NATIONAL TRANSFER ACCOUNTS IN THE MALDIVES

METHODOLOGY USED

National Bureau of Statistics in Collaboration with UNFPA

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CONTENTS

SECTION 1: INTRODUCTION

Maldives economy has seen impressive growth over the past decade. The population has also grown over the years with high influx of migrant population and the resident population is expected to reach nearly 1 million by 2054.

The changes in the population age structure that accompany any change in demographic components is important because the income and consumption pattern of the population changes over the course of their lives.

In order to understand how the economy works, it is crucial to be able to observe and analyze the economic interactions among different actors in the economy and its population. The National Transfer Accounts (NTA) measures important aspects of age-specific economic behavior, with regard to the generation of income, the redistribution of income between age groups and its use for consumption and saving.

The Maldives National Bureau of Statistics (NBS) together with UNFPA Maldives undertook the development of National Transfer Accounts in Maldives for the first time in August 2019. The first ever NTA was based on the results of Household Income and Expenditure Survey (HIES) 2016 and SNA data for the same period.

NTA consists of three accounts. The economic life cycle account provides a measure of the extent to which individuals at each age are able to provide for their material needs through their current labour. This is through their consumption, labour income and the difference between the two- the life cycle deficit/ surplus. The results of Maldives first ever NTA is based on the life cycle account.

While the technical details of the NTA methodology are well explained in the NTA manual and in other publications, this paper talks about the data preparation and methodology applied in the context of Maldives to prepare NTA accounts. In particular, this document is organized as follows. Section 2 describes the data used for NTA and each component of life cycle account including the macro controls used in NTA. Section 3 discusses the life cycle account and Section 4 with conclusion, data limitation and way forward.

SECTION 2: DATA PREP FOR NATIONAL TRANSFER ACCOUNTS AND COMPONENTS FOR LIFE CYCLE ACCOUNT

In order to construct NTA, the following data was collected through various agencies for 2016:

1- System of National Accounts (SNA)- published by National Bureau of Statistics (NBS)

2- Household Income and Expenditure Survey 2016 dataset- for private consumption and labour income

3- Administrative data from government agencies. This includes:
- School attendance by age received through Ministry of Education and Ministry of Higher Education.
- Health facility utilization by age based on the service record data provided by Aasandha Company Pvt Ltd.

This report also uses the same codes used in the NTA manual for different variables in the life cycle deficit age profiles as follows:

Main codes for NTA age profiles

Life cycle deficit age profiles—consumption

C	Consumption
CF	Private consumption
CG	Public consumption
CFE	Private consumption, education
CFH	Private consumption, health
CFX	Private consumption other than health and education
CGE	Public consumption, education
CGH	Public consumption, health
CGX	Public consumption other than health and education

Life cycle deficit age profiles—labour income

YL	Labour income
YLE	Labour earnings, including fringe benefit
YLS	Self-employment labour income

The NTA age profiles are based on survey and administrative data. These data are used to construct the private consumption and public consumptions variables needed for the life cycle account. The public and private consumption are both distinguished by use or purpose relying on three categories: education, health and all other consumption. The next section outlines how each of these variables are constructed.

2.1 POPULATION ESTIMATES

The population age profiles used in NTA are based on 'Maldives population projections 2014-2054'. Maldives population projection presents age profiles for:

1- Resident Population (which includes Resident Maldivian and Resident Foreigners)
2- Resident Maldivian
3- Resident Foreigners

Population projections are done for singles year ages up to 80+ years. NTA follows the same ages and population used in Maldives Population Projection with 80 years as the uppermost age limit.

2.2 NATIONAL TRANSFER ACCOUNTS AND MACRO CONTROLS

NTA and System of National Accounts (SNA) have different purposes and conceptual frameworks. Many NTA flows are identical to or can be constructed from SNA data. Amon the most important difference between SNA and NTA framework are the different units of analysis and differences in the different classification of sectors. The NTA records transactions between individuals rather than between institutional units (or households). The government is considered an intermediary in NTA. In order to construct a complete set of accounts, flows to and from the rest of the world (ROW) are also considered.

The life cycle deficit is an NTA variable, equal to consumption less labour income and it has no counterpart in SNA. Other components of the life cycle flows are constructed directly from SNA data with adjustments as given in the following sections.

Both the public and private consumption are based on final consumption expenditure data in SNA. Labour income is an estimate of the value of the return to labour and it has not direct counterpart in SNA. The earnings reported in SNA undergoes an adjustment when doing NTA. SNA does not report the value of self-employment and unpaid family workers. For NTA purpose, a value for this is assigned from mixed income.

The NTA aggregated flows are constructed using data from the System of National Accounts (SNA) 2016. These are also called macros controls, which are used to scale NTA age profiles.

MACRO CONTROLS AND ADJUSTMENT IN NATIONAL TRANSFER ACCOUNTS

Also called "control totals", macro controls are aggregate measures of economic flows, as meas¬ured in the System of National Accounts (SNA). They are used to scale NTA age profiles so that the NTA aggregate estimates match the estimates from the SNA. Note that not all NTA age profiles have an exact SNA macro control—some NTA age profiles are combinations of SNA concepts, so the macro control will be computed as the combination of SNA amounts.

Scaling of NTA age profiles is done by finding a multiplicative factor that makes the NTA aggregate match the SNA aggregate. For example, if total consumption of private education in SNA was 110 units but the population aggregate NTA estimate based on data from a consump-tion survey was only 100 units, the NTA value for each age would be multiplied by 1.1.

