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Cost of India's generational economy: Implications for strategizing and financing human capital investment for children

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M.R. Narayana
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ABSTRACT
Using National Transfer Accounts (NTA) methodology, this paper calculates the cost of children, youth, adults and elderly in India's generational economy. Age-specific and lifetime costs of these generations are measured in terms of per capita consumption expenditure and distinguished by public and private consumption of education, health and others. Relative cost of children, youth and elderly is determined with respect to cost of adults, and uniqueness and similarities of cost components are compared across generations. Variations in generational costs over time are distinguished between inflation effect and resource allocation effect. These analyses are useful for forward-looking policy interventions, such as, projecting resource requirements for implementation of National Education Policy 2020 for school education, financing UN-SDGs as they are related to human development, and for strategizing and financing human capital investment for children in India's generational economy. The approach and implications are of general relevance to other generational economies, subject to the comparability of socio-economic and demographic structures.

Keywords: Cost of children**,** Generational economy, National Transfer Accounts, National Education Policy, Human capital investment

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NATIONAL TRANSFER ACCOUNTS
Understanding the generational economy

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Implications for strategizing and financing human capital investment for children

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Using National Transfer Accounts (NTA) methodology, this paper calculates the cost of children, youth, adults and elderly in India's generational economy. Age-specific and lifetime costs of these generations are measured in terms of per capita consumption expenditure and distinguished by public and private consumption of education, health and others. Relative cost of children, youth and elderly is determined with respect to cost of adults, and uniqueness and similarities of cost components are compared across generations. Variations in generational costs over time are distinguished between inflation effect and resource allocation effect. These analyses are useful for forward-looking policy interventions, such as, projecting resource requirements for implementation of National Education Policy 2020 for school education, financing UN-SDGs as they are related to human development, and for strategizing and financing human capital investment for children in India's generational economy. The approach and implications are of general relevance to other generational economies, subject to the comparability of socio-economic and demographic structures.

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1. Introduction

Are children costly to parents and governments? If yes, do they cost more for parents (private sector) or government (public sector)? Which components of lifetime child development cost more at what ages? Are children costlier than youth, adults or elderly? If yes, which components are costlier to children than others? What implications do the cost of children have on financing child development in a cost-sharing arrangement between public and private sectors? Further, UN Population Projections (United Nations, 2019) for India show a decline

in child population (0-18 years) from 476 million in 2010 to 390 million in 2050 and 269 million in 2100. Does this decline result in lesser public spending on children? If so, how such freed up resources can be reallocated to child quality improvements? The key objective of this paper is to offer plausible answers to these research questions which are of current public policy relevance and importance for strategizing and financing human capital investments for children in India's generational economy.

This paper uses the National Transfer Accounts (NTA) methodology to obtain unambiguous answers and evidence-based implications to the above policy-relevant questions for India. National Transfer Accounts (NTA) is a framework to understanding and analysis of generational economy.[1] It provides a macroeconomic framework for calculation of age-specific and inter-age flows of resources in public and private sectors. Individual is the unit of analysis of NTA because age is specific to individuals. Generations are distinguished by age groups: Children, Youth, Adults and Elderly. The macroeconomic foundations of NTA is National Income and Product Accounting (NIPA). The age-specific flows encompasses all the main economic activities, viz., production, consumption, exchange, allocation and distribution. Social institution of family/household plays an important role in NTA's private sector. The manual of NTA, published by the United Nations, is an essential reference for methodology and data descriptions for construction of NTA (United Nations, 2013). Seminal works on theory and empirics of NTA are given in Lee and Mason (2011).[2]

Using the NTA methodology, this paper presents an economic approach for measurement and analysis of age-specific and lifetime cost of generations in terms of monetary values of per capita consumption for India at national level of aggregation. Composition of per capita consumption is distinguished by education, health and others in public and private sectors. This analysis distinguishes the single-year age and lifetime cost of children, youth, adults and elderly. Cost are compared across generations and inter-temporal costs are distinguished between inflation and resource allocations effects. Data on macro controls (or National Income Aggregates) and NTA rescaling methods are used to obtain the recent cost estimates.

[1] In the NTA framework, a generational economy is characterized by four features (United Nations, 2013: p.4). First, social institutions and economic mechanisms are used by each generation or age group to produce, consume, share and save resources. Second, economic flows across generations. Third, explicit and implicit contracts that govern intergenerational flows. Fourth, inter-generational distribution of income or consumption that results from the foregoing.

[2] All updated resources on National Transfer Accounts are available at: https://ntaccounts.org/web/nta/show/

Implications of these cost estimates are explored to (a) project resource requirements for implementation of India's National Education Policy 2020 for school education, (b) financing UN-SDGs as they are related to human development and (c) for strategizing and financing human capital investment with special reference to children. Subject to comparability of socio-economic and demographic structures, however, the approach and implications of this paper are of general relevance to other generational economies.

Given the federal structure of government, India's current policy frameworks for development of children and youth and social protection for elderly are available at national and sub-national levels. The national policy framework for development of children is given by National Policy for Children 2013 (Government of India, 2013) and for youth by National Youth Policy 2021 (Government of India, 2022). At sub-national level, the most recent youth policy is released by Karnataka State [Government of Karnataka (2022)]. Lack of estimates of cost of children and youth are the gaps in these policy framework. However, this paper fills in this gap and show its importance for projecting/forecasting the resource requirements for child and youth development programmes and schemes in India.

There is a vast literature on cost of children in public and private sectors. This theoretical and non-India specific empirical literature is best reviewed and summarized by Sarlo (2013). Further, a vast literature is available on definition and measurement of child development by using select indicators and construction of indices of child development. At the global level, this literature includes Cobham et.al. (2012) and Save the Children (2017, 2012) and its Indian adaptations for sub-national measurements by Ritu Mathur et.al. (2022a and 2022b). Further, using the UN-SDGs framework, UNICEF (2017) has developed the child focused indicators at global level. In the context of India, using UN-SDGs framework in the NITI Aayog's India SDG Index (2021), Narayana (2022) has developed a framework for identification, classifications and measurement of child development indicators and indices for India. In addition, child development indicators have also been developed by World Vision India (2020). However, cost of children to execute the child development programmes and schemes remains a policy gap in these studies.[3]

[3] A notable exception is UNICEF (2019) which develops a detailed framework including public financing for early childhood development and UNESCO (2022) on funding education with special reference to non-state education sector.

NTA approach in this paper offers newer insights by age-specific cost for children encompassing education, health and other costs in a single framework and consistent with India's macro economy. Further, the NTA framework is also useful to extend for calculation of cost of youth, adults and elderly and to bring out the disparities in cost and relative cost by ages/age groups by nature and magnitude of consumption. Thus, NTA approach is plausible for economy-wide policy formulations in a generational economy context.

Rest of this paper is organised as follows. As a background to forward-looking policies, section 2 describes the demographic background in terms of projected size of population of children, youth, adults and elderly in India from 2010 through 2100. Section 3 explains the methodology for cost calculations by generations. Section 4 includes the analysis of main results. Section 5 includes select policy implications of generational costs. Conclusion is given in Section 6.

