therefore, while constructing MSPI, an attempt has been made to identify and include a set of indicators which provide information regarding the level of benefit offered by social protection programs.

Coverage: Under the 'Coverage' dimension, the depth of population covered under the social protection program is to be determined. While designing social security schemes, the target universe has to be defined clearly. Unless the scheme covers every individual of the targeted universe, the objective of saturation cannot be achieved, which is one of the essential determining factors for success of the scheme. Thus, it is important to gauge the coverage of the program vis-à-vis the eligible population. Therefore, under the coverage parameter, indicators that give information regarding the spread/reach of social security schemes are included.

Efficacy: Under the dimension 'Efficacy', the ability/probability of delivering the desired outcome by effective implementation of the program is to be assessed. At the conceptualisation stage of social protection programs, the objective gets defined and certain outcomes/results are to be expected. Therefore, the proper implementation with minimum leakages is very crucial to generate desired results, especially in case of low- and middle-income countries considering their budgetary constraints. The effective and maximum utilisation of resources enhance the chances/ability of the program to be successful.

Figure 5: Dimensions of MSPI



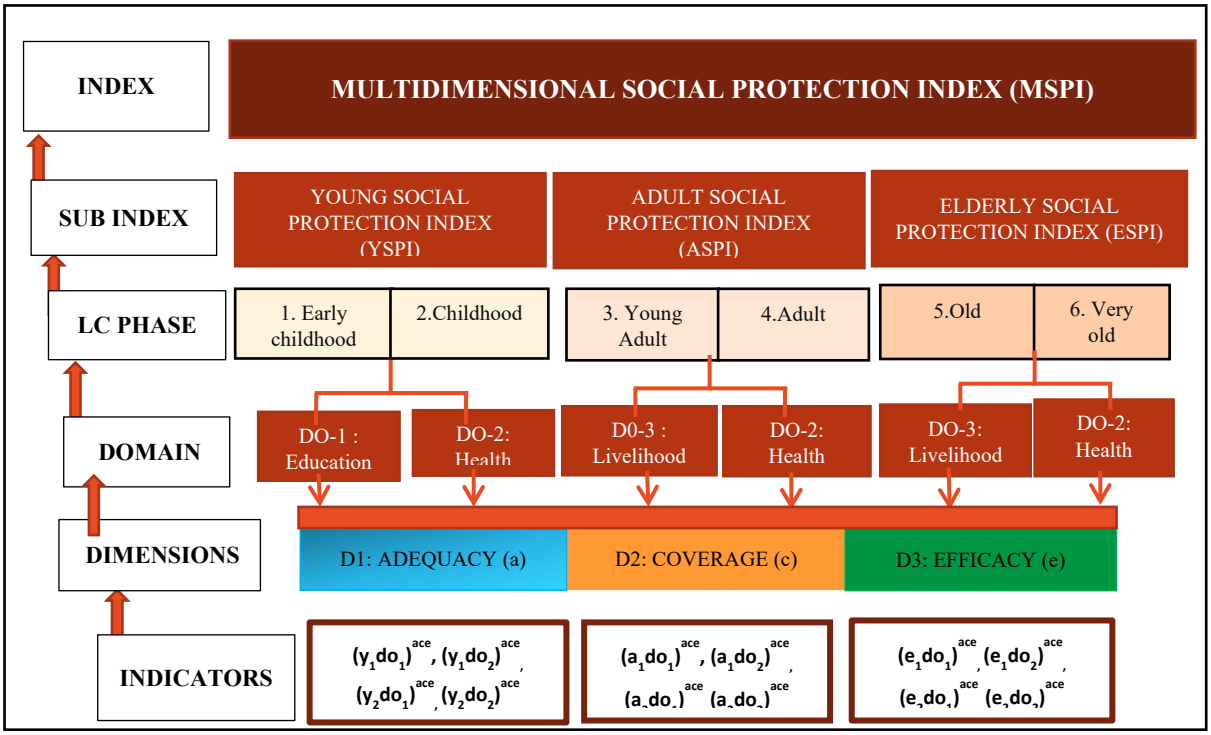
(v) Indicators:

In order to evaluate any social protection framework in all three dimensions, it is important to develop right set of indicators representing the performance of social protection programs in respective dimensions. In case of MSPI, developing indicators which can measure the various dimensions of social protection framework is a challenging task as for computing this composite multidimensional index a set of quantifiable, simple and limited indicators is critical. The process of development of indicator is a two-stage process: at the first step the parameter which can provide insights regarding the performance of the program in terms of adequacy, coverage and efficacy needs to be identified and at the second stage the benchmark or minimum standard against which the identified parameters can be compared are to be a decided.

The final indicators thus can be deduced by combining two-steps. While developing MSPI, the utmost importance has been given to curate a set of indicators which can be easily understood and quantified. This is essential and required for deriving the final composite score of the MSPI. The reliability of index depends upon the appropriateness of indicators. Further, in MSPI, the flexibility in framing indicators is in built by its conceptualisation, this is helpful in customising the set of indicators keeping in view the country specific or region-specific requirement in accordance with the prevailing social protection framework.

To summarise, the concept of Multidimensional Social Protection Index (MSPI) comprises of five components i.e. sub-indices, Life cycle phases, domains, dimensions and indicators. The diagrammatic representation of MSPI is depicted using flow chart as below:

Figure 6: Conceptualisation of MSPI-LC: Flowchart



3.2 Mathematical Construct of MSPI

This section presents the methodology adopted to construct the MSPI. The methodology suggested here for constructing a social protection index is derived after examining various Index building methodologies. The methodologies which inspired the construction of MSPI includes methodology adopted for constructing Human Development Index, Multidimensional Poverty index, SDG India Index, Melbourne Mercer Global Pension Index, Social Progress Index, etc. In this paper, for comprehensive representation and assessment of social protection framework using life cycle approach, three sub-indices are created which are to be estimated for the social protection programs spread over six major life cycle phases across three domain areas on the basis of three dimensions with the help of appropriate indicators. The calculation of MSPI is six steps process. The stepwise details are given below:

Step1: - At the first step, the social protection programs are mapped to respective matrix based on the targeted life cycle phase and addressed domain. Such matrix comprises of six life cycle phases and three domain area and is termed as 'LC-DO Matrix ', here LC and DO stands for Life cycle and Domain respectively. The diagram given below indicates, the process of mapping schemes on the LC-DO matrix, where row represents domain area and column represents life cycle phases.

Figure 7 LC-DO matrix

	LC PHASE 1	LC PHASE 2	LC PHASE 3	LC PHASE 4	LC PHASE 5	LC PHASE 6
DO 1						
DO 2						
DO 3						

Step2: - This step is very important as it involves framing appropriate indicators for estimating each dimension viz. Adequacy, Coverage and Efficacy of every program under each domain of respective life cycle phase. In MSPI, the dimension Adequacy, for the domain Education is to be gauged on the basis of number of years of elementary schooling covered under the program vis-à-vis the total years of schooling classified as elementary education. The elementary level is usually considered as minimum education everyone should get irrespective of capabilities and economic status and hence used for estimating the adequacy the social protection program is providing. The definition of elementary education may slightly vary across the jurisdictions and hence may be customised accordingly. The indicator framed for determining the adequacy of social protection program mapped under Health domain is proportion of per hospitalisation medical expenses covered under program vis-à-vis average per hospitalisation expenses for the respective age group. Here, the yardstick used is average per hospitalisation expenses because usually government run primary and secondary healthcare centres provides basic health care services and even at private hospitals availing such services

is not a costly affair. The real problem is with tertiary health care services for which government may have limited infrastructure in place and treatment at private hospital is also very expensive. This causes heavy out-of-pocket expenses and intensifies the financial burden. Therefore, the level of hospitalisation expenses covered by social protection programs is an important barometer to gauge adequacy of health-oriented programs.

The programs under Livelihood domain provides for income support to the identified section of society. The level of income support that can be considered as adequate is always debatable, however, in case of MSPI, the adequacy of income support provided by a program is estimated by comparing it to the average consumption expenditure of the given population. The program would be 100% adequate if it provides fully for average consumption expenditure.

Under the coverage dimension the objective is to determine the depth of the program in terms of beneficiaries and the depth is measured by dividing the beneficiaries of the program by the eligible population. Thus, the indicator used in MSPI for Coverage dimension across all domain is beneficiaries of the program as a proportion of the eligible population.

For Efficacy determination, it is important to get insight regarding the ability of program to deliver the expected outcomes. There are various methods to estimate the efficacy such as cost-benefit analysis, degree of realised outcomes, impact analysis etc. However, in MSPI in efficacy is determined on the basis of fund utilisation. The rationale of this approach lies in the fact that this approach is simpler, quantifiable and easily understandable. The central assumption of this indicator is that the probability of getting desired outcome increases on utilising maximum allotted funds. The indicator used is funds actually utilized for beneficiaries vis-à-vis the funds released by Govt. under the programs. The list of broader indicators framed for MSPI are tabularised in the table given below:

Table Broader Indicators for MSP

Dimension	Domain	Indicators
Adequacy	Do_1: Education	No. of years of elementary schooling covered under program vis-a-vis the total years of elementary schooling
	Do_2: Health	proportion of per hospitalisation medical expenses covered under program vis-à-vis avg. per hospitalisation expenses for the respective age grp
	Do_3: Livelihood	Income support provided by program to the avg. Consumption Expenditure
Coverage	Do_1, Do_2 & Do_3	beneficiaries of the program as proportion of eligible population
Efficacy	Do_1, Do_2 & Do_3	fund actually utilized for beneficiaries Vis-à-vis fund release by Govt. under the programs.

These are indicative set of indicators and if required, can be modified in accordance with social protection framework such that it shall correctly represent the respective domain and dimension.