The NTA flow identity summed across all ages yield the following aggregate values for each of the flows:

$$Y^l(x)+Y^k(x)+Y^p(x)+\tau(x)=C(x)+S(x)$$

The left-hand side is the disposable income of age group x. The first three terms, labour income, capital income and property income are very similar to primary income, income received by person age x because of their involvement in producing goods and services. The final term given on left-side is net transfers, which is equivalent to transfer inflows less transfers outflows. This is essentially the income approach in the GDP and the right side of the equation represents the expenditure approach in the GDP. A switch in the variables give consumption and income on one side and the rest on the other side. The first one gives the SNA identity and the second one gives the NTA identity.

To derive the given formula, the following information from SNA has been used:

1- GDP by expenditure approach (includes final consumption expenditure, capital formation and external balance), in current prices and in million MVR

2- GDP by income approach(includes compensation, operating surplus and mixed income, in current prices and in million MVR

3- Final consumption expenditures of household, in current prices and in million MVR

4- Government final consumption expenditure, in current prices and in million MVR

SNA Detail	in Current prices (in million MVR)
Production Approach, 2016 (Current M MVR)	**64919.3**
Taxes les subsidies on products and production	8914.5
Taxes on products	9456.9
Taxes on production	3416.8
LESS: Subsidies	542.4
Gross Value Added	56004.8
Compensation of employees	23255.0
Gross Operating Surplus	15067.5
Mixed Income	8187.5
Memo: Consumption of Fixed Capital	8486.7
Expenditure Approach, 2016 (Current M MVR)	**68720.4**
Household Final Consumption Expenditure	26909.3
Government Final Consumption Expenditure	12503.8
Gross Fixed Capital Formation	25595.7
Changes in Inventory	753.0
Export of Goods and Services	51972.2
Import of Goods and Services	49013.6
Household Final Consumption Expenditure, 2016 (Current M MVR)	**26909.3**
Education	881.5
Health	1408.2
Others, N.E.C.	24619.6
Government Final Consumption Expenditure, 2016 (Current M MVR)	**12503.8**
Education	2175.3
Health	2284.5
Others, N.E.C.	8044.0

National account data was then used to construct NTA aggregate controls. These are used to scale NTA age profiles. For some of the aggregated NTA values are the same as those from SNA table, while in other cases aggregate control specific to NTA controls has been created.

Consumption, public consumption and private consumption are based on final consumption expenditure data in SNA. The following steps has been followed to construct the macro controls for NTA aggregates:

1- Add taxes less subsidies due to labour- Labour income is an estimate of the value of the return to labour and it has no direct counterpart in SNA. SNA does have some estimates for the return to labour except that levied taxes has been removed already which again gets included for NTA purpose.
SNA does not report the value of labour for self-employment, but for NTA purpose this has been estimated using mixed income.

Since there is no personal income tax taken in Maldives, the amount for taxes on production was all assigned to Gross Operating Surplus. This gives tax less subsidies on production due to mixed income and compensation of employees as zero and gross operating surplus equivalent to the amount of taxes on production. And since Maldives has no estimate for mixed income (included as part of GOS), it's share has been estimated using a regression model.

As a next step, self-employment of labour income was calculated as 2/3 of Mixed Income[1] plus tax less subsidies on production due to Mixed Income. Since there is no personal income tax in Maldives, all taxes on production was assumed to be on returns to capital (i.e on GOS and net property income). Labour income was derived as the total of earning and self-employment labour income.

2- Remove taxes less subsidies from consumption- NTA divides taxes on products and production less subsidies into: taxes less subsidies on labour income, taxes less subsidies on capital income and taxes less subsidies on consumption. While labour income and capital income in NTA are adjusted upward to value labour and capital income, consumption is adjusted downward to exclude taxes less subsidies on products. VAT on expenditure items is not part of consumed value and are therefore removed to calculate the value of consumption. The tax less subsidy for household final consumption expenditure was adjusted in this way by subtracting taxes on products by less subsidies on products assuming that only private consumption is taxed in the country.

Adjustment was brought to household private consumption where household final consumption expenditure (in SNA) was subtracted by tax less subsidy amount. Within private consumption no adjustment was made to health and education with the assumption that these services are not taxed in the country. Other consumption, N.E.C was therefore adjusted by subtracting the difference between health and education from the total private consumption.

Since there is no tax less subsidies on products for government final consumption expenditure, it remains the same as SNA values.

1 *This is best available evidence given in NTA manual based on (Lee, Lee, et al., 2008)*

Total consumption is derived by summing private and public consumption.

3- Re-allocation of social health insurance expenditure from private consumption to public consumption- No adjustment was done to social health insurance expenditure as Maldives is already part of GFCE. Therefore, in this case, private consumption is equivalent to SNA values.

4- Final aggregate NTA- based on the figures derived, final aggregated NTA macro control was compiled as:

Code	Description	M MVR
LCD	Lifecycle Deficit	1,785.3
C	Consumption	30,498.6
CF	Private Consumption	17,994.8
CFE	Education	881.5
CFH	Health	1,408.2
CFX	Others, N.E.C.	15,705.0
CG	Public Consumption	12,503.8
CGE	Education	2,175.3
CGH	Health	2,284.5
CGX	Others, N.E.C.	8,044.0
YL	Labor Income	28,713.3
YLE	Earnings	23,255.0
YLS	Self-employment Labor Income	5,458.3

5- Disaggregation of aggregates by level of service- once the macro controls have been identified, the next involved providing NTA macro control by level of service.