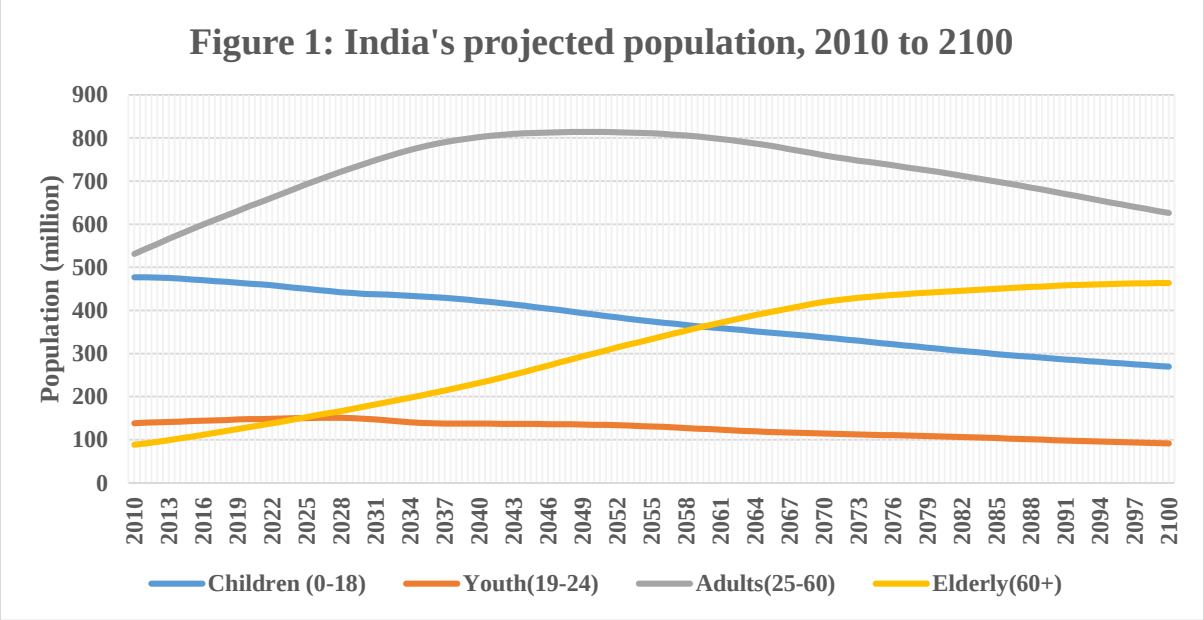
2. Demographic background

National Policy for Children 2013 (Government of India, 2013) defines children in age group of 0-18 years and National Youth Policy 2021 (Government of India, 2022a) defines youth in age group of 15-29 years. United Nations definition of youth is 15-24 years (Government of India, 2022b). We follow the UN definition of children (0-18 years) and, excluding age groups of children, youth population is redefined in this paper to include 19-24 years.

India's latest population census was conducted in 2011. Based this census data, official projected population is reported in Government of India (2019) up to 2036 at five years interval (0 to 79 years and 80+ years). From age 5 to 23 years, projected population is given at single years of age. Thus, data on projected population by single years of age is not available from age 0 to 4 years. To overcome this data problem, throughout this paper, UN projected population (United Nations, 2019) is used.

India's long term population projections from 2010 to 2100 are shown in **Figure 1.** Projected size of population by age groups or generations shows a decline in size of both child and youth population and increase in elderly population. For instance, child population is projected to decline from 476 million in 2010 to 439 million in 2030, 390 million in 2050, 324 million in 2075 and to 269 million in 2100. Youth population is projected to increase from 2010 (138

million) to 2029 (150 million) and declines thereafter to 135 million in 2050, 111 million in 2075 and 91 million in 2100. At the same time, adult population is projected to be the highest and increases from 531 million in 2010 to 740 million in 2030, 814 million in 2050, but declines to 740 million in 2075 and 626 million in 2100. In contrast, the size of elderly population rises throughout from 88 million in 2100 to 177 million in 2030, 300 million in 2050, 434 million in 2075 and 463 million in 2100. Will cost burden to families and government change due to projected size of India's population and its age structure transition? This is one of the research questions answered later in this paper.



Source: Author's calculation using the data in United Nations (2019)

3. Methodology and data for cost calculation

Lifetime cost of children, youth, adults and elderly are measured in monetary values of per capita consumption. Consumption is distinguished by education, health and others in public and private sectors. NTA methodology is used to calculate the age profiles of education, health and other consumptions (United Nations, 2013). Methods, data and results of the construction of NTA age profiles for India are available for the benchmark year 2004-05 (Narayana, 2018). The benchmark values are used to project for a subsequent year (baseline year) by using the rescaling factor for each consumption variable as follows.

Let Z(t) and z(x,t) represent the aggregate and per capita value of variable z in year t at age x (ranging from 0 to $\boldsymbol{\omega}$). Following NTA methodology, (United Nations, 2013: p.63), first of all, adjusted NTA per capita values are obtained by a scaling factor (θ). This scaling factor is calculated by dividing a macro control (Z) by unadjusted aggregate value of the flow in following way.

$$\theta = Z / \sum_{x=0}^{\omega} z(x)N(x) \ldots\ldots\ldots (1).$$

The age shape is multiplied to obtain the adjusted per capita values:

$$\tilde{z} = \theta z(x) \ldots\ldots\ldots\ldots\ldots (2)$$

Next, the upscaling factor is calculated by:

$$\lambda = Z(Baseline) / \sum_{x=0}^{\omega} z(x, Baseline)N(x, Benchmark) \ldots\ldots\ldots (3)$$

The adjusted NTA per capita values in equation (2) are scaled using the scaling factor (**$\boldsymbol{\lambda}$**) as follows.

$$\bar{\tilde{z}}(x, Baseline) = \lambda \tilde{z}(x, Benchmark) \ldots\ldots\ldots (4)$$

Where $\tilde{z}(x, Benchmark)$ is an adjusted per capita age profile.

Projection by rescaling factor in equation (4) is applied for each consumption in public and private sectors. That is, public education consumption, public health consumption, public other consumptions, private education consumption, private health consumption and private other consumptions. The aggregate values or macro controls (or values of all age groups combined) are sourced from India's National Accounts Statistics 2022 (Central Statistical Office, 2022).

Per capita age profiles of cost show the average value of consumption at each single years of age. These monetary values are used as proxies for calculation of cost of children by age. Unless stated otherwise, all costs are measured at current prices. All costs are calculated by single year of age and by age groups. Per capita cost by age groups is calculated by Synthetic

Cohort Measure where per capita values in each age group are summed over single-year-of-age (United Nations, 2013: p.13). Further, cost of children is distinguished by levels of education as per the educational structure recommended by the National Education Policy 2020 (Government of India, 2020).