Step 3: At step 3, the value of each indicator is computed using the data collected from primary or secondary sources for respective indicators. As is evident from the table of indicators given at step 2 above, the defined set of indicators are in the form of ratios. Therefore, for the purpose of simplification, the computed values are to be converted into percentages.

Step 4: The values of indicator computed at step 3 may vary with a wider range. In such cases, evaluating the programs becomes cumbersome and may possibly provide misleading results. Especially when the value of the given indicator exceeds 100% , it, is not adding further to the core objective of the social protection program. Thus, it is important to limit the score to be assigned to the value equal or above100%. Therefore, while assigning scores to indicators, each indicator is winsorized at 100% and transformed at a 0-10 scale. This is to be done using the following equation:

If $Xi \geq 100\%$ then $Xt = 10$ and if $Xi \leq 100\%$ then $Xt = Xi/10$

where, Xi is calculated value of indicator and Xt is transformed value of indicator on point scale of 0-10

Step 5:- The next step involves the aggregation of the scores estimated for each dimensions as described in the previous step. The arithmetic aggregation implies the equal weight approach. The most influential and widely accepted well-being index i.e. Human Development index has continued using equal weight approach inspite of certain limitations that have attracted criticism and hence for computing MSPI a similar approach is being adopted.
Further, (Mayer & Jencks 1989, p. 96) defended equal weighting stating that they didn't have reliable basis for weighing ten hardships according to their importance. More than such agnostic rationale; in case of MSPI, it is strongly believed that all three dimensions are equally important and thus knowingly a prudent call has been taken to use equal weighing while doing aggregation at dimension level for every program at each stage of life.
Therefore, if we consider $X_{l,do}$ represents score of program at given life cycle phase (l) under respective domain (do) and $X_{a,l,do}$; $X_{c,l,do}$; $X_{e,l,do}$ are values computed for adequacy, coverage and efficacy indicators for each program, then the score for each program as mapped on the LCP-DO matrix is given by the following equation:

$$X_{l,do} = X_{a,l,do} + X_{c,l,do} + X_{e,l,do}$$

Understanding the fact that there may be more than one program under the same life cycle representing the same domain, it is vital to aggregate all such programs at the dimension level so that comprehensive assessment can be done. In such case the above equation will become:

$$X_{l,do} = (X_{\mathbf{a}},l^{1},do^{1} + X_{\mathbf{a}},l^{2},do^{2} + \ldots.+X_{\mathbf{a}},l^{n}do^{n}) +(X_{\mathbf{c}},l^{1},do^{1} \cap X_{\mathbf{c}},l^{2},do^{2} \cap \ldots. \cap X_{\mathbf{c}},l^{n}do^{n})+(\sum X_{\mathbf{e}},l^{n},do^{n}) / n$$

Step 6:- While discussing the geometric mean approach used in HDI post 2010, S. Anand (2018, LSE III working paper) argued that *additively separable in its component indicators; hence the contribution of each component can be separately identified and quantified as a percentage of the overall index.*

The score calculated at previous step are arithmetically aggregated to compute the value of each sub-index as indicated below:

$$YSPI = \sum_{l}\sum_{d} X_{l,d}$$

$$ASPI = \sum_{l}\sum_{d} X_{l,d}$$

$$ESPI = \sum_{l}\sum_{d} X_{l,d}$$

Note: Here 'd' is used to represent the domain area instead of 'do'.

YSPI score is the sum of values of programs calculated at step 5 under l_1 and l_2 representing respective domain d_1 and d_2.

ASPI score is the sum of values of programs calculated at step 5 under l_3 and l_4 representing respective domain d_3 and d_2.

ESPI score is the sum of values of programs calculated at step 5 under l_5 and l_6 representing respective domain d_3 and d_2.

Step 7: The final score of the MSPI is to be estimated by adding the weighted sub-indices. The weightages W_1 ,W_2 and W_3 are given on the basis of the proportion of population in the respective age-group who are identified as people needing some sort of social protection.

$$MSPI = \{W_1 * YSPI + W_2 * ASPI + W_3 * ESPI\}$$

On performing these seven steps, the final score of the MSPI can be estimated. It is evident from the various steps that construction of MSPI proposed herein is simple, logical and replicable irrespective of jurisdiction with some customisation. Thus to confirm this , it is important to see how MSPI works in the real environment. For this purpose, it is important to guage its practical applicability. The next section provides insights on this aspect.

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4. Application of MSPI: Indian States (Selected programs)

Many concepts look perfect theoretically however, they fail the feasibility test. Therefore, whenever a new concept is being introduced, it is imperative to comprehend the practical applicability of such concept. Thus, in this section an attempt has been made to understand whether the newly introduced index i.e. MSPI can practically be implemented. For this purpose, the MSPI score has been estimated for Indian States.

India being a welfare state runs many social protection programs for its citizen. Some programs are jointly sponsored and administered by central and state government and some of them are separately taken care of by the central government or respective state governments . These programs comprise of social insurance schemes, social assistance schemes and active labour market programs targeting different age groups and domain area of life. However, keeping in view the limited scope of this study i.e. only to assess the practical applicability of the newly introduced MSPI, five major social protection programs covering different phases of life with considerable period of operationalisation are considered for estimating MSPI score for each state. The brief details about the schemes under study are as under:

Box 1: Flagship social protection schemes in India considered for this study

• **Integrated Child Development Services Scheme (ICDS) :**
One of the world's largest and unique programmes for early childhood care and development, The Scheme offers Supplementary Nutrition, Pre-school non-formal education etc.

• **Mid-day Meal Scheme (MDM):**
The mid-day meal programme is a multi-faceted programme of the Government of India that, seeks to address issues of food security, lack of nutrition and access to education on a nationwide scale. Under the scheme, children will receive food n nutrition if they study in Primary and Upper Primary Classes.

• **Mahatma Gandhi National Rural Employment Guarantee Act:**
Mandate of the MGNREGA is to provide at least 100 days of guaranteed wage employment in a financial year to every rural household whose adult members volunteer to do unskilled manual work. An adult residing in rural areas is entitled to apply for MGNREGA job card basis which they can demand work from the government under the MGNREGA scheme.

• **Pradhan Mantri Jan Arogya Yojana (PMJAY-AB):**
Launched in September 2018, provide cashless and paperless access to services for the beneficiary at the point of service of up to 5 lakh rupees per family per year for secondary and tertiary care hospitalization. Socio-economic census 2011 is used to identify the eligible benefits.

• **Indira Gandhi National Old Age Pension Scheme (IGNOAPS) :**
Under this scheme, financial Assistance is provided to old aged persons of 60 years age and above, living below poverty line (BPL) wherein the monthly pension provided to persons aged between 60 to 79 years is Rs. 200 and for persons aged 80 years and above the monthly pension provided is Rs. 500. Few States are also contributing additionally.

Now, we will attempt to compute statewise MSPI score using each step as discussed in the section "Construction of an Index", to assess the status of each of these schemes in various states in terms of Adequacy, Coverage and Efficacy.

Step 1: First, these five social protection programs are to be mapped to respective matrix based on the targeted life cycle phase and addressed domain.

It is noteworthy to mention that the same program may fall under different life cycle phases e.g. PMJAY, it is the flagship health protection program providing primary and secondary health services through primary and secondary health care centres and most importantly providing the health insurance of Rs. 5 lakhs for tertiary treatment (which is real cause of out-of-pocket expenditure) for the entire family right from newly born to old aged. Therefore, PMJAY is mapped under domain 2 i.e. health for each life cycle phase. Similarly, other programs are also mapped on the basis of targeted age group and domain area as given in the matrix below:

Figure 8: LC-DO Matrix

	LC PHASE 1	**LC PHASE 2**	**LC PHASE 3**	**LC PHASE 4**	**LC PHASE 5**	**LC PHASE 6**
DO 1	ICDS	MDM				
DO 2	PMJAY	PMJAY	PMJAY	PMJAY	PMJAY	PMJAY
DO 3			MGNREGA	MGNREGA	IGNOPS	IGNOPS

Step2: - As this step demands, appropriate indicators for estimating each dimension viz. Adequacy, Coverage and Efficacy of every program under each domain of respective life cycle phase are framed. Here, the ICDS and MDM are programs that are intended for the overall development of the child by ensuring basic education and food supplements. The purpose of including food supplements may prima-facie appear to provide nutritional value but it is also to motivate parents especially poor ones to send their children to schools so that every child shall get basic primary and secondary education. For these programs, 'adequacy' indicators are considered as proportion of minimum prescribed nutritional value delivered by programs, though it is understood that the given indicator may not directly assess the adequacy of education. However, it is important to understand that adequate food supplement is the major reason why poor parents get convinced to send their wards to school instead of sending them to work on farms and also these programs by their design provide maximum education that a child can take in the respective age group. Therefore, it is prudent to assess the adequacy of these programs on the basis of nutritional supplements offered by them.

For determining the adequacy of PMJAY, 'level of hospitalisation expenses covered under the program' is considered as an indicator. To determine this, the hospitalisation expenses offered by the program is to be assessed against the actual hospitalisation expenses. This shall provide an insight into whether the benefits offered by the program are adequate or not.

In case of programs intended to support livelihood like MGNREGA and IGNOPS, the adequacy is gauged on the basis of level of consumption expenditure covered by these programs.

For evaluating the 'Coverage' dimension, it is important to identify the right set of people who are in need of support of such program to survive or to prevent themselves from falling into the 'poverty trap'. For identifying the realistic eligible group, the bottom two quintile approach has been preferred instead of strictly going by 'poverty line' definition. The bottom two quintile as given in the NFHS survey 2019-21 are used to deduce the eligible population using the age-group wise population distribution. In case of demand-based programs like MGNREGA, the coverage is determined on the basis of extent of demand that is actually met.