Since no further breakdown for education by level can be derived from Maldives SNA, data from UIS for the year 2016 was used to get the proportions allocated for public expenditure by level (refer to Table 1 included in Annex 1). Using these proportions breakdown was done by pre-primary, primary, lower secondary, upper secondary, post-secondary non-tertiary and at tertiary level. Others not defined by level remained as residual (as the remaining of what is left in the total).

Similarly, breakdown for public health was estimated based on National Health Accounts (NHA) of Maldives for 2014 (given as Annex1, table 2). NHA provided the total amount on health care function funded by government by in-patient care, out-patient care, ancilliary services, medicines and other goods, preventive care and for governance, financing and administration. Further aggregation was done where in-patient care remained as it is. Out-patient care was the sum of ancillary services and medicines and other goods, while general health was the sum of preventive care and governance, financing and administration.

Further breakdown was applied in health to allocate for Aasandha and general government expendi-

ture. For Aasandha, the breakdown of total expenditure by in-patient and out-patient was applied using Aasandha data. The general government was computed as difference between the NTA aggregate and Aasandha expenditure.

6- Disaggregation of labor earning and consumption by Resident population- as a next step, NTA aggregated for labour earning was further disaggregated between resident Maldivians and resident Foreigners. It was assumed that self-employment labour income will only come from Maldivians and therefore NTA macro control was set to Maldivians only. This was done as such mainly because foreigners mostly come into the country as employees and an insignificant contribution to self-employment comes from foreigners as reported in the Census 2014. The earning was disaggregated between Maldivians and Foreigners based on 'workers' remittances' information from MMA Balance of Payments worker's remittances (debit). This together with the local consumption of residents foreigners calculated from the NTA CFX gave an estimation of the earnings for foreigners. This amount was deducted from the total earning to get the earning for Maldivians.

Detail of NTA disaggregation by service is presented in Table 3, Annex 1.

2.3 CONSTRUCTION OF PRIVATE CONSUMPTION VARIABLES

Private consumption is mainly based on household surveys. The main source of survey data used was Household Income and Expenditure Survey (HIES) 2016. HIES 2016 is represented at Atoll level with good enough sample to be used for this purpose. The age profiles from the survey are presented from age 0 to 90+. The age limit was set to 80+ years for NTA purpose to conform with the population projections and to lump the small number of respondents older than 90 years.

In household income and expenditure survey, consumption expenditure is mainly collected at household level. However, for the construction of age profiles in NTA, the individual is important rather than the household. This is because NTA provides disaggregation of the accounts by generation (captured through age groups). That is, the primary institutions are the different generations, therefore the need to have estimates by individuals.

Hence, in order to bring down consumption expenditure from household to individual level, household head is used as a representation of one individual at household level. Essentially the survey gives the expenditure of a certain item and a value of how many people of each age in that household are there. Eg: for education, how many household members attend school by age. Using the weights, individual level consumption is imputed for each individual.

2.3.1 PRIVATE EDUCATION EXPENDITURE

Household Income and Expenditure survey 2016 collected information on education expenses at unit level form (Form 3). This include school fees, tuition fees, other course fees, subject fees and other educational expenses. This information was collected for past 12 months. Additionally, educational expenses on stationaries was also collected in the survey for the past one month. This was multiplied by 12 to make it consistent with other expenditures, ie to bring all expenses to a yearly figure.

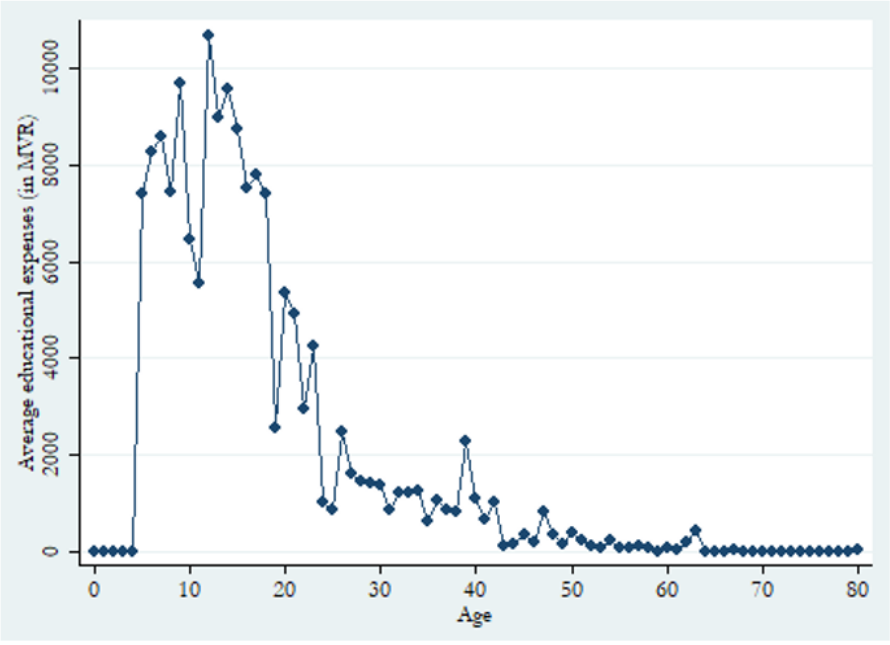
This information was useful for capturing household level out of pocket expenses on education. The educational expenses wherever defined was lump to generate educational expenses at:

- Pre-school level
- Primary level
- Secondary level
- Higher secondary
- Tertiary

The age for school attending population is considered as those aged between 5 and 50 years. The results from HIES 2016 showed that only few attended educational institution/ training after 50 years and therefore it was decided to top code education at age 50.