India's latest base year for estimation of National Income and Product Accounts is 2011-12. Using the methodology and prices for this base year, annual national income estimates are constructed by Central Statistical Office (2015). Accordingly, India's official macro controls for public and private consumptions are available up to Financial Year 2020-21 (i.e. from 1st April 2020 to 31st March 2021) and, using equation (4), up-scaled values of cost of children can be calculated up to 2020-21 as the latest baseline year. Financial year 2020-21 is of special significance for Indian economy due to the First Wave of Covid-19 pandemic effects. However, measurement of pandemic effects on the cost of generations is outside the scope of this paper.

Comparison of cost of generations between 2011-12 and 2020-21 allows for variability in data except for age profile of per capita consumption in benchmark year. The variability in data over time may be mainly attributable to inflation and reallocation effects in macro controls for consumption. Thus, throughout this paper, the macro controls from 2011-12 series of National Income Accounts are used.

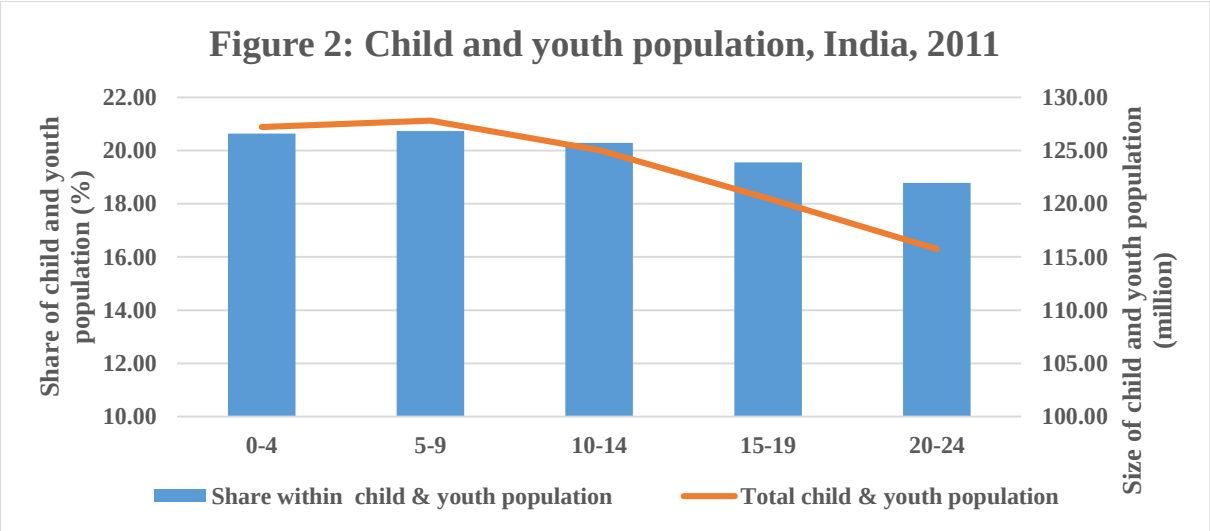
An alternative method for the above up-scaling is forecasting consumption in household data and calculate the age profile of per capita consumption for each year. In this method, growth rate of private final consumption expenditure by items of consumption in National Accounts Statistics is used to forecast the benchmark values (2011-12) and nominal consumption expenditure for each household for each year (Bhalla et.al., 2022). Age profile of consumption is estimable via this distribution for each year This forecasting method of Bhalla et.al., (2022) is not applied in this paper for two important reasons. (a) NTA age profiles are calculated by capturing the diversity of age-specific consumption. This age-specific diversity is uncaptured if aggregate growth of consumption by items is used. Second, NTA consumption profiles are distinguished by public and private sectors. However, the forecasting method is not applicable for public consumption.

4. Analysis of results

Cost of generations is calculated and analysed for the financial year 2011-12 and compared with the latest baseline year 2020-21. This analysis is useful to compare and distinguish the intra-generational, inter-generational and inter-temporal variations in cost structure and components. These comparisons are plausible because the official method of estimation and estimates of macro controls use the same base year (i.e. 2011-12). Main results and implications are presented below by each generation.

4.1. Cost of children and youth

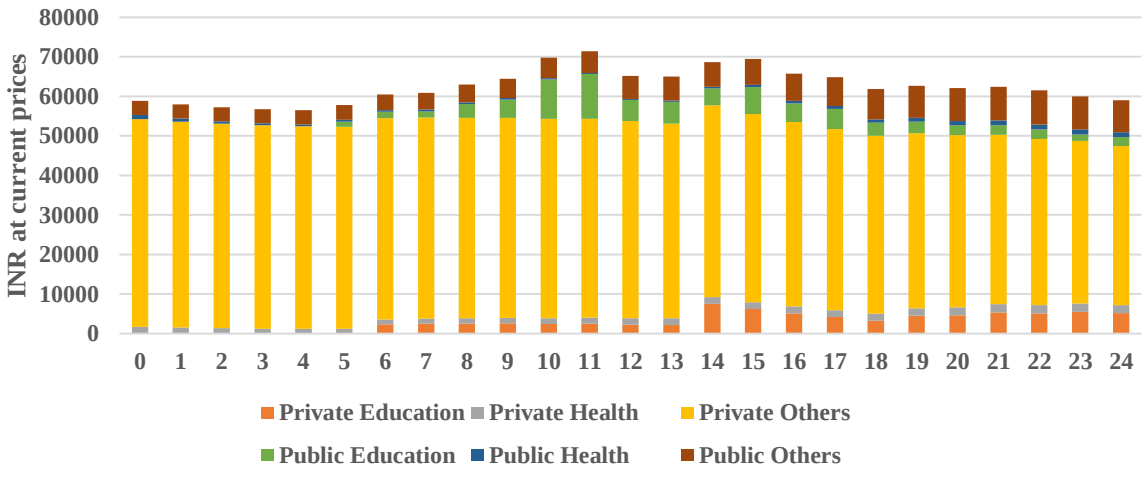
India's projected total child (0-18 years) and youth (19-24 years) population in 2011 was 616 million or about 49 percent of total population. **Figure 2** shows the heterogeneity in size compositions of child and youth population at 5-years interval. This may have differential effects on nature and size of cost of the children because the consumption needs of children and youth differ by their age cohorts. Further, cost being measured by per capita consumption, the size of population in relevant age or age groups matters.



Source: Author's calculations using the data in United Nations (2019)

The components of India's per capita consumption cost for children and youth by single years of age are shown in **Figure 3**. Cost is calculated by education, health and other consumptions and distinguished between the public (i.e. tax payers through General Government) and private (i.e. parents through the institution of family) sources.

Figure 3: Components of per capita cost of children (0-18) and youth (19-24), Single Year of Age, India, 2011-12



Source: Author's calculations

Public and private cost of children rises from age 0 through age 11 and fluctuates thereafter. In general, private cost is higher than the public cost in every component. A notable exception is bigger public education consumption for school education age groups (6-18 years) and bigger private education consumption for higher education age groups (19-24 years). Of all the components of cost, (a) other consumption is highest in both public and private sectors, and (b) health consumption cost is lowest at every age but private health cost is higher than public health cost for children and youth. Thus, cost components show wide disparities by the types of consumption and by public and private sectors.