Further, as discussed earlier, efficacy is gauged on the basis of percentage of fund utilised for implementing the programs. There are other ways for estimating the efficacy, however due to data constraints, the fund utilisation of respective scheme vis-à-vis fund allotted for the scheme is used as an indicator for the purpose of this study.

The domain-wise, life cycle stage wise list of indicators for respective sub-index for programs selected for this study is presented below:

Table 2 : list of indicators for selected social protection programs

Sub index SI	Life cycle Phase	Domain	Program	Dimension	Indicators
YSPI	Early Childhood	Education cum food supplements	**ICDS**	Adequacy	Proportion of minimum prescribed nutritional value delivered by program
				Coverage	No. of beneficiaries in age grp.(0-6) in 2 quintile / population in age grp.(0-6) in last two quintile
				Efficacy	funds actually utilized for beneficiaries / funds released by Govt. under the programs
		Health	**PMJAY**	Adequacy	level of hospitalisation expenses covered under the program
				Coverage	No. of beneficiaries in age grp.(0-6) in 2 quintile / population in age grp.(0-6) in last two quintile
				Efficacy	funds actually utilized for beneficiaries / funds released by Govt. under the programs
	Childhood	Education cum food supplements	**MDM**	Adequacy	Proportion of minimum prescribed nutritional value delivered by program
				Coverage	No. of beneficiaries in age grp.(7-14) in 2 quintile / population in age grp.(0-6) in last 2 quintile
				Efficacy	funds actually utilized for beneficiaries / funds released by Govt. under the programs

Sub index SI	Life cycle Phase	Domain	Program	Dimension	Indicators
		Health	**PMJAY**	Adequacy	level of hospitalisation expenses covered under the program
				Coverage	no of beneficiaries in age grp.(7-14) in 2 quintile / population in age grp.(0-6) in last 2 quintile
				Efficacy	funds actually utilized for beneficiaries / funds released by Govt. under the programs

SI	LC Phase	Domain	program	Dimensions	Indicators
ASPI	Young Adult	livelihood	**MGNREGA**	Adequacy	Ratio of Income support provided by program to the avg. Consumption Expenditure for age grp(15-39)
				Coverage	Actual beneficiaries as a % of population seeking benefit in the age group (15-39)
				Efficacy	funds actually utilized for beneficiaries / funds released by Govt. under the programs
		Health	**PMJAY**	Adequacy	hospitalisation medical expenses covered under program/actual hospitalisation exp. for age grp(15-39)
				Coverage	no of beneficiaries in age grp.(15-39) in last 2 quintile / population in age grp.(15-39) in last two quintile
				Efficacy	funds actually utilized for beneficiaries / funds released by Govt. under the programs
	Adult	livelihood	**MGNREGA**	Adequecy	Ratio of Income support provided by program to the avg. Consumption Expenditure for age grp(40-60)
				Coverage	Actual beneficiaries as a % of population seeking benefit in the age group (40-60)
				Efficacy	% of funds actually utilized for beneficiaries / funds released by Govt. under the programs
		Health	**PMJAY**	Adequecy	hospitalisation medical expenses covered under program/actual hospitalisation exp. for age grp(40-60)
				Coverage	no of beneficiaries in age grp. (40-60) in 2 quintile / population in age grp. (40-60) in last two quintile
				Efficacy	funds actually utilized for beneficiaries / funds released by Govt. under the programs

SI	LC Phase	Domain	SP program	Dimensions	Indicators
ESPI	Old	livelihood	**IGNOPS**	Adequacy	level of Monthly Per Capita Consumption Expenditure covered by Pension programs
				Coverage	no of beneficiaries in age grp.(60-79) in 2 quintile / population in age grp.(60-79) in last two quintile
				Efficacy	funds actually utilized for beneficiaries / **funds** released by Govt. under the programs
		Health	**PMJAY**	Adequacy	level of hospitalisation expenses covered under the program
				Coverage	no of beneficiaries in age grp.(60-79) in 2 quintile / population in age grp.(60-79) in last two quintile
				Efficacy	funds actually utilized for beneficiaries / **funds** released by Govt. under the programs
	Very Old	livelihood	**IGNOPS**	Adequacy	level of Monthly Per Capita Consumption Expenditure covered by Pension programs
				Coverage	no of beneficiaries in age grp.(60-79) in 2 quintile / population in age grp.(60-79) in last two quintile
				Efficacy	funds actually utilized for beneficiaries / **funds** released by Govt. under the programs
		Health	**PMJAY**	Adequacy	level of hospitalisation expenses covered under the program
				Coverage	no of beneficiaries in age grp.(60-79) in 2 quintile / population in age grp.(60-79) in last two quintile
				Efficacy	funds actually utilized for beneficiaries / **funds** released by Govt. under the programs

Step 3: At step 3, the value of each indicator is computed using the data collected from primary or secondary sources for respective indicators**.** The data sources such as censuses, household surveys and administrative records are used. Here, for computing value of listed indicators, secondary data such as annual report of various ministries, reports of MOSPI, Niti Ayog on SDG developments, Census report, RBI reports etc. has been collected, processed and used. Since the last official census data is available for the year 2011 which is a decade old, to make the index more relevant in today's context the population projected data for 2021 estimated by committee on population projections, is used. For some indicators, data collected by government dept./agencies by conducting primary survey are also used. e.g. National Family Health Survey (NFHS-5), 2019-21, NSS KI (75): Key indicators of social consumption in India, NABARD All India Rural Financial Inclusion Survey" (NAFIS) 2016-17. Information and data have also been collected through Replies of Parliamentary Questions and RTI's. Program details and progress release by respective administrative ministries for various

schemes through press releases, website publications, working papers have also been referred. The data for the year FY 2019-20 pertaining to the respective social protection scheme is used for assessment.

The data thus collected is used for computing the value of each indicator using the data collected. Since the defined indicators are in form of ratios, for the purpose of simplification the computed values are converted into percentages. The values of indicators computed at this step is presented in appendix no.

Step 4 : Mathematically, indicator(s) may have value ranging from 0% to any value which can also exceed 100% mark. However, practically if the indicator(s) have 100% or more value, it indicates that the program provides adequate benefit, full coverage and maximum efficacy. Thus, any social protection program is intended to score 100% for respective indicators so that it can be a successful program. It is important to mention that when the value of a given indicator exceeds 100% , it, is not adding further to the core objective of the social protection program. Also, it may exert pressure on limited resources. Thus, it is important to limit the score to be assigned a value equal or above100%. Therefore, while assigning score to indicators, each indicator is winsorize at 100% and transformed into 0-10 scale. This is to be done using the equation: If $Xi \geq 100\%$ then $Xt = 10$ and if $Xi \leq 100\%$ then $Xt = Xi/10$; where, Xi is calculated value of indicator and Xt is transformed value of indicator on point scale of 0-10. computed for different states at this step is presented in appendix.

Step 5 : Aggregation of the scores estimated for each dimensions as described in previous step. This shall give the score for each program as mapped on the LCP-DO matrix. The values of indicators for different states as presented in the table below:

Table 3: Aggregated score at each life cycle phase

State	Early Childhood phase for d_1: (y_1d_1)	Early Childhood phase for d_2: (y_1d_2)	Childhood phase for d_1: (y_2d_1)	Childhood phase for d_2: (y_2d_2)	Young Adult phase for d_2: (a_1d_2)	Young Adult phase for d_3: (a_1d_3)	Adult phase for d_2 (a_2d_2)	Adult phase for d_3 (a_2d_3)	Old phase for d_2 (e_1d_2)	Old phase for d_3: (e_1d_3)	Very Old phase for d_2 (e_2d_2)	Very Old phase for d_3: (e_2d_3)
AP	26.2	22.0	27.1	27.9	27.9	13.8	27.9	21.5	27.9	15.7	27.9	16.9
AS	30.0	17.1	30.0	18.5	23.2	20.9	22.8	21.8	26.2	9.8	26.2	18.8
BH	23.1	19.4	26.1	20.9	28.2	22.2	29.0	18.5	29.0	15.5	29.0	24.1
CH	27.1	20.8	28.6	24.3	30.0	18.7	30.0	21.6	30.0	17.4	30.0	21.9
GJ	25.0	19.4	26.4	24.6	28.2	23.0	28.2	20.8	28.2	17.0	28.2	16.6
HR	18.9	20.2	28.3	21.0	23.3	20.8	23.3	20.9	24.3	19.5	23.3	22.9
HP	26.6	19.1	29.9	19.6	21.2	21.5	20.7	25.1	21.0	14.6	20.3	23.4
J&K	24.9	19.4	28.3	19.7	20.5	19.3	20.5	22.0	21.0	11.2	20.6	13.4
JH	22.4	20.8	26.3	23.8	30.0	21.1	30.0	20.6	30.0	21.8	30.0	22.4
KN	27.2	17.9	29.2	25.2	25.2	21.1	25.2	22.2	25.2	16.4	25.2	24.9
KL	23.7	26.6	26.8	26.6	26.6	13.5	26.6	21.5	26.6	17.3	26.6	19.4