Since household expenses on education was captured, the next step involved allocating education expenses directly to household members. In the model used for education, 2 types of regression were applied to derive individual level expenses on education. The first regression is run on the educational expenses by level for school attending population by level. The second regression is run on educational expenses not defined by level for those currently attending educational institutions aged between 5 and 50 years. As an initiation each person in the household was assigned a weight of 0 in both regressions. This is followed by allocating the regression coefficient to each person who is currently attending school within the age of 5 to 50 years. Keeping in mind the regression will give negative regression coefficient, it was adjusted by subtracting it by the minimum value of regression and finally adding it all by 1 (assigned to cases where the weights was >0). Individual expenses are then summed up to derive total household expenses on education. This is then multiplied by the household's total education expenditure to derive the expenditure allocated to each household member who is currently attending school. These steps were followed separately for the 2 types of regression used in education. At the end, educational expense is sum of individual expenses generated through both the regressions.

Figure 2.1: Private consumption on education by age using three different models, HIES 2016



Source: HIES 2016

2.3.2 PRIVATE HEALTH EXPENDITURE

For private health expenditure, the data reported on 'health expenditure' from HIES 2016 was used. Expenditure on health was primarily collected under:

Form reference in HIES 2016	Detail (category)	Reference period
Form 2	Health expenses (in-patient)	Past 12 months
Form 2	Health expenses (out-patient)	Past month
Form 2	Health expenses (other medical expenses)	Past month

The data on health expenses did not differentiate between public and private utilization of health facilities at household level. From in-patient and out-patient expenses, the household expenses on health abroad was excluded. Expenditures abroad is part of the external account in SNA. Thus for NTA profile for the household final consumption expenditure on health in SNA, only domestic health expenditure has been used. However, given that Maldivians spend a substantial amount for health abroad, it may be considered as a future extension to Maldives NTA.

A total for health expenses was then derived by summing these 3 categories: in-patient, out-patient and other medical expenses. Both out-patient and other medical expenses was converted to yearly figures before summing.

Private health consumption is run against population utilization rate health facilities. For this, data from universal health coverage provided by the government was used. Data from Aasandha include breakdown of health facility utilization between private and government facilities. Since Aasandha is provided by government no distinction was made between public and private utilization. In this model, the utilization measure is calculated by each age and sex. Below sites the formula as given in NTA manual:

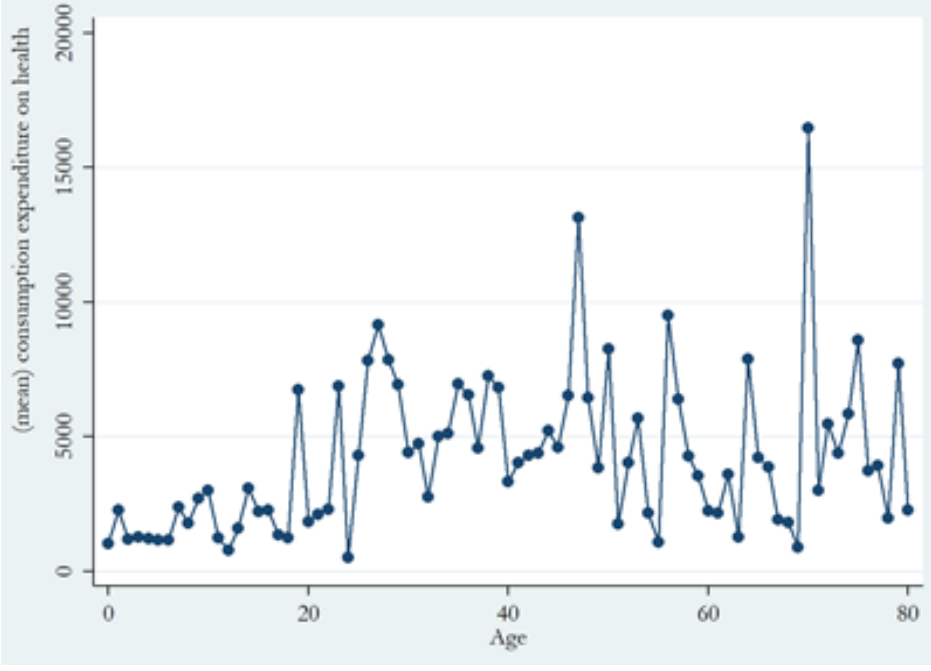
$$CFH_j = \sum_a \beta(a)U(a)M_j(a) + \varepsilon_j \qquad (5.4)$$

where $U(a)$ represents a single utilization measure for each age, and $M_j(a)$ is the number of household members aged a in household j. The estimated parameters $\beta(a)$ are interpreted as the unit cost for each age. In some cases it may be reasonable to assume that the unit cost is independent of age, but this is probably an unattractive option for health services. Thus, the unit cost may be assumed to follow a particular functional form, such as a quadratic in age. In this case, the model to be estimated is:

$$CFH_j = \sum_a \beta_0 U(a)M_j(a) + \sum_a \beta_1 aU(a)M_j(a) + \sum_a \beta_2 a^2 U(a)M_j(a) + \varepsilon_j \qquad (5.5)$$

The estimated parameters can be interpreted as the unit cost by age among in and out-patients. Once this has been done, the household health expenditure was regressed on the number of household members aged between 0 and 70 years. Next steps are similar to what was done in education, where as an initiation each person in the household was assigned a weight of 0 in the regression. This is followed by allocating the regression coefficient to each person in the household between 0 to 70 years. As regression results in negative coefficients, it was adjusted by subtracting it by the minimum value of regression and finally adding it all by 1 (only to cases >0). Individual health expenses were then summed up to derive total household expenses on health. This is then multiplied by household's total health expenditure to derive the unit cost per age.