Table 1 presents the lifetime cost of children and youth by age groups in India for financial year 2011-12. The values in this table refers to Synthetic Cohort Measure or per capita values summed over single-year-of age within age groups. Total private lifetime cost of children (INR1316.76 thousand) is 5.34 times higher than public lifetime cost of children (INR246.58 thousand). Private lifetime cost of children is higher in all components except for education up to age 19 years. Cost of early childhood education for pre-school children (0-3 years) is not reflected in Table 1 because it is not a part of school education and provided by a non-Education Department (Ministry/Department of Women and Child Development). Lifetime cost of human capital on health and education by the private sector (INR115.49 thousand) is about 1.16 times bigger than the public sector (INR99.95 thousand).

Most importantly, India's cost of children and youth are largely borne by private sector. This is evident in Table 1 by the share of lifetime cost components of public and private sector in the combined all consumption total. Of the total cost, 84.23 percent is financed by private sector. Of the components, financing of education consumption is notable for the public sector (5.33 percent) which is higher than private sector (4.80 percent).

Table 1: Cost of children and youth: Synthetic Cohort Measure for five-year-age groups, India, 2011-12

Age group	Private sector (INR thousand)				Public sector (INR thousand)				All consumption (INR thousand)
	Education	Health	Others	Total	Education	Health	Others	Total	
0-4	0.00	6.87	259.15	266.02	0.00	3.39	17.77	21.16	287.19
5-9	9.80	6.38	254.27	270.45	12.65	2.16	21.41	36.23	306.67
10-14	16.78	8.00	248.38	273.15	36.48	1.53	28.82	66.83	339.98
15-19	22.95	8.98	229.51	261.44	22.88	3.60	36.62	63.09	324.53
20-24	25.47	10.27	209.96	245.70	11.31	5.95	42.00	59.27	304.97
Combined (% share)	75.00 (4.80)	40.49 (2.59)	1201.27 (76.84)	1316.76 (84.23)	83.32 (5.33)	16.63 (1.06)	146.62 (9.38)	246.58 (15.77)	1563.34 (100.00)

Source: Author's calculations.

Interestingly, private consumption of education and health shows an increase with age and that of other consumptions decline at higher ages. This decline is mainly attributable to Equivalent Scale Method adopted in calculation of age profile of private consumption others (United Nations, 2013: pp.100-101). That is, private consumption others of an individual within a household is assumed to be proportional to an equivalent scale that is constant at 0.4 for those age 4 years or younger; increases linearly from age 4 to 20; and is equal to 1 for adults age 20 and older. In contrast, public consumption of education and health show considerable variations across age groups. However, public consumption others show an increase for age groups of children than youth because this consumption is allocated on per capita basis and child population is relatively higher than youth population (as shown in Figure 2).

Table 2 gives the results of cost of children for the year 2020-21. A big increase in the cost is evident by each components of the public and private sectors. For instance, combined all consumption of children and youth has increased by about 233 percent between 2011-12 and 2020-21. However, there are variations across the components in public and private

consumptions. For instance, the rise in private (or public) consumption of education is about 298 (or 276) percent, health is 306 (or 252) percent, other consumptions is 226 (or 216) percent, and total private (public) consumption is 232 (or 238) percent. Thus, the cost of children and youth has increased in India over the years.

Table 2: Cost of children and youth: Synthetic Cohort Measure for five-year-age groups, India, 2020-11

	Private sector (INR thousand)				Public sector (INR thousand)				All consumption (INR thousand)
Age group	Education	Health	Others	Total	Education	Health	Others	Total	
0-4	0.00	21.01	585.25	606.26	0.00	8.54	38.44	46.98	653.24
5-9	29.24	19.51	574.23	622.97	34.87	5.45	46.30	86.62	709.59
10-14	50.07	24.45	560.92	635.44	100.51	3.84	62.34	166.70	802.13
15-19	68.51	27.45	518.31	614.27	63.04	9.06	79.19	151.29	765.56
20-24	76.03	31.40	474.15	581.58	31.17	15.00	90.85	137.01	718.60
Combined (% share)	223.86 (6.13)	123.82 (3.39)	2712.85 (74.34)	3060.53 (83.87)	229.59 (6.29)	41.90 (1.15)	317.11 (8.69)	588.60 (16.13)	3649.13 (100.00)
Nominal increase (%)	298.49	305.77	225.83	232.43	275.55	251.89	216.28	238.71	233.42
Real increase (%)	143.49	135.77	59.83	78.43	119.55	81.89	50.28	84.71	78.42

Notes: Nominal (or Real) increase refers to increase in cost at current (or constant) prices between 2011-12 and 2020-21.
Source: Author's calculations.

It is important to note that inter-temporal increase in consumption cost includes inflation effects. Using macro controls-based deflators by components of consumption, figures in the last two rows of Table 2 shows a comparison between nominal and real increase in cost of children and youth. [4] The real increase is increase in cost without inflation and, hence, captures the real resource allocation effects on cost of consumption for children and youth. Given the higher increase in private cost in each component, and inflation effects and inflation rates are comparable between public and private sectors, inflation effect results in remarkable decline in the private and public costs of children and youth in India. Thus, between 2011-12 and 2020-21, the combined all consumption cost of children and youth declines from a nominal rise of 233.42 percent to a real decline of 78.42 percent.

[4] These deflators are calculated by ratio of a consumption at current prices to consumption at constant prices. Subtracting the inflation-adjusted cost from nominal increase, the real increase in cost is obtained. For lack of constant price data on public education, health and other consumptions, private sector consumption deflators are applied to public sector consumption.

4.1.1. Cost of children and youth by levels of education

Results of cost of children and youth provide with a new policy framework for strategizing and financing India's human capital investments for children. For instance, the latest National Education Policy 2020 (NEP 2020) is being implemented in India. The structure includes a new pedagogical and curricular for education development of children and youth: 5 years of Foundational learning including 3 years (age 3-6 years) at pre-school and 2 years (ages 6-8) at Class 1 & 2; 3 years of Preparatory (ages 8-11) at Class 3 to 5; 3 years of Middle (ages 11-14) at Class 6 to 8; 4 years of Secondary (ages 14-18) at Class 9 to 12. Inclusion of age groups 3-6 years is new in school education to develop children to be school ready for Grade I. Higher education for youth age groups to be flexible with different designs of Master's programmes (e.g. 2-year Master's programme for 3-year Bachelor's programme and 1-year Master's programme for 4-year Bachelor's programme). Age specific lifetime cost of children and youth is useful for assessing the cost-sharing arrangements for financing of NEP 2020 through public and private investments in education. As a counterfactual, this cost by levels of education is calculated for year 2011-12 and given in **Table 3**.