State	Early Childhood phase for d_1: (y_1d_1)	Early Childhood phase for d_2: (y_1d_2)	Child hood phase for d_1: (y_2d_1)	Child hood phase for d_2: (y_2d_2)	Young Adult phase for d_2: (a_1d_2)	Young Adult phase for d_3: (a_1d_3)	Adult phase for d_2 (a_2d_2)	Adult phase for d_3 (a_2d_3)	Old phase for d_2 (e_1d_2)	Old phase for d_3: (e_1d_3)	Very Old phase for d_2 (e_2d_2)	Very Old phase for d_3: (e_2d_3)
MP	26.2	19.0	27.1	23.3	27.8	20.6	27.8	22.2	27.8	11.6	27.8	14.7
MH	26.0	18.4	25.7	21.9	27.6	22.4	27.6	21.5	27.6	19.7	27.6	23.3
OD	30.0	0.0	28.0	0.0	0.0	19.6	0.0	23.4	0.0	18.3	10.0	19.5
PN	22.0	20.0	27.9	20.0	28.0	17.0	28.0	21.0	28.0	12.1	28.0	18.0
RJ	22.3	18.8	26.0	22.0	28.0	18.3	28.0	23.1	28.0	13.7	28.0	25.0
TN	25.3	20.2	27.3	27.2	27.2	19.6	27.2	23.1	27.2	15.3	27.2	19.5
TL	24.3	0.0	25.5	0.0	10.0	14.2	0.0	21.9	0.0	14.6	0.0	19.8
UP	23.0	20.5	25.1	22.4	27.4	20.4	30.0	23.2	30.0	20.1	26.5	25.3
UK	26.4	22.2	30.0	30.0	30.0	20.5	27.7	21.1	29.1	17.4	30.0	16.1
WB	25.4	0.0	29.1	0.0	0.0	17.6	0.0	22.6	0.0	21.1	0.0	26.9
NE	29.9	21.1	29.0	24.5	30.0	19.1	30.0	23.5	30.0	10.5	30.0	17.7
India	25.0	20.0	27.3	18.9	21.2	18.8	20.9	22.2	21.8	0.0	10.0	0.0

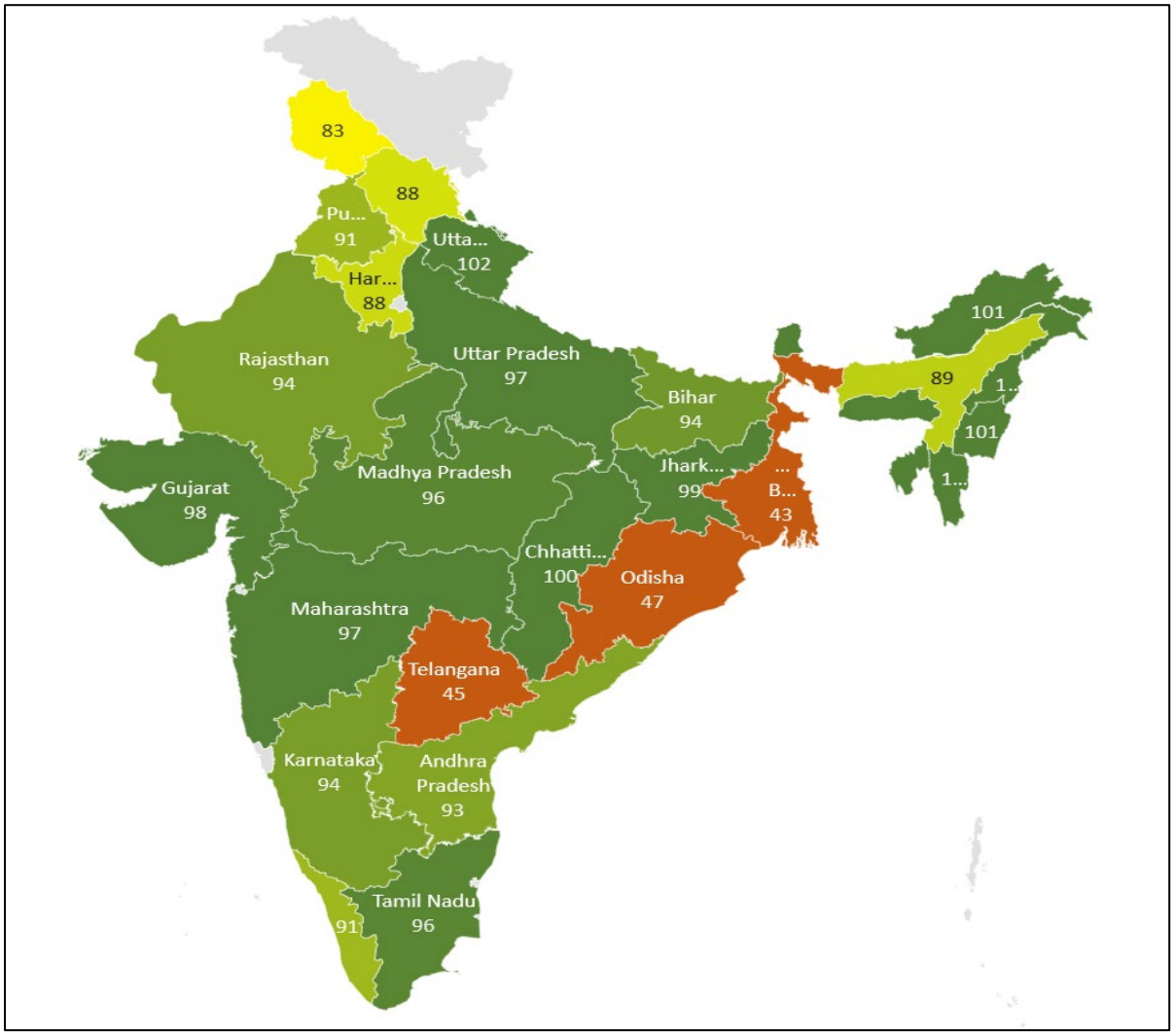
Step 6: The score calculated at previous step for each of the life cycle phases and then arithmetically aggregated to compute the value of each sub-index as indicated below:

Table 4: State wise Sub-indices score

States	YSPI Score	ASPI Score	ESPI score
AP	103.2	91.1	87.2
AS	95.6	88.7	72
BH	89.5	97.9	89
CH	100.8	100.3	94.8
GJ	95.4	100.2	90.4
HR	88.4	88.3	86.6
HP	95.2	88.5	70.5
J&K	92.3	82.3	64
JH	93.3	101.7	103.6
KN	99.5	93.7	83.2
KL	103.7	88.2	87.8
MP	95.6	98.4	78.8
MH	92	99.1	94.6
OD	58	43	46.6
PN	89.9	94	80.2
RJ	89.1	97.4	83.4
TN	100	97.1	85
TL	49.8	46.1	29.2
UK	111.3	101	90.4
UP	91	99.3	100.2
WB	54.5	40.2	42.2
NE except Assam	104.5	102.6	81
India	91.2	83.1	31.8

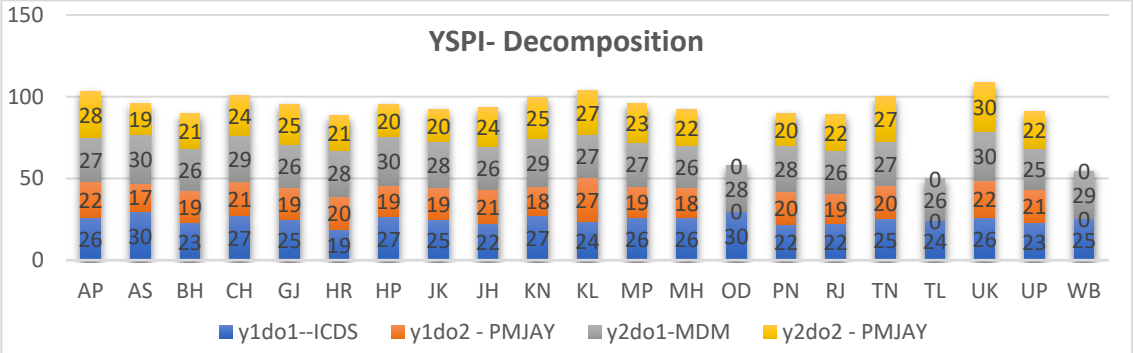
Step 7 : The final score of the MSPI is to be estimated by adding the weighted sub-indices. The weightages W_1, W_2 and W_3 are given on the basis of the proportion of population in the respective age-group.

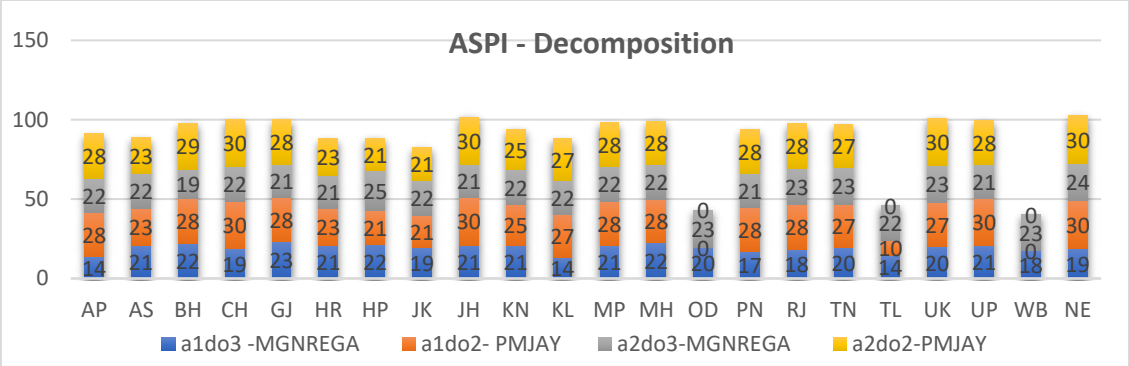
STATE	AP	AN	AS	BH	CH	GJ	HR
MSPI	93	101	89	94	100	98	88
STATE	HP	J&K	JH	KN	KL	MP	MH
MSPI	88	83	99	94	91	96	97
STATE	MN	MG	MZ	NG	OD	PN	RJ
MSPI	101	101	101	101	47	91	94
STATE	SK	TN	TL	TR	UP	UK	WB
MPSI	101	96	45	101	97	102	43