Figure 2.2: Private consumption on health by age using three different models, HIES 2016



Source: HIES 2016

2.3.3 PRIVATE CONSUMPTION OTHER THAN HEALTH AND EDUCATION

HIES 2016 captured household expenditure by various categories and groups. This includes the following expenses at household level, unit level and at individual level:

Form reference in HIES 2016	Detail (category)	Reference period
Form 2	Monthly rent	Past month
Form 2	Expected rent (for owner occupied dwellings)	Past month
Form 2	Consumer Durables (Estimated price of purchase and received items)	Last purchased item and items purchased during past 12 months
Form 2	Repair of consumer durables	Past 12 months
Form 2	Repair and Maintenance of house	Past 12 months
Form 2	Furniture	Past 12 months
Form 2	Kitchen utensils and household furnishing items	Past 3 months
Form 2	Other Expenses (electricity, gas, water, waste, salary, domestic helpers salary/wage)	Past month
Form 2	Travel Abroad	Past 12 months
Form 2	Travel inbound	Past 6 months
Form 3	Household Maintenance	Past month
Form 3	Entertainment, Sports and Recreational Activities	Past month
Form 3	Transport, Postal and petrol	Past month
Form 3	Personal Care	Past month & past 12 month
Form 3	Media and other relatives	Past month
Form 3	Clothing	Past 3 months
Form 3	Footwear	Past 3 months
Form 3	Education expenses	Past 12 months & past month
Form 3	Insurance	Past 12 months
Form 4	Mobile phone Expenses (excl. purchase of phone)	Past month
Form 7	Food consumption including food away from home	Past 7 days

These expenses were converted to monthly terms before proceeding with any calculations. Again, these are expenses incurred at household level and has to be allocated among individual members. When it comes to other consumption, the age profile of consumption will vary by age. As per international reviews, consumption will be low for children or elderly and high among working age group. Unit cost per age has been assigned using an equivalence scale based on an extensive review of literature on household consumption.

Thus following international recommendation, all other household consumption was allocated to individuals using an equivalence scale where 0.4 was used for those age 4 or younger, and increases linearly from age 4 to age 20 and is equal to 1 for adults age 20 and older. The following formula as given in NTA manual was used for doing this:

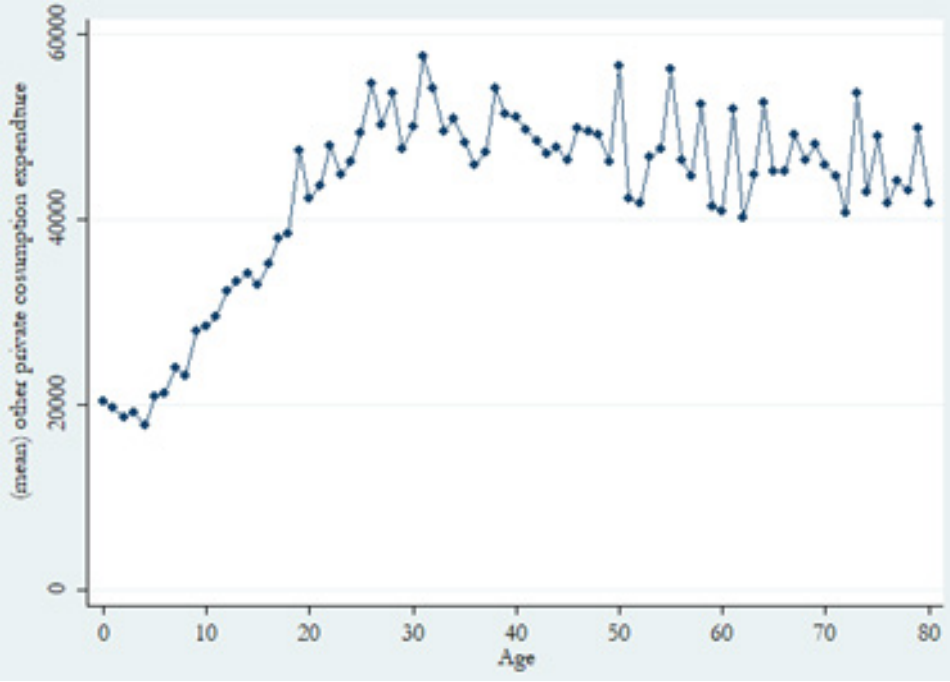
$$\alpha(a) = 1 - 0.6 * D(4 < a < 20) * ((20 - a)/16 - 0.6 * D(a \leq 4)$$

After assigning the equivalence scale values at individual level, this was then summed up at household level. A total of other expenditure was accumulated by excluding tobacco expenses from other consumption expenditure. Next step involved allocating other expenses at individual level. This was done for ages between 10 and 70 years.

The model for other consumption expenditure allocates individual consumption expenditure by dividing weighted equivalence scale values for each individual by total household weighted consumption and multiplied by other consumption expenditure.

Using these information, private consumption was derived by adding up individual consumption of other private expenditure with the results generated through the equivalence scale. This model seemed most applicable to Maldives and hence it was selected.

Figure 2.2: Private consumption on health by age using three different models, HIES 2016



Source: HIES 2016

2.4 SMOOTHING OF AGE PROFILES

The age specific estimates derived from survey sometimes have huge variation across different ages. Hence, smoothing is applied to the results to minimize the random variation of the age-specific estimates without eliminating the 'real' variations between ages.