Table 3: Cost of children and youth by levels of education: Synthetic Cohort Measure, India, 2011-12

Levels of education	Private sector (INR thousand)				Public sector (INR thousand)				All consumption (INR thousand)
	Education	Health	Others	Total	Education	Health	Others	Total	
Pre-school	2.28	3.58	153.34	159.20	2.91	1.31	11.37	15.59	174.80
Class 1 & 2	4.97	2.59	101.60	109.16	5.06	0.90	8.77	14.73	123.90
Preparatory	7.44	4.37	151.30	163.10	26.01	0.95	15.60	42.56	205.67
Middle	11.89	5.01	147.67	164.56	15.15	0.94	18.12	34.21	198.77
Secondary	18.50	7.09	185.15	210.75	19.98	2.68	28.46	51.13	261.87
Higher	29.92	12.15	254.32	296.39	14.21	6.87	50.16	71.23	367.63
Combined (% share)	75.00 (5.63)	34.80 (2.61)	993.38 (74.54)	1103.17 (82.78)	83.32 (6.25)	13.66 (1.03)	132.48 (9.94)	229.46 (17.22)	1332.63 (100.00)

Note: Levels of education are as per National Education Policy 2020 (Government of India, 2020).
Source: Author's calculations

The results in Table 3 imply that the cost burden is heavier for public sector in provisioning of education consumption for children and youth at all levels of education except higher education, although overall cost is largely share by private sector (82.78 percent). Further, the results in Table 3 are different from results in Table 1 because of different coverage of ages in pre-school level. A notable exception is public and private consumption of education due to zero cost for age group 0-4 years in both the tables.

In the presence of fiscal constraints, however, the General Government may have to look for alternative strategies for reducing the private cost of education consumption for parents and for encouraging higher private sector participation. Over the years, these financing strategies have been focused on subsidization and its targeting, cross-subsidization through differential fee fixation, public-private partnerships (including Corporate Social Responsibility funding, school adoption schemes, and voluntary private contributions), residential schools and hostels, scholarships and its disbursement through Direct Benefit Transfer mode, Right-to-Education Act, fee regulations in private sector, cost-recovery by fee hike etc. These strategies have reduced the cost of public education consumption for families/students. However, cost-sharing should essentially aim at reducing or redefining the cost to Government and increasing cost sharing by private sector.

Table 4 shows the cost of children and youth by levels of education for the year 2020-21 which is the benchmark year for introduction of NEP 2020. The cost in each component and lifetime cost of children has increased more than 100% over a period of 10 years. Cost is heavily shared by private sector. Inflation effect is remarkable as it reduces the nominal increase in combined cost for all consumption (Rs.234.42 thousand) to real increase of Rs.79.43 thousand. Further, of all the levels of education, higher education is costliest in the private sector and preparatory stage education is costliest in the public sector.

Table 4: Cost of cost of children and youth by levels of education: Synthetic Cohort Measure, India, 2020-21

Levels of education	Private sector (INR thousand)				Public sector (INR thousand)				All consumption (INR thousand)
	Education	Health	Others	Total	Education	Health	Others	Total	
Pre-school	6.80	10.95	346.30	364.05	8.03	3.31	24.59	35.92	399.97
Class 1 & 2	14.84	7.93	229.45	252.21	13.93	2.27	18.98	35.18	287.39
Preparatory	22.20	13.35	341.68	377.24	71.67	2.40	33.74	107.81	485.05
Middle	35.48	15.33	333.48	384.28	41.75	2.38	39.18	83.30	467.59
Secondary	55.23	21.69	418.13	495.05	55.06	6.76	61.56	123.38	618.42
Higher	89.32	37.16	574.33	700.81	39.15	17.30	108.48	164.93	865.74
Combined (% increase)	223.86 (7.17)	106.40 (3.41)	2243.37 (71.81)	2573.63 (82.38)	229.59 (7.35)	34.41 (1.10)	286.52 (9.17)	550.53 (17.62)	3124.16 (100.00)
Nominal increase (%)	298.48	305.85	225.83	233.30	275.55	252.11	216.28	239.93	234.43
Real increase (%)	143.48	135.85	59.83	79.30	119.55	82.11	50.28	85.93	79.43

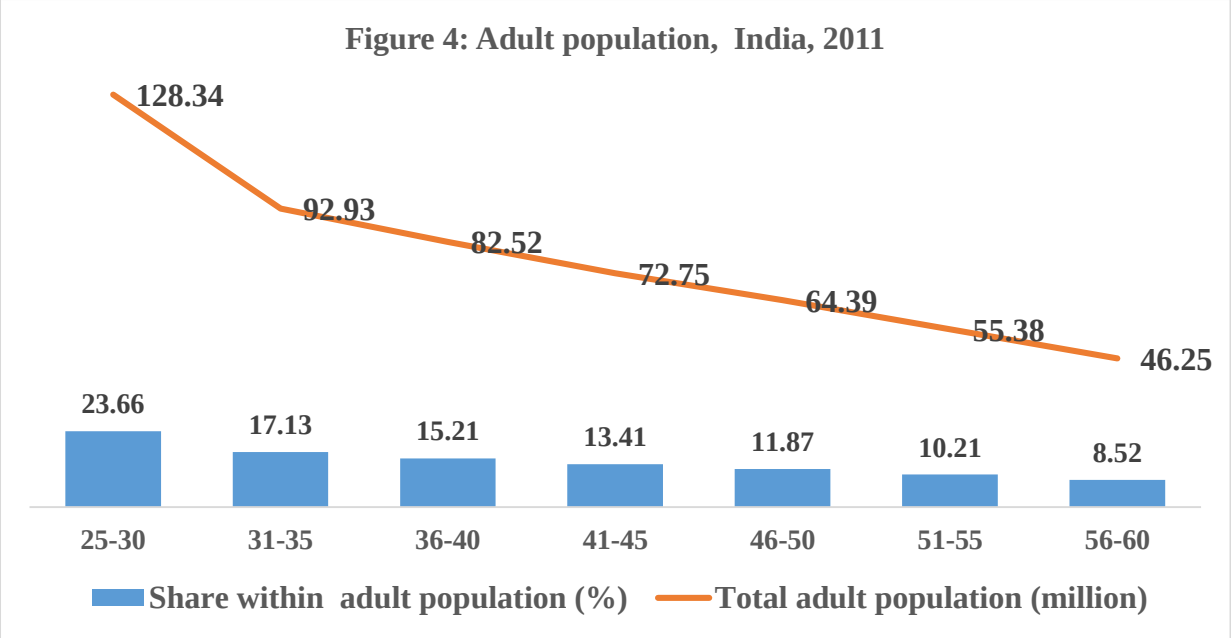
Note: Levels of education are as per National Education Policy 2020, Government of India.
Source: Author's calculations

4.2. Cost of adults and elderly

In a generational economy, relative cost of children refers to a comparison of cost of children with cost of youth, adults and elderly. Cost of youth is already calculated in section 4.1 above. Cost of adults and elderly is calculated and analysed below. This analysis aims at determining the (a) unique similarities and essential differences across and within generations and (b) relative cost of children.