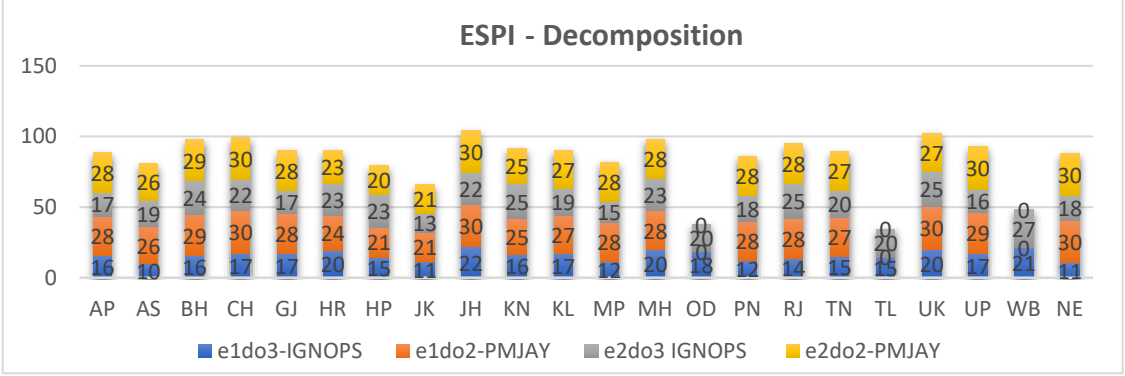


Box 2: Insight of MSPI score: Analysis at different Life cycle phases & at domain level

MSPI provides for in-depth analysis for different life cycle stages. The 'additive separable' characteristic of MSPI, allows its decomposition into sub-indices and sub-indices into life phases and further into schemes. Such decomposition helps in identifying and analysing the factors which are contributing to overall score of an Index and the factors which are not. In the given study of assessing practical applicability of MSPI, the final scores for each state for all sub-indices have been disaggregated as illustrated using the bar charts below. On analysing these results, it can be inferred that the reason for low scores for the states of West Bengal (WB), Odisha (OD) and Telangana (TL) are their 'zero' score under the domain 2 i.e. health domain. Out of 5 schemes selected herein PMJAY represents health domain which is not implemented in WB and OD and in TL it has been recently implemented. Therefore for the FY 2019-20, y2do2, a2do2, e2do2 are zero for these 3 states.

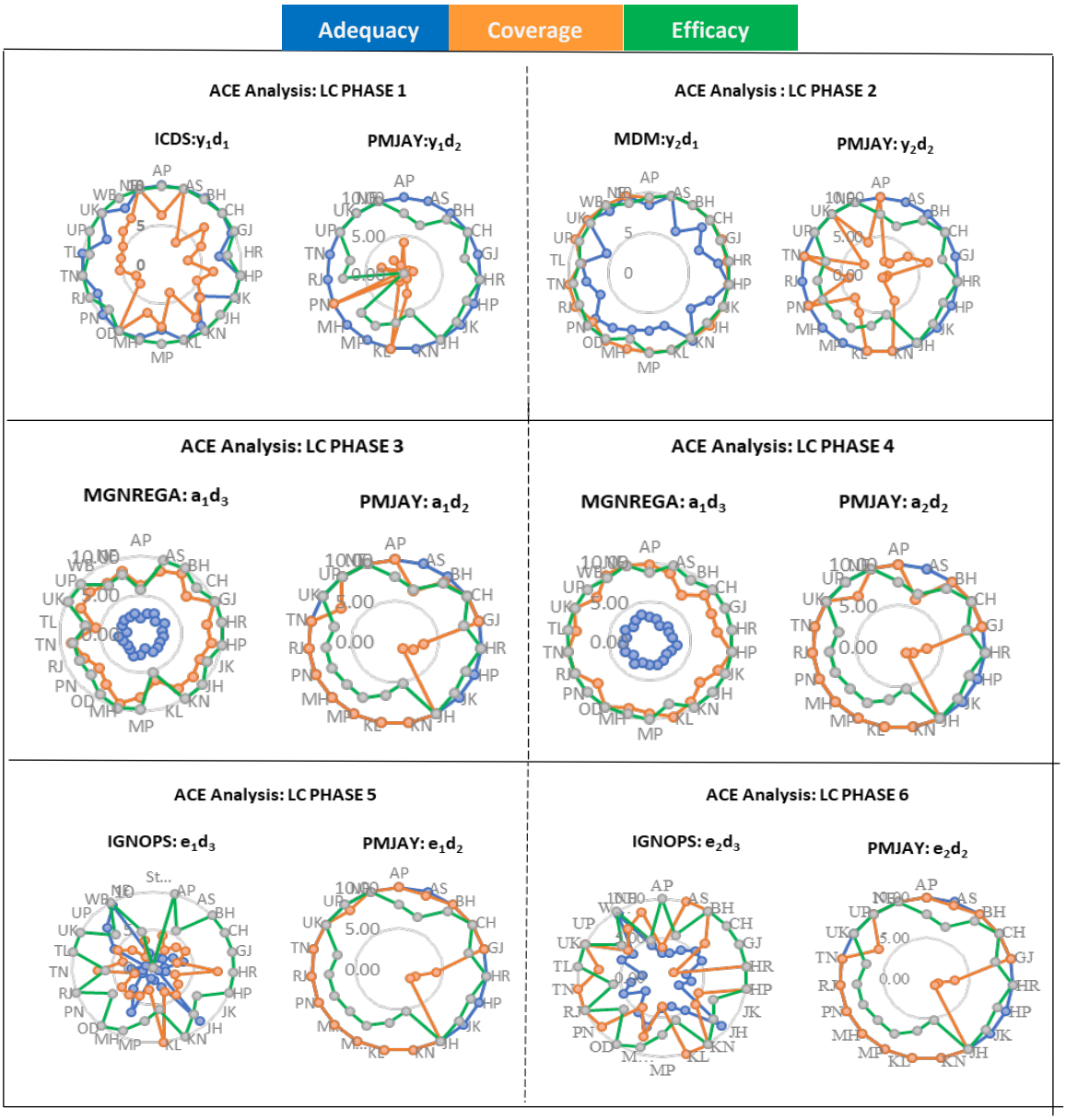






Box 3: Insight of MSPI score: Dimensional Dissection of schemes.

'Disaggregation' property enables MSPI to provide insights about the nitty-gritties at dimension level. MSPI throws light on whether the scheme is offering adequate level of benefits or not, whether all of the intended population is covered under the scheme or not and whether the scheme is efficiently managed or not. In this study, the dimensional dissection of selected 5 schemes at various life cycle phases reveals adequacy and coverage needs to be improved for all the schemes by most of the states whereas efficacy for PMJAY and IGNOPS require improvement. This has been represented using the graphs below where blue colour indicates adequacy, yellow colour coverage and green colour efficacy of schemes.:



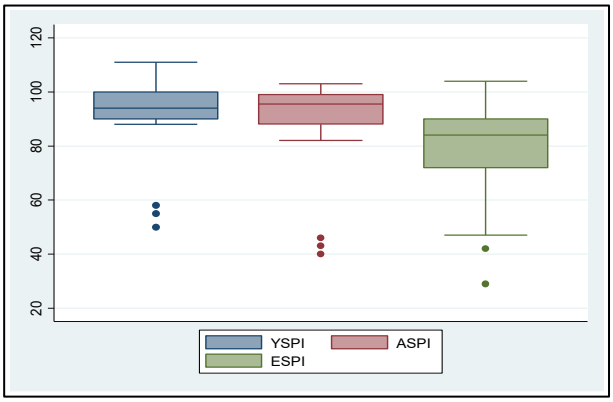
Findings and Inferences:

Five flagship social protection programs of central government running across India are considered to compute MSPI for major Indian states. The results shows that there is wide variation among the states with scores ranging from 102- to 43. The results and analysis thereof reveal that Uttarakhand scores highest number (102) among all states on evaluating performance on the basis of MSPI. Odisha, Telangana and West Bengal remain at the bottom among all state with MSPI score 47,45 and 43 respectively. Out of 5 selected schemes, one scheme i.e. PMJAY had not been implemented (by FY 2029-20) in the state of West Bengal, Telangana and Odisha which is dragging them down in the ranking table.
In addition to Uttarakhand North-Eastern states and state of Chhattisgarh have scored more than 100 on MSPI scale. MSPI scores for states such as Jharkhand, Gujarat, Maharashtra, Uttar Pradesh, Tamil Nadu, Madhya Pradesh, Bihar, Karnataka, Rajasthan, AndraPradesh, Punjab and Kerala lie in the interval of 91-99.

Table: Summary Statistics

	YSPI	ASPI	ESPI
Mean	90.5	88.1	79.1
Median	94.25	95.55	84.2
Range	61.5	62.4	74.4
Minimum	49.8	40.2	29.2
Maximum	111.3	102.6	103.6
Count	22	22	22

Fig: Box graph for sub-indices



The analysis of sub-indices reveals that the Mean value of YSPI scores for all states is highest (90.5) followed by mean value of ASPI score (88). The mean value of ESPI score is lowest (79) among the 3 sub-indices. Further, the range of YSPI & ASPI scores for states is narrow whereas the score for ESPI has comparatively higher range (Box graph). This suggest that all states need to strengthen the social protection system for elderly population.
Providing adequate livelihood during adulthood and old age has been the challenge for all the states. Except MDM, for all the other schemes Coverage needs to be improved by all states.

Likewise, the analysis can be done for each program, each domain and each state. As demonstrated in this chapter, MSPI score has been successfully computed for states in India. This shows that MSPI is a practically implementable solution to assess the social protection framework.