The age profile of private education consumption was not smoothed in order not to lose variation across different ages, as education is specific to certain age group for entering and leaving the educational system.

On the other hand, the data on both private health and other consumption was smoothed to reduce the noise in the data. As recommended by NTA manual, Friedman's SuperSmoother was used which is a nonparametric regression estimator. The number of observations (for each age) in the survey was used as weights. In doing so, greater weight is given to the age-specific averages based on more observations, while age-specific averages based on fewer observations are given less weight. Using SuperSmoother can result in smoothed age profiles having negative figures for those age profiles which are very close to 0. Special care was taken to replace the negative smoothed values with the original estimates. Health consumption age profiles at age 0 was not smoothed as well. If the profiles are already smooth in some age groups, smoothed results was applied to those age groups with large variations. Similarly, for the labour income, smoothing was done specific to working age (for those above 15 years).

Care was also given to avoid double smoothing and hence no further smoothing was applied for age profile of the life cycle deficit, which is calculated as the difference between consumption and labour income. This is mainly because original age profiles composing of health and education has been already smoothed and adjusted to match the value of macro controls (only basic age profiles are smoothed and never higher order age profiles).

Figure 2.4: Result of smoothed age profiles over unsmoothed age profile for private consumption on health

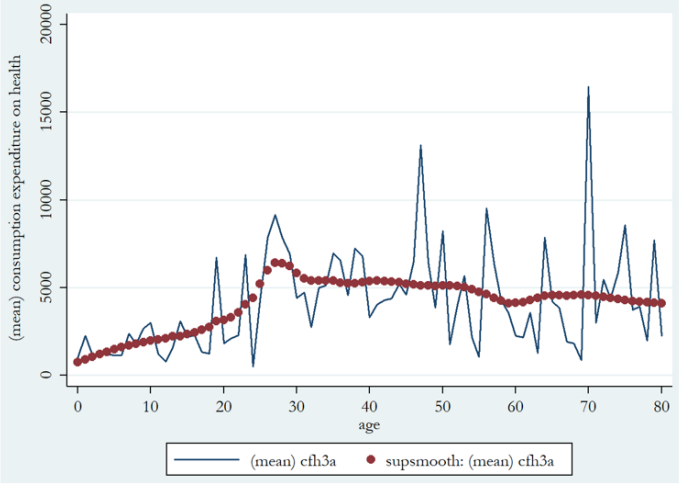
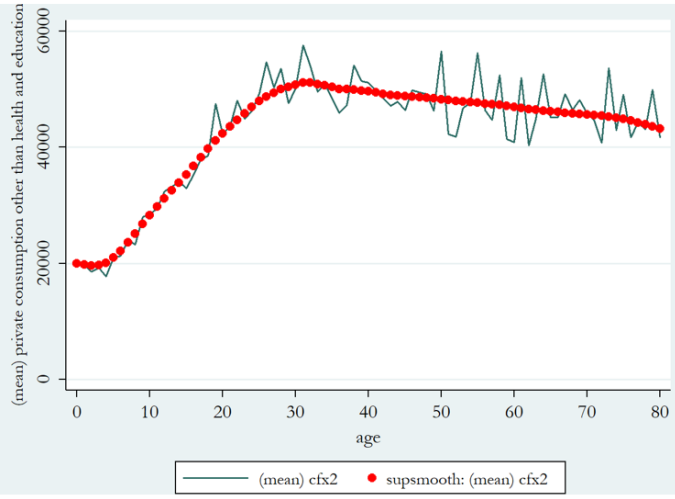


Figure 2.5: result of smoothed age profiles over unsmoothed age profile for private consumption other than health and education



Source: HIES 2016

2.5 LABOUR INCOME

In NTA, labour income consists of two components. The first is the wages and salaries of employees including the value of fringe benefits. The second is the labour share of entrepreneurial income by own-account workers, estimated using the income from entrepreneurial activities in which the household members are engaged. The age profiles for labour income are estimated using the HIES 2016 as these information was captured in the survey.

This section follows 2 parts. The part 1 describes how labour income was allocated for Maldivians while part 2 describes how labour income was allocated to Resident Foreigners.

PART 1:

In HIES 2016, employment information was captured from Resident Maldivian population 15 years and above. The component on earning was a sum of wages, salaries including other benefit that the 'employees' received from their primary, secondary and other income. Since the income was in monthly terms, this was converted into annual terms. This gives 'earnings and benefits'.

The next step involved generating self-employment income for Maldivians. The total income from self-employment was derived as well as total expenditure from self-employment was derived. Self-employment was categorized as those working as 'employer or owner, own account worker, own account worker (with family members) and contributing family workers'. Next, total income as well as total expenditure was generated at household level. Total earning from self-employment was derived after subtracting total household less total household expenditure. For households where the income was equivalent to 0, it was replaced with expenditure if expenditure was greater than income.

Similar to the iteration method in health consumption, the regression model was used for simplification. The average wage by age of those who reported as employees as weights was used to allocate the household level self-employment earnings to those who reported that they are self-employed. In doing so, those who are not self-employed gets an allocated weight of 0. To increase the likelihood of maximizing the approximation, the predictors are included in the model to run the second step iteration. Since no value was less than zero, all missing value was set to zero. Next step involved generating household level self-employment income by summing up the weighted individual allocations for a household. This was then allocated at individual level by dividing the weighted individual allocation by weighted household level self-employment income and multiplied by the self-employment value for a household from the survey.

As a next step the data was collapsed for self-employment income and for earnings by taking a mean for each age.