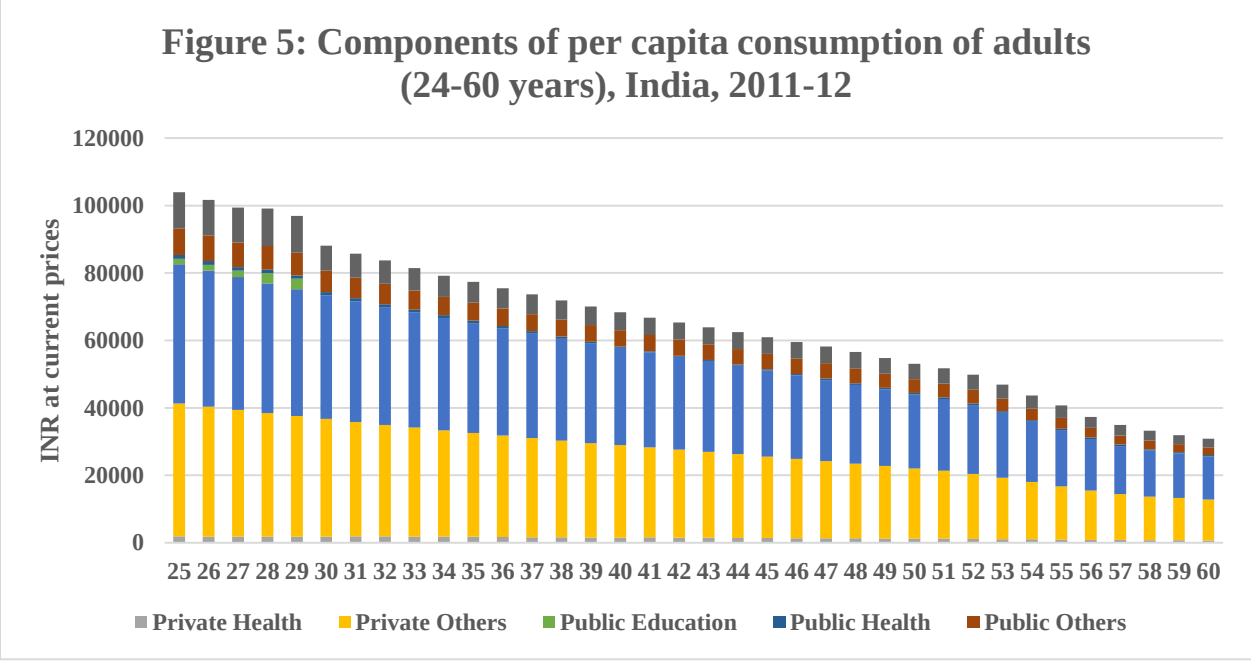
4.2.1. Cost of adults

Adult population comprises individuals in the age group 25-60 years. Distribution of adult population at 5-years interval is shown in **Figure 4** for year 2011. Total adult population (542.55 million) constitute about 43.42 percent. About 24 percent of total adult population (or 128.34 million) is in age group 25-30 years and declines with higher age. Closer to elderly age group (55-60 years), adult population declines to 46.25 million and shares 8.52 percent within total adult population. Consequently, cost of adults may vary across ages and age groups.



Source: Author's calculation using the data in United Nations (2019).

Cost of adults by age groups by components of consumption (education, health and others) in public and private sector is measured in per capita terms. This is shown by single year of age in **Figure 5.**



Source: Author's calculation

Unlike the cost of children and youth in Figure 1, education cost is less and that of health and other consumption costs are higher for adults. In terms of Synthetic Cohort Method, the cost of adults at five-year interval is given in **Table 5** for 2011-12 and **Table 6** for 2020-21. Total private cost is higher than public cost. Within both public and private sector, cost of adults is highest for age group 25-30 years because this group includes consumption cost of higher education beyond 24 years (i.e. after youth period). Most importantly, per capita lifetime cost of adults is lesser than children and youth.

Table 5: Cost of adults: Synthetic Cohort Measure for five-year age interval, India, 2011-12

Age group	Private sector (INR thousand)				Public sector (INR thousand)				All consumption (INR thousand)
	Education	Health	Others	Total	Education	Health	Others	Total	
25-30	0.023	10.70	223.00	233.72	11.44	6.22	43.13	60.79	294.51
31-35	0.017	8.87	161.76	170.65	0.00	4.37	28.68	33.05	203.69
36-40	0.015	7.78	143.54	151.34	0.00	3.16	25.13	28.28	179.62
41-45	0.013	7.19	127.26	134.47	0.00	1.69	23.43	25.12	159.59
46-50	0.011	6.12	110.84	116.98	0.00	2.29	21.72	24.02	140.99
51-55	0.009	5.05	90.42	95.48	0.00	2.36	18.46	20.82	116.30
55-60	0.005	3.57	65.74	69.31	0.00	2.10	12.59	14.69	84.01
Combined (% share)	0.094 (0.01)	49.28 (4.18)	922.57 (78.27)	971.94 (82.46)	11.44 (0.97)	22.19 (1.88)	173.14 (14.69)	206.77 (17.54)	1178.72 (100.00)

Source: Author's calculations.

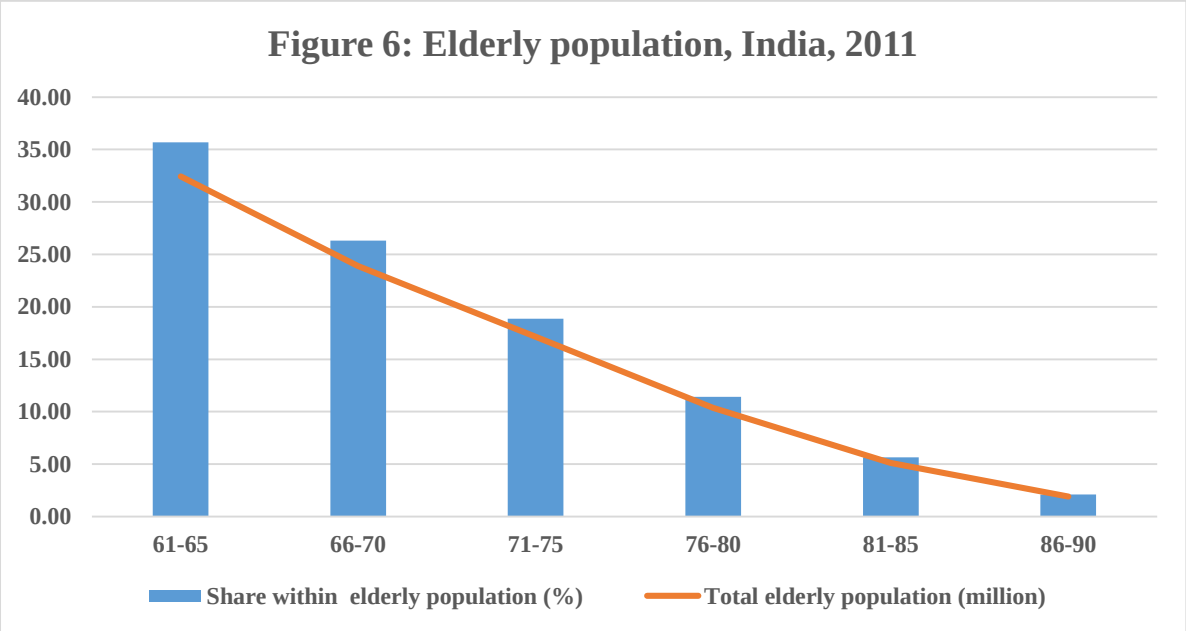
Table 6: Cost of adults: Synthetic Cohort Measure for five-year age interval, India, 2020-21