5. Robustness check:

The MSPI score for Indian states exhibited herein are computed by assigning the weights equivalent to the proportion of population in respective age-group at the sub-indices level. It is important to put forth that with the given methodology for constructing MSPI, it is possible to assign different weights even at the dimension level. It means the while estimating the score for each program, the dimensions viz. adequacy, coverage and efficacy may be assigned some weights and then accordingly they may be aggregated. In short, MSPI allows assigning weights not only at sub-indices level but also at dimension level. Given these options of assigning weights, MSPI may be computed under following four scenarios:

S-1: Equal weighting at dimension level and sub-indices level
S-2: Equal weighting at dimension level and different weighing at sub-indices level
S-3: Differential weighting at dimension level as well as at sub-indices level
S-4: Differential weighting at dimension level and equal weighing at sub-indices level

Scenario S-1:

Under scenario S-1, equal weights have been assigned across three dimensions and three sub-indices for estimating the MSPI. Since, the dimensions and sub-indices are three in number, assigning equal weights implies multiplying each dimension and sub index by 33.33% before aggregation at respective levels.

Scenario S-2:

In scenario S-2, equal weights i.e. 33.33% have been assigned across three dimensions and different weights at sub-indices level are assigned. Here, different weights are taken as the proportion of population to the corresponding sub-index for respective states. Thus, weights at sub-index level varies from state to state depending upon the proportion of young, adult and elderly population in the states.

Scenario S-3:

In case of scenario S-3, different weights are assigned at dimension level as well as at sub-indices level. For deciding weights to assign at dimensional level, the methodology of 'Melbourne Mercer Global Pension Index' is adopted wherein differential weighting is incorporated on the basis of level of importance. Similarly, for developing this scenario, differential weighing of dimensions is undertaken to reflect their level of importance. The dimensions 'Adequacy' and 'Coverage' are considered relatively more and equally important as compared to 'Efficacy'; therefore, to reflect the same in the weighing at dimensional level, 40% weightage has been assigned to 'Adequacy' and 'Coverage' individually and 20% weightage assigned to 'Efficacy'. Differential weighting at sub-index level is based on the proportion of population in different age-groups as stated in S-2 above.

Scenario S-4:

Under scenario S-4, differential weighting at dimension level and equal weighing at sub-indices level are assigned. As explained at S-3 above, here different weights are assigned to 'Adequacy', 'Coverage' and 'Efficacy' as 40%, 40% and 20%. At sub-indices level, equal weights i.e. 33.33% are assigned.

The MSPI computed under the four scenarios namely S-1, S-2, S-3 and S-4 are presented in the table below:

Table : State-wise MSPI score under different scenario

State	Different scenarios for computing MSPI			
	S-1	**S-2**	**S-3**	**S-4**
AP	31.6	31.4	31.1	31.0
AS	29.7	29.5	29.5	29.3
BH	31.7	31.7	30.5	30.5
CH	33.4	33.4	32.1	32.1
GJ	31.8	31.7	30.9	30.8
HR	29.6	29.6	27.7	27.7
HP	29.5	29.2	27.7	27.4
J&K	27.3	26.8	25.5	24.9
JH	33.3	33.2	32.3	32.2
KN	31.7	31.7	32.0	31.9
KL	31.5	31.3	32.1	32.0
MP	30.9	30.7	30.3	30.1
MH	32.2	32.1	31.8	31.8
OD	16.8	16.5	16.2	15.9
PN	30.1	30.0	30.7	30.6
RJ	31.3	31.2	30.5	30.4
TN	31.9	31.8	32.1	32.0
TL	14.9	14.5	14.3	13.7
UK	34.8	34.9	33.9	33.9
UP	31.4	31.4	30.2	30.3
WB	16.1	15.9	15.5	15.2
NE	33.1	32.8	32.5	32.3
India	26.3	22.9	25.3	22.3

To ascertain the robustness of the proposed MSPI and methodology suggested therefore, we need to examine and compare the MSPI score under different scenarios. If the MSPI scores change significantly with changing scenarios, it means the given structure of MSPI is not robust. On the other hand, insensitivity of MSPI to the above defined scenarios would establish the robustness. Therefore, in order to check and confirm the robustness, we may frame the hypothesis as given below:

Hypothesis: *There is no significant difference in MSPI score computed under scenario S-1, S-2, S-3 and S-4.*

i.e. H_0: $S\text{-}1_{(scores)} = S\text{-}2_{(scores)} = S\text{-}3_{(scores)} = S\text{-}4_{(scores)}$

To test the hypothesis above, ANOVA test is used. On applying the given test, following results are obtained:

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
S-1	23	670.8324	29.1666	30.9926
S-2	23	664.1936	28.8780	33.3388
S-3	23	654.6827	28.4645	31.5738
S-4	23	648.1618	28.1809	34.1393

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	13.13952	3	4.3798	0.1347	0.9391	2.7082
Within Groups	2860.979	88	32.5111			
Total	2874.119	91				

The above results indicate that F crit (2.7082) is greater than the Fcal (0.1347). Therefore, the null hypothesis is accepted. The substantive conclusion is that there is no significant difference in terms of MSPI scores when computed under different scenarios S-1, S-2, S-3 and S-4. In other words, MSPI scores do not vary as a function of weights assigned either at sub-indices level or at dimension level.

To summarise the above discussion, it may be inferred that the Multidimensional Social Protection Index qualifies the robustness test.

6. Discussion and Conclusion:

A multidimensional social protection index (MSPI) proposed in this paper will contribute to the knowledge towards understanding social protection framework across geographies. The life cycle approach adopted in developing MSPI is very instrumental in understanding the requirement and assessing the gaps thereof at different stages of life. This is an important aspect of MSPI, as policy makers keep phases of life cycle at the centre while designing any kind of social protection program. The decomposition of MSPI into sub-indices representing the three major life cycle phases and their further decomposition into six life stages, provides meaningful insights to ascertain the status of social protection framework at different life cycle stages. Such information is useful from the point of view of directing and allocating the resources towards the programs pertaining to the life cycle stage where they are needed the most. For instance, if we consider the sub-indices scores (calculated at step 6 under section 4) for two neighbouring states Uttar Pradesh (UP) and Uttarakhand (UK), it is found that the YSPI $_{(score)}$ of UP is 91 whereas it is 111.3 for UK, further ESPI $_{(score)}$ for UP and UK are 100.2 and 90.4 respectively. ASPI $_{(score)}$ for both states are nearly same in the range of 100 (±1). These results suggest that in case of UP, Government agencies need to focus more on programs targeted towards Young Population whereas in case of UK social protection programs for Elderly population have to be strengthened.

By its structure, MSPI provides flexibility to deepen the study even at regional or district level. It means MSPI can be applied at State-level and the status and progress of each district/region in the state can be ascertained.

Another important feature of MSPI is disaggregation at domain level. Such disaggregation is critical in reviewing and analysing the different areas of social protection i.e. health, education, and livelihood. The Box- 1 exhibits the domain level analysis; low scores under health dimension in case of Telangana, West Bengal and Odisha clearly indicate the gaps in the area of health protection framework in these states. This is endorsed by the fact that PMJAY- a flagship health insurance scheme was not implemented in these states by March 2020. It is to reiterate that the given study is limited to five flagship social protection programs (Box-1). Hence, provision of domain level analysis makes MSPI an assessment tool with a holistic approach which is vital in identifying the concern domain area, prioritising them and taking bolstering measures.

In addition to the above, MSPI also enables to conduct dimensional dissection, exhibited in Box-3. From the analysis demonstrated at Box-3, it is evident that the programs namely ICDS and IGNOPS have less coverage whereas MGNREGA and IGNOPS are lagging behind in terms of adequacy. This suggests that policy makers of respective states may redefine the counters for these programs to improve the coverage and adequacy. In short, dimensional dissection of MSPI helps in evaluating each social protection program with respect to adequacy, coverage and efficacy.

The successful application of MSPI for selected programs over different Indian states (as demonstrated step by step in section 4 of this paper) implies that the proposed index is not limited only to theoretical conceptualisation but it can also be implemented in the real world. Though in this study MSPI scores are computed for Indian states, this index practically can be implemented in any jurisdiction. The domain, dimensions and indicators laid down while constructing the index are replicable across various jurisdictions and hence can be utilised across the world as a standard mechanism for evaluating the social protection framework. However, the index also provides flexibility for customization according to the country specific dynamics.

Again, the MSPI would be instrumental in setting up the benchmarks and would help government agencies to compare the social protection programs against the best one in the respective categories.

Finally, the robustness check conducted on MSPI shows that the scores computed under different scenarios do not significantly differ statistically. This confirms the robustness of MSPI and its methodology.

To conclude, it is needless to mention that to address the issue of socio-economic inequalities across/within counties, creating a strong, robust and efficient Social Protection Framework is unarguably one of the best solution available with policymakers and to develop such a framework there is an urgent need of a standard quantifiable mechanism for assessment of prevailing social protection framework and after detailed deliberations in this paper, the proposed MSPI offers a solution. Use of life cycle approach, comprehensiveness in terms of covering various domains and dimensions, robustness and most importantly ease of implementation, makes MSPI an instrumental tool for ascertaining social protection framework. Therefore, the MSPI proposed in this paper may be very useful to provide new dimensions in the field of social protection.