Since the data is gather at an individual level the next step involved smoothing the age profile of labour income from earnings. The first set of smoothing using SuperSmoother was run for the ages between 20

and 62 years. The second set of smoothing was run for the ages between 66 and 90 years. These two set of smoothing results was overlapped and since smoothing results with negative value, these values was replaced with the original values.

Smoothing for self-employment earning was done using the same method. Since smoothing resulted in negative values for younger ages, for those less than 15 years it was replaced with original values.

Figure 2.6: result of smoothed age profiles over unsmoothed age profile for labour income- earnings

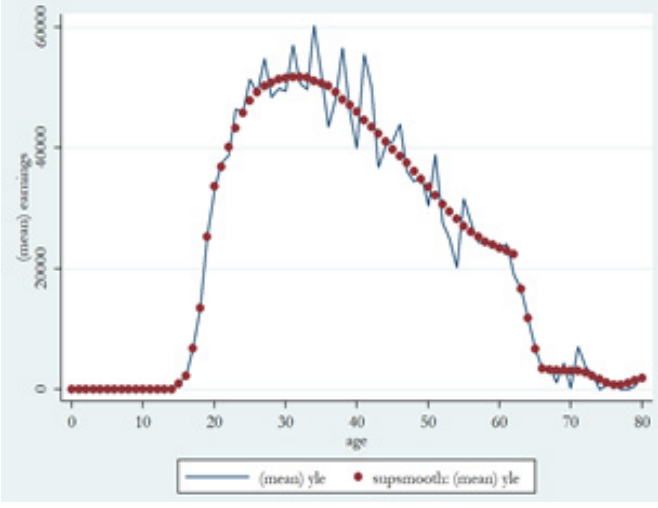
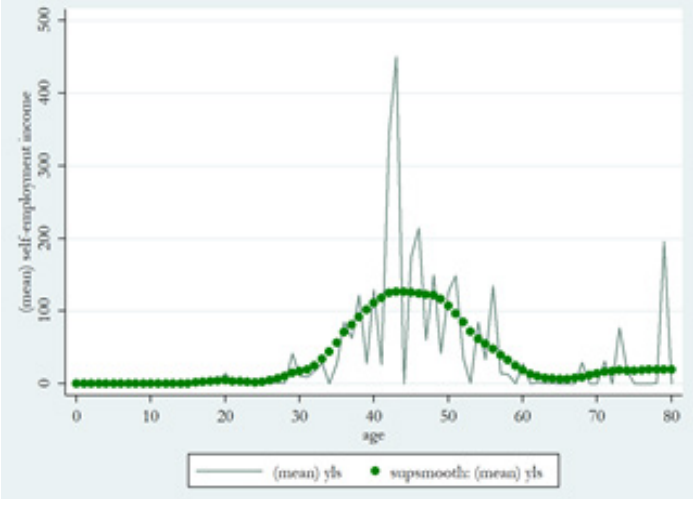


Figure 2.7: result of smoothed age profiles over unsmoothed age profile for labour income- self-employment income



Source: HIES 2016

As seen from Figure 2.6 and Figure 2.7 labour income from earnings is like an inverted U-shaped curve while labour income from self-employment income is much smaller in size.

PART 2:

Since HIES 2016 captured only a small proportion of resident foreigners, both the data from HIES 2016 and census 2014 was used to estimate the age profile for foreigners.

Census 2014 collected detail level information on foreigners including their occupation details. The occupation of the foreigners was further categorized into the skill level defined in the ISCO as:

Skill Level	ISCO group
Level 0	Missing values (which is not given in ISCO and specific to this purpose)
Level 1	Involves the performance of simple and routine physical and manual tasks. This is ISCO major group equal to 9
Level 2	Typically involves the performance of tasks such as operating machinery and electronic equipment, driving vehicles, maintenance and repair of electrical and mechanical equipment, and manipulation, ordering and storage of information. This is equivalent to ISCO major group 4 to 8.
Level 3	Typically involve the performance of complex technical and practical tasks that require an extensive body of factual, technical and practical tasks that require an extensive body of factual, technical and procedural knowledge in a specialized field. This is equivalent to ISCO major group 3.
Level 4	Typically involve the performance of tasks that require complex problem-solving, decision-making and creativity based on an extensive body of theoretical and factual knowledge in a specialized field. This is equivalent to ISCO major group 1 and 2.

Once the skill level for foreigners was identified, the mean count of skill level by age was generated. The foreign population by skill level was derived so that this could be used to estimate the wages for these skill level based on the locals from HIES 2016. The wages of Maldivians for these skill level was used as proxy to reshape it for macro controls for foreign workers.

As a next step, the wage rates by age for Maldivians was applied as a proxy for the relative wages among occupation groups where foreigners are employed. The distribution of foreign workers by occupation was taken to calculate the overall average wage by age of foreign residents. Smoothing was then applied to each skill level by age.

2.6 ADJUSTING PRIVATE CONSUMPTION FOR NTA MACRO CONTROLS

The age profiles generated from the survey data often result to be inconsistent with aggregate controls. To assure that the estimated allocation for each age from the survey match with the aggregated NTA macro control, scaling factor is applied to each account (ie. is to education, health and other private consumption).