Age group	Private sector (INR thousand)				Public sector (INR thousand)				All consumption (INR thousand)
	Education	Health	Others	Total	Education	Health	Others	Total	
25-30	0.071	32.72	503.61	536.40	31.53	15.66	93.28	140.47	676.87
31-35	0.051	27.11	365.32	392.48	0.00	11.00	62.03	73.03	465.51
36-40	0.046	23.78	324.17	347.99	0.00	7.96	54.34	62.30	410.29
41-45	0.040	22.00	287.40	309.44	0.00	4.26	50.67	54.93	364.37
46-50	0.035	18.72	250.32	269.07	0.00	5.78	46.98	52.76	321.83
51-55	0.029	15.45	204.19	219.67	0.00	5.94	39.93	45.88	265.55
55-60	0.021	10.91	148.46	159.39	0.00	5.29	27.24	32.52	191.91
Combined (% share)	0.293 (0.01)	150.68 (5.59)	2083.46 (77.27)	2234.44 (82.87)	31.53 (1.17)	55.88 (2.07)	374.47 (13.89)	461.89 (17.13)	2696.32 (100.00)

Source: Author's calculations.

4.2.2. Cost of elderly

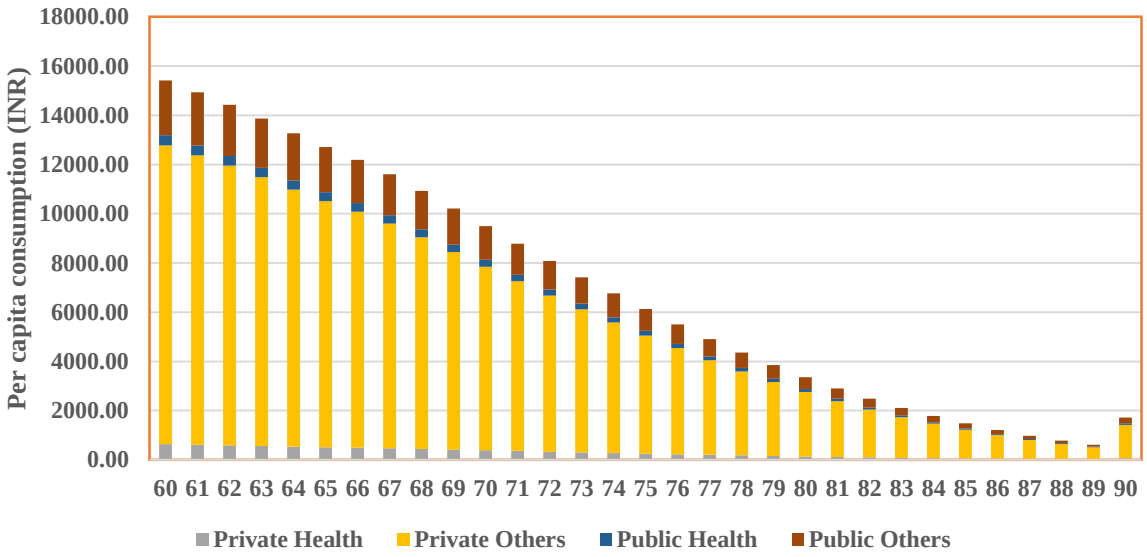
India's projected elderly population (60-90 years) is about 91 million (or 7.23 percent of total population) in 2011. **Figure 6** shows the distribution of elderly population by 5-years interval. Apparently, the highest share (32.42 percent) is for age group 61-65 years, and about 92 percent of total elderly population is up to age 80 years. Thus, it is important to know the differential cost of elderly across ages and between age groups.



Source: Author's calculations using the data in United Nations (2013).

Components of per capita cost of elderly by single years of age are presented in **Figure 7** (per capita values). Unlike the cost of children, youth and adults, cost of education is not relevant for elderly population. Like cost of children, youth and adults, other consumption is highest in both public and private costs, and private other consumption cost is higher than public other consumption cost. For all elderly ages, private cost of health is higher than public cost. In contrast to per capita cost of children and youth, per capita cost of elderly declines from lower age (60 years) through higher age (89 year).

Figure 7: Decomposition of consumption of elderly by sources, Single Year Age, India, 2011-12



Source: Author's calculations

Synthetic Cohort Measure of per capita cost of elderly in 2011-12 is presented in **Table 7** at 5-years interval. India's elderly is costlier before 80 years than after. The costliest elderly age group is 60-64 years who are relatively younger among the elderly. In terms of combined per capita cost of consumption, elderly is less costly than children, youth and adults. For instance, combined all consumption for children and youth in Table 1 is INR1563.34 thousand. This is 7.30 times smaller than combined all consumption for elderly in Table 7. However. Private health cost is least expensive for elderly because it is 4.63 times smaller in private sector and 2.63 times smaller in public sector than for children and youth.

Table 7: Consumption of elderly, Synthetic Cohort Values for five-year-age groups, India, 2011-12

Levels of education	Private sector (INR thousand)				Public sector (INR thousand)				All consumption (INR thousand)
	Education	Health	Others	Total	Education	Health	Others	Total	
60-64	0.00	2.93	56.64	59.57	0.00	1.96	10.38	12.34	71.91
65-69	0.00	2.33	45.36	47.69	0.00	1.67	8.29	9.95	57.64
70-74	0.00	1.67	31.82	33.49	0.00	1.24	5.81	7.05	40.54
75-79	0.00	1.02	19.37	20.39	0.00	0.80	3.56	4.36	24.75
80-84	0.00	0.51	9.88	10.39	0.00	0.43	1.81	2.24	12.63
85-90	0.00	0.26	5.33	5.59	0.00	0.24	0.96	1.21	6.80
Combined (% share)	0.00 (0.00)	8.71 (4.07)	168.40 (78.60)	177.12 (82.67)	0.00 (0.00)	6.33 (2.95)	30.81 (14.38)	37.15 (17.34)	214.26 (100.00)

Source: Author's calculations.