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Abbreviations:

AP	Andhra Pradesh
ASPI	Adult Social Protection Index
AS	Assam
BH	Bihar
BPL	Below Poverty Line
CH	Chhattisgarh
ICDS	Integrated Child Development Scheme
IGNOPS	Indira Gandhi National Old-age Pension Scheme
DL	Delhi
ESPI	Elderly Social Protection Index
GJ	Gujarat
HR	Haryana
HP	Himachal Pradesh
J&K	Jammu & Kashmir
JH	Jharkhand
KN	Karnataka
KL	Kerala
MGNREGA	Mahatma Gandhi National Rural Employment Guarantee Act
MP	Madhya Pradesh
MN	Manipur
MH	Maharashtra
MDM	Mid-Day Meal program
MG	Meghalaya
MZ	Mizoram
MSPI	Multidimensional Social Protection Index
NG	Nagaland
OD	Odisha
PN	Punjab
PMJAY	Pradhan Mantri Jan Arogya Yojana
RJ	Rajasthan
SK	Sikkim
TN	Tamil Nadu
TL	Telangana
TR	Tripura
UK	Uttar Pradesh
UP	Uttarakhand
WB	West Bengal
NE	North-East
YSPI	Young Social Protection Index

Appendix 1 : Wealth quintile -NFHS latest wealth Index

Wealth quintile -NFHS latest wealth Index					
State	**Lowest**	**Second**	**Middle**	**Fourth**	**Highest**
Andaman & Nicobar Islands	8	15.2	25.6	33.3	18
Andhra Pradesh	5.2	19.2	31.2	28.9	15.6
Arunachal Pradesh	23.3	31.8	24.8	15.2	4.9
Assam	38.1	32	16.1	9.6	4.1
Bihar	42.8	26.1	15.4	10.3	5.4
Chandigarh	1.1	2.2	5.8	11.5	79.4
Chhattisgarh	29.9	24	18.6	15.8	11.7
Dadra, Nh, Daman & Diu	12.3	24.4	22.7	23.3	17.3
Delhi	0.2	2.6	9.2	20.3	67.7
Goa	0.5	2.7	9.8	25.7	61.3
Gujarat	12.2	16.4	19.3	24.7	27.4
Haryana	2	8.3	15.8	26.2	47.7
Himachal Pradesh	3.8	13.4	24.7	29.2	28.9
Jammu & Kashmir (Ut)	10.2	16.5	20.8	27.2	25.2
Jharkhand	45.9	21.8	14.3	10.6	7.5
Karnataka	7.3	18.2	28.4	27.2	19
Kerala	0.8	4.7	17.9	36.5	40.1
Ladakh	13.3	30.6	27	22.8	6.3
Lakshadweep	0.1	2	15	46.7	36.2
Madhya Pradesh	31.5	21.4	16.8	15.3	15.1
Maharashtra	8.6	15.3	22.1	26.1	27.9
Manipur	18.3	32.6	24.1	17.2	7.8
Meghalaya	31	34.9	20.2	9.7	4.2
Mizoram	6.6	13.2	25.2	30.2	24.8
Nagaland	27.6	28.6	21	15.4	7.4
Odisha	35.1	25.2	18.3	12.6	8.7
Puducherry	2.4	7.2	14.7	30	45.7
Punjab	1.1	5	11.4	21.9	60.6
Rajasthan	13.3	20.6	22.5	22	21.6
Sikkim	2.7	18.9	34.7	31	12.8
Tamil Nadu	4.8	15.2	26.4	29	24.6
Telangana	5.1	17.2	28.1	27.5	22.2
Tripura	31.6	33.1	22.3	10.6	2.5
Uttar Pradesh	23.9	23.6	18.3	16.4	17.8
Uttarakhand	5.9	17.6	20.6	22.3	33.6
West Bengal	32.7	26.1	19.3	14.2	7.7

Source: National Family and Health survey NFHS 2019-21

Appendix 2 : Estimated Eligible population in 2020 for offering Social Protection

State	2020 projected population by population projected report 2011-36 in '000	% of Last 2 quintile population as per NFHS 5	Estimated Eligible population in 2020 for offering Social Protection in '000
A&N Island	399	23.2	92.6
Andhra Pradesh	52,504	24.4	12811.0
Arunachal Pradesh	1,519	55.1	837.0
Assam	34,668	70.1	24302.3
Bihar	1,21,302	68.9	83577.1
Chandigarh	1,193	3.3	39.4
Chhattisgarh	29,109	53.9	15689.8
Dadra & Nh*	577	36.7	211.8
Gujarat	68,862	28.6	19694.5
Goa	1,549	3.2	49.6
Haryana	29,077	10.3	2994.9
Himachal Pradesh	7,347	17.2	1263.7
Jammu & Kashmir	13,305	26.7	3552.4
Jharkhand	37,937	67.7	25683.3
Kerala	35,307	5.5	1941.9
Karnataka	66,322	25.5	16912.1
Ladakh	295	43.9	129.5
Lakshadweep*	68	2.1	1.4
Manipur	3,134	50.9	1595.2
Meghalaya	3,256	65.9	2145.7
Maharashtra	1,23,295	23.9	29467.5
Mizoram	1,204	19.8	238.4
Madhya Pradesh	83,374	52.9	44104.8
Nagaland	2,171	56.2	1220.1
Odisha	45,350	60.3	27346.1
Puducherry	1,537	9.6	147.6
Punjab	30,099	6.1	1836.0
Rajasthan	78,273	33.9	26534.5
Sikkim	670	21.6	144.7
Telangana	37,473	22.3	8356.5
Tamil Nadu	76,049	20	15209.8
Tripura	4,032	64.7	2608.7
Uttarakhand	11,270	23.5	2648.5
Uttar Pradesh	2,27,943	47.5	108272.9
West Bengal	97,516	58.8	57339.4

Source: Authors estimation based on report of technical group on Population Projections and NFHS 2019-21

Appendix 3 : Age-group wise % distribution of projected population for year 2020

State	2020 age wise distribution of eligible population in '000					
	0-6yrs	**7-14yrs**	**15-39yrs**	**40-59yrs**	**60-79yrs**	**80+yrs**
Andhra Pradesh	1186	1440	5381	3216	1409	179
Assam	2926	3563	10547	5249	1823	194
Bihar	12938	15144	34267	14793	5934	501
Chhattisgarh	2055	2306	6668	3295	1239	126
Delhi	56	67	258	131	47	5
Gujarat	2289	2576	8331	4451	1812	236
Haryana	349	400	1318	632	261	36
Himachal Pradesh	114	146	523	315	143	23
Jammu & Kashmir	319	519	1606	771	295	43
Jharkhand	3406	4068	11070	4983	2003	154
Karnataka	1691	2046	7154	4076	1725	220
Kerala	179	217	711	515	284	37
Maharashtra	4149	4514	12376	5923	2240	265
Madhya Pradesh	4252	5319	18965	10453	4499	617
Odisha	2931	3550	11349	6372	2817	328
Punjab	167	205	795	437	200	31
Rajasthan	3635	4113	11463	5068	2017	239
Telangana	745	918	3318	2231	1019	125
Tamilnadu	1481	1789	6631	3635	1491	183
Uttarakhand	384	416	1157	477	193	21
Uttar Pradesh	11520	14140	48723	22304	10069	1516
West Bengal	5310	6789	24541	14220	5791	688
North-East (Except Assam	852	1166	3925	1856	667	86

Source: Authors estimation based on report of technical group on Population Projections and NFHS 2019

Appendix 4:Calculated dimension wise values of indicators for schemes under LC-Phase1

State	Adequacy ICDS	Coverage ICDS	Efficacy ICDS	Adequacy PMJAY (0-6yrs)	Coverage PMJAY (0-6yrs)	Efficacy PMJAY (0-6yrs)
Andhra Pradesh	10.0	6.3	9.9	10.0	4.1	7.9
Assam	10.0	10.0	10.0	10.0	0.4	6.7
Bihar	10.0	3.3	9.8	10.0	0.4	9.0
Chhattisgarh	10.0	7.1	10.0	10.0	0.8	10.0
Gujarat	9.6	5.4	10.0	10.0	1.2	8.2
Haryana	7.3	3.3	8.3	10.0	0.2	10.0
HimachalPradesh	10.0	6.6	10.0	10.0	0.2	8.9
Jammu & Kashmir	10.0	4.9	10.0	10.0	0.1	9.3
Jharkhand	6.2	6.4	9.8	10.0	0.8	10.0
Karnataka	9.2	8.0	10.0	10.0	2.7	5.2
Kerala	10.0	3.7	10.0	10.0	10.0	6.6
Madhya Pradesh	8.3	7.9	10.0	10.0	1.2	7.8
Maharashtra	9.7	6.3	10.0	10.0	0.8	7.6
Odisha	10.0	10.0	10.0	0.0	0.0	0.0
Punjab	9.7	3.6	8.7	10.0	10.0	0.0
Rajasthan	8.8	3.5	10.0	10.0	0.8	8.0
Tamil Nadu	10.0	5.3	10.0	10.0	3.0	7.2
Telangana	10.0	5.1	9.2	0.0	0.0	0.0
Uttar Pradesh	7.6	5.4	10.0	10.0	0.5	10.0
Uttarakhand	10.0	6.4	10.0	10.0	2.2	10.0
West Bengal	8.4	7.0	10.0	0.0	0.0	0.0
North-East	10.0	10.0	9.9	10.0	1.1	10.0

Source: Authors calculation

Appendix5:Calculated dimension wise values of indicators for schemes under LC-Phase2

States/UTs	Adequacy MDM	Coverage MDM	Efficacy MDM	Adequacy PM JAY (07-14yrs)	Coverage PM JAY (07-14yrs)	Efficacy PM JAY (07-14yrs)
Andhra Pradesh	8.4	9.3	9.4	10.00	10.00	7.90
Assam	10	10	10	10.00	1.80	6.70
Bihar	6.1	10	10	10.00	1.90	9.00
Chhattisgarh	8.6	10	10	10.00	4.30	10.00
Gujarat	6.8	9.9	9.7	10.00	6.40	8.20
Haryana	8.6	9.7	10	10.00	1.00	10.00
Himachal Pradesh	10	9.9	10	10.00	0.70	8.90
Jammu &Kashmir	8.3	10	10	10.00	0.40	9.30
Jharkhand	6.8	10	9.5	10.00	3.80	10.00
Karnataka	10	9.6	9.6	10.00	10.00	5.20
Kerala	6.8	10	10	10.00	10.00	6.60
Madhya Pradesh	7.2	9.9	10	10.00	5.50	7.80
Maharashtra	7.4	9.8	8.5	10.00	4.30	7.60
Odisha	8.2	10	9.8	0.00	0.00	0.00
Punjab	8.7	9.2	10	10.00	10.00	0.00
Rajasthan	6.6	10	9.4	10.00	4.00	8.00
Tamil Nadu	7.8	10	9.5	10.00	10.00	7.20
Telangana	8.4	8.5	8.6	0.00	0.00	0.00
Uttar Pradesh	5.7	10	9.4	10.00	2.40	10.00
Uttarakhand	10	10	9.5	10.00	10.00	10.00
West Bengal	9.1	10	10	0.00	0.00	0.00
NE except Assam	10	10	9	10.00	4.50	10.00

Source: Authors calculation

Appendix6: Estimated dimension wise values of indicators for schemes under LC-Phase 3

States/UTs	Adequacy MGNREGA 15-40 yrs	Coverage MGNREGA 15-40 yrs	Efficacy MGNREGA 15-40 yrs	Adequacy PMJAY 15-40 yrs	Coverage PMJAY 15-40 yrs	Efficacy PMJAY 15-40 yrs
Andhra Pradesh	2.00	6.20	5.60	10.00	10.00	7.90
Assam	2.70	8.40	9.80	10.00	6.50	6.70
Bihar	3.00	9.20	10.00	10.00	9.20	9.00
Chhattisgarh	2.40	7.30	9.00	10.00	10.00	10.00
Gujarat	3.20	9.80	10.00	10.00	10.00	8.20
Haryana	2.60	8.20	10.00	10.00	3.30	10.00
Himachal Pradesh	2.80	8.70	10.00	10.00	2.30	8.90
Jammu & Kashmir	2.60	7.90	8.80	10.00	1.20	9.30
Jharkhand	2.70	8.40	10.00	10.00	10.00	10.00
Karnataka	2.70	8.40	10.00	10.00	10.00	5.20
Kerala	2.00	6.30	5.20	10.00	10.00	6.60
Madhya Pradesh	2.70	8.20	9.70	10.00	10.00	7.80
Maharashtra	3.00	9.40	10.00	10.00	10.00	7.60
Odisha	2.50	7.80	9.30	0.00	0.00	0.00
Punjab	2.20	6.70	8.10	10.00	10.00	8.00
Rajasthan	2.40	7.60	8.30	10.00	10.00	8.00
Tamil Nadu	2.70	8.50	8.40	10.00	10.00	7.20
Telangana	1.80	5.60	6.80	10.00	0.00	0.00
Uttarakhand	2.60	8.00	9.80	10.00	7.40	10.00
Uttar Pradesh	2.60	8.20	9.70	10.00	10.00	10.00
West Bengal	2.50	7.70	7.40	0.00	0.00	0.00
NE except Assam	2.70	8.40	8.00	10.00	10.00	10.00

Source: Authors calculation

Appendix7: Estimated dimension wise values of indicators for schemes under LC-Phase 4

States/UTs	Adequacy MGNREGA (40-59yrs)	Coverage MGNREGA (40-59yrs)	Efficacy MGNREGA (40-59yrs)	Adequacy PMJAY (40-59yrs)	Coverage PMJAY (40-59yrs)	Efficacy PMJAY (40-59yrs)
Andhra Pradesh	3.10	9.70	8.70	10.00	10.00	7.90
Assam	2.90	8.90	10.00	10.00	6.10	6.70
Bihar	2.30	7.00	9.20	10.00	10.00	9.00
Chhattisgarh	2.80	8.80	10.00	10.00	10.00	10.00
Gujarat	2.60	8.20	10.00	10.00	10.00	8.20
Haryana	2.70	8.20	10.00	10.00	3.30	10.00
Himachal Pradesh	3.30	10.00	11.80	10.00	1.80	8.90
Jammu & Kashmir	2.90	9.10	10.00	10.00	1.20	9.30
Jharkhand	2.60	8.00	10.00	10.00	10.00	10.00
Karnataka	3.00	9.20	10.00	10.00	10.00	5.20
Kerala	3.20	10.00	8.30	10.00	10.00	6.60
Madhya Pradesh	3.00	9.20	10.00	10.00	10.00	7.80
Maharashtra	2.90	8.90	9.70	10.00	10.00	7.60
Odisha	3.40	10.00	10.00	0.00	0.00	0.00
Punjab	2.70	8.30	10.00	10.00	10.00	8.00
Rajasthan	3.20	9.90	10.00	10.00	10.00	8.00
Tamil Nadu	3.20	10.00	9.90	10.00	10.00	7.20
Telangana	2.90	9.00	10.00	0.00	0.00	0.00
Uttarakhand	3.20	10.00	10.00	10.00	10.00	10.00
Uttar Pradesh	2.70	8.40	10.00	10.00	7.70	10.00
West Bengal	3.20	9.90	9.50	0.00	0.00	0.00
NE except Assam	3.50	10.00	10.00	10.00	10.00	10.00

Source: Authors calculation

Appendix 8: Estimated dimension wise values of indicators for schemes under LC-Phase 5

State	Adequacy IGNOPS (60-79yrs)	Coverage IGNOPS (60-79yrs)	Efficacy IGNOPS (60-79yrs)	Adequacy PMJAY (60-79yrs)	Coverage PMJAY (60-79yrs)	Efficacy PMJAY (60-79yrs)
Andhra Pradesh	1.30	4.40	10.00	10.00	10.00	7.90
Assam	1.50	2.70	5.60	10.00	9.50	6.70
Bihar	1.60	3.90	10.00	10.00	10.00	9.00
Chhattisgarh	2.80	4.60	10.00	10.00	10.00	10.00
Gujarat	3.90	3.10	10.00	10.00	10.00	8.20
Haryana	1.50	8.00	10.00	10.00	4.30	10.00
Himachal Pradesh	1.70	2.90	10.00	10.00	2.10	8.90
Jammu & Kashmir	0.80	3.80	6.60	10.00	1.70	9.30
Jharkhand	9.20	4.60	8.00	10.00	10.00	10.00
Karnataka	2.80	3.60	10.00	10.00	10.00	5.20
Kerala	1.70	10.00	5.60	10.00	10.00	6.60
Madhya Pradesh	1.40	3.00	7.20	10.00	10.00	7.80
Maharashtra	6.50	4.10	9.10	10.00	10.00	7.60
Odisha	3.70	4.60	10.00	0.00	0.00	0.00
Punjab	1.50	4.60	6.00	10.00	10.00	8.00
Rajasthan	1.30	2.40	10.00	10.00	10.00	8.00
Tamil Nadu	2.70	6.80	5.80	10.00	10.00	7.20
Telangana	0.90	3.70	10.00	0.00	0.00	0.00
Uttarakhand	5.30	4.80	10.00	10.00	10.00	10.00
Uttar Pradesh	7.70	3.40	6.30	10.00	9.10	10.00
West Bengal	9.50	1.60	10.00	0.00	0.00	0.00
NE except Assam	1.90	3.70	4.90	10.00	10.00	10.00

Source: Authors calculation

Appendix 9: Estimated dimension wise values of indicators for schemes under LC-Phase 6

States/UTs	Adequacy IGNOPS (80+ yrs)	Coverage IGNOPS (80+ yrs)	Efficacy IGNOPS (80+ yrs)	Adequacy PMJAY (80+ yrs)	Coverage PMJAY (80+ yrs)	Efficacy PMJAY (80+ yrs)
Andhra Pradesh	3.10	3.80	10.00	10.00	10.00	7.90
Assam	3.20	10.00	5.60	10.00	9.50	6.70
Bihar	4.10	10.00	10.00	10.00	10.00	9.00
Chhattisgarh	5.20	6.70	10.00	10.00	10.00	10.00
Gujarat	5.10	1.50	10.00	10.00	10.00	8.20
Haryana	2.90	10.00	10.00	10.00	3.30	10.00
Himachal Pradesh	3.40	10.00	10.00	10.00	1.40	8.90
Jammu & Kashmir	2.10	4.70	6.60	10.00	1.30	9.30
Jharkhand	9.20	5.20	8.00	10.00	10.00	10.00
Karnataka	4.90	10.00	10.00	10.00	10.00	5.20
Kerala	3.80	10.00	5.60	10.00	10.00	6.60
Madhya Pradesh	3.90	3.60	7.20	10.00	10.00	7.80
Maharashtra	6.50	7.70	9.10	10.00	10.00	7.60
Odisha	5.10	4.40	10.00	10.00	0.00	0.00
Punjab	2.60	9.40	6.00	10.00	10.00	8.00
Rajasthan	5.00	10.00	10.00	10.00	10.00	8.00
Tamil Nadu	3.70	10.00	5.80	10.00	10.00	7.20
Telangana	2.30	7.50	10.00	0.00	0.00	0.00
Uttarakhand	5.30	10.00	10.00	10.00	6.50	10.00
Uttar Pradesh	4.50	5.30	6.30	10.00	10.00	10.00
West Bengal	9.50	7.40	10.00	0.00	0.00	0.00
NE except Assam	4.20	8.60	4.90	10.00	10.00	10.00

Source: Authors calculation