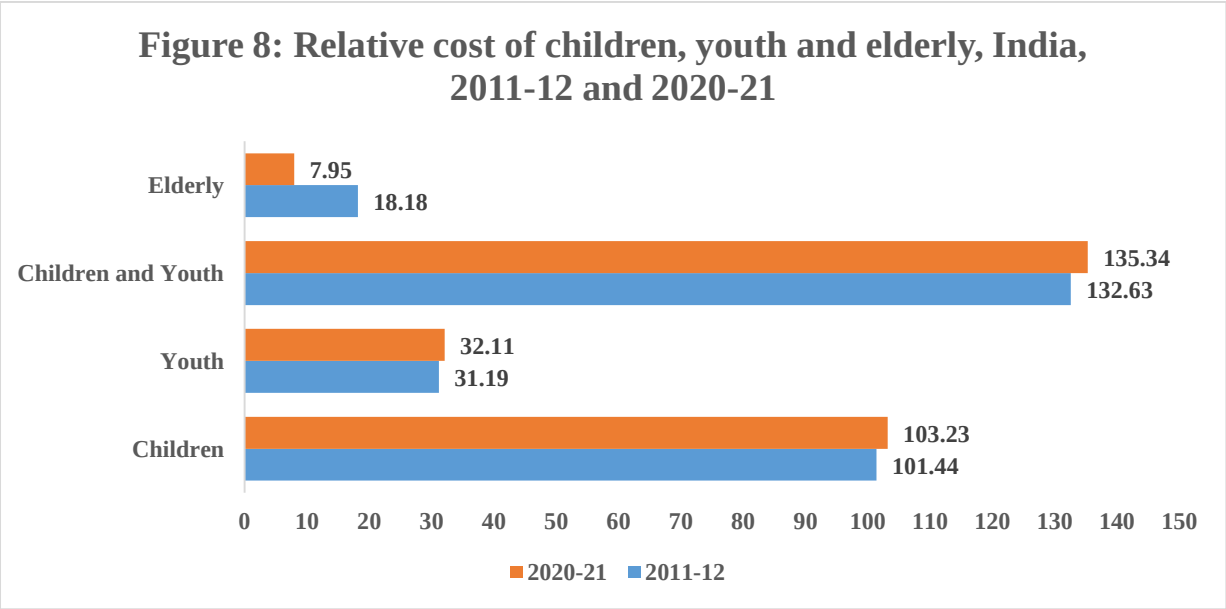
Table 8: Consumption of elderly, Synthetic Cohort Values for five-year-age groups, India, 2020-21

Levels of education	Private sector (INR thousand)				Public sector (INR thousand)				All consumption (INR thousand)
	Education	Health	Others	Total	Education	Health	Others	Total	
60-64	0.00	8.97	127.90	136.88	0.00	4.93	22.45	27.38	164.26
65-69	0.00	7.11	102.44	109.55	0.00	4.20	17.92	22.12	131.67
70-74	0.00	5.09	71.87	76.96	0.00	3.12	12.57	15.69	92.65
75-79	0.00	3.11	43.75	46.86	0.00	2.00	7.70	9.71	56.57
80-84	0.00	1.56	22.31	23.87	0.00	1.08	3.92	4.99	28.86
85-90	0.00	0.79	12.04	12.83	0.00	0.61	2.08	2.70	15.53
Combined (% share)	0.00 (0.00)	26.64 (5.44)	380.31 (77.69)	406.96 (83.13)	0.00 (0.00)	15.95 (3.26)	66.64 (13.61)	82.59 (16.87)	489.55 (100.00)

Source: Author's calculations.

4.2.3. Relative cost of children in a generational economy

Relative cost of children is measured by combined all consumption per capita cost of children, youth and elderly as a percentage of per capita cost of adults (25-59 years). **Figure 8** shows the cost of children, youth and elderly for every INR100 consumed by adults in 2011-12 and 2020-21. The results imply that children are the neither costliest nor cheapest in India. Relative costs for children and youth are remarkably higher because, unlike elderly, their costs include the cost of education consumption. Decline in relative cost of elderly is notable.



Source: Author's calculations

5. Select policy implications

Cost of children and youth by age or age groups is policy useful. First, to quantify the cost-sharing arrangement between public and private sectors. Second, to estimate the resource requirements in public and private sector for implementation of NEP 2020 by levels of education. Third, cost of elderly is useful to estimate the relative cost of components of social protection and cost sharing by families and government. Fourth, cost of consumption of children and youth also represents the cost of human capital investments in terms of improving education, health and other consumptions that contribute to reducing poverty and hunger. These implications are of policy importance for assessment of resource requirements for child and youth development within the framework of UN-SDGs as they are related to Goal 1 (No Poverty), Goal 2 (Good Health and Wellbeing). Goal 3 (Quality Education) and Goal 5 (Gender Equality). These human capital investments at present shall be contributory for reaping long run demographic dividend as the children and youth graduate themselves into adulthood or working ages. Thus, these results have implications for strategizing human capital investment for children and youth, and financing human development of all generations, in a cost-sharing model between public and private sectors.

Other things being the same including per capita cost of consumption, a decline in population size of children and youth implies a reduction in cost burden to the families and government, and an increase in elderly population implies an increasing cost burden. This decline is evident for long term in Figure 1. However, beneficiary cost norms in public sector programmes depends on the size of beneficiary as well as amount of benefit levels and duration of benefits. Given the duration of benefits, an upward revision in amount of benefits has a positive impact on cost burden if only its impact is more than offsetting a decline in population. In this regard, NTA-based cost calculation by age is policy useful for estimating the fiscal cost for improving the differential consumption needs and welfare of children, youth and elderly generations.

6. Conclusion

This paper has used the NTA methodology for measurement of cost of generations in Indian economy. Cost is calculated by per capita consumption of education, health and others in public and private sectors and by four generations: Children, Youth, Adults and Elderly. In the

absence of recent values of the age profiles, the benchmark values (2004-05) are projected to alternative baseline values (2011-12 and 2020-21) by the rescaling technique.

The empirical results show that children are costly in India and costlier than youth, adults and elderly. Cost of education varies by age and by public and private sectors. Interestingly, public (or private) education is costlier than private (or public) education for children (or youth). Health, either public or private, is less costly than education and other consumptions for children, youth and elderly. These cost-sharing results imply that private cost is higher than public cost in all components. Overall, in all the generations, about 82 percent of total lifetime cost is borne by the private sector. These results show remarkable disparities in nature, magnitude and composition of costs by public and private sectors and generations.

At present, first of all, National Health Accounts of India gives health expenditure by public and private sectors without age specificities. Second, public expenditure on children is consolidated by (a) Government of India in Statement No.12 (Allocations for the welfare of children) in Expenditure Profile volume of Union Budget and (b) few state governments in the form of Child Budget but none of these volumes include age specific expenditures for children. Third, forecasting of resource requirements for attainment of age specific targets and indicators of UN-SDGs 2030 needs be strengthened NTA methodology is very useful to fill in the above policy research gaps by introduction of age into the analysis and to reorient the macroeconomic analyses in a generational economy context.

Construction of NTA is yet to be officially institutionalized in India but a policy imperative to be given both important and urgent consideration. Central Statistical Office (CSO) in the Ministry of Statistics and Programme Implementation is the official institution for construction of National Income and Product Accounting in India. For coordinated policy efforts, CSO is a plausible institutional set up for official construction of NTA as well.

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