To adjust each profile, the first step was to calculate the scaling factor for each service. To do that macro control for each service was divided by the unadjusted aggregate value of the flow of service. The unadjusted aggregate value of each service was derived by multiplying the estimated allocation for each age for a given service (education, health, and other consumption) by the projected population for each age and deriving the sum of it. Once the unit cost /scaling factor was generated, the per capita spending for each service was calculated separately as allocation derived from the survey for each age by the scaling factor. This was done separately for raw and smooth data.

$$\theta = \frac{X}{\sum_{a=0}^{80+} x(a)N(a)} \quad (5)$$

In the above formula, X represents the value of a macro control, x(a) is the per capita estimated (unadjusted) age profile at age a and N(a) is the population count at age a. To calculate the adjustment factor, we therefore divide the value of a macro control (for a specific country and year) by the unadjusted aggregate value of estimated economic activity. The calculated adjustment factor is then used to finalize the age profile by shifting the unadjusted age profile downward or upward by the same factor for each age group a:

$$\bar{x}(a) = \theta\, x(a) \quad (6)$$

$$\bar{X}(a) = \bar{x}(a)N(a) \quad (7)$$

This is given in detail on the construction of public consumption variables.

2.7 CREATING PUBLIC CONSUMPTION VARIABLES

Similar to private consumption, public consumption is also divided into three main categories: education, health and public consumption other than education and health.

Data in public consumption are not available from household surveys and are usually found in administrative data, government reports, etc. The next section explains how each of these variable was constructed.

2.7.1 PUBLIC EDUCATION CONSUMPTION

Public education consumption consists of two parts: formal and other education consumption. Formal education consumption is government spending on education for children and young adults attending schools. This includes primary, secondary and tertiary education levels. Other education consumption refers to spending on cultural and other types of general and adult education. These are not targeted for a particular age groups.

For calculating age profiles for school enrollment, data was received from Ministry of Education on current school attending population. However, complete data on tertiary education was not made available by the time of NTA computation. Since HIES captured school attendance population by age and by level, this information was used to come up with public education age profile. From HIES 2016, the average number of children by age was generated for pre-primary, primary, lower secondary, upper secondary, post-secondary non-tertiary and tertiary for the Maldivian population.

Since HIES 2016 reported school attendance of children 5 years and above, the missing data was supplemented by administrative data for children less than 5 years from Ministry of Education. These proportions were then included for each age by level in the excel sheet as enrolment rate. Public informal education consumption is not age targeted, so it was allocated equally with a rate of 1.0 (where everyone consumes equally).

Next step was to calculate the unit cost per level for education. To do that the scaling factor for each level was calculated which is macro control divided by the unadjusted aggregate value of the flow of education for a given level. The unadjusted aggregate value is derived by multiplying the enrolment rates of each level by the projected population for each level and deriving the sum of it. Once the unit cost/scaling factor was generated, per capita spending for each age was calculated separately as enrolment rate times the unit cost. The per capita consumption for public education was calculated by summing across the levels of education- that is primary, secondary and tertiary. Total public education (CGE) by age was computed by summing public formal and informal education consumption by age.

2.7.2 PUBLICLY FUNDED HEALTH CONSUMPTION

Public consumption on health consists of three parts: health care purchased by individuals and reimbursed through public programmes, health care provided directly to individuals by government clinics and hospitals, and collective services such as health education and preventive programmes that are provided to the public at large.

The health facility utilization data from Aasandha was used as proxy for service provided directly by government. The universal health insurance scheme was introduced in 2012 following the enactment of the National Social Health Insurance Act in December 2011, which provided a legal framework for establishing a universal health care financing scheme for all Maldivians. It was named 'Aasandha' and covered foreign facilities empaneled in the scheme including hospitals in Sri Lanka and India. In 2014, 'Aasandha' scheme was again re-named to 'HusnuvaaAasandha' (translates into a universal health insurance scheme without a price ceiling). This allowed unlimited coverage for all necessary healthcare services, sickness and injuries.

Some pre-calculations was done to data received from Aasandha. Aasandha data for expenditure incurred by the government to health facilities was made available for in-country and abroad for both in-patient (IP) and out-patient (OP). From this information, expenses spent on health facilities in Maldives was included to take into account the domestic health expenditure. As a next step, total expenditure on OP and IP was derived by adding up expenses paid to government and private health facilities in the country (dividing it by million MVR). This was done for both IP and OP separately. The next step was to generate the per capita expenditure on public health. This was done by dividing the total expense for each age divided by the total population in each age. The utilization rate per age was calculated next which is derived by dividing expen-

diture per case for each age by the total expenditure for each age. This was done for both government and private facilities in Maldives. The sum of these two was divided by the total population in each age to get the case rate /utilization rate for each age.

The public health consumption consists of three set of numbers. The first is the per capita expenditure the government pays to the health facilities through Aasandha. This has been labeled as OP(Aasandha) and IP(Aasandha). The second are those provided directly by the government through its maintained health facilities. Since no data was available for this, the utilization rate by age based on Aasandha data has been used. General health or collective health services was allocated on a per capita basis where everyone was given a rate of 1.0 uniformly assuming that each individual consumes the same amount of these services.

The next step was to calculate the unit cost of health. This was done first by multiplying the expenditure/ utilization rate for each age by the projected population for each age and deriving the sum of it to get the number of persons who have availed health services. SNA macro controls was then applied, where macro controls for each was divided by the population who have availed health services. This gives the unit cost of health each group. Once the unit cost was generated, per capita spending for each age was calculated separately as expenses across three sections (Aasandha, utilization and general health) times the unit cost. Total public health (CGH) by age was computed by summing Aasandha, utilization and general health).

2.7.3 PUBLIC CONSUMPTION OTHER THAN EDUCATION AND HEALTH

Majority of public consumption consist of education and health. This is mainly because the public consumption varies significantly with age for education and health. The rest of public consumption, i.e public consumption other than education and health, is combined into one variable. As given in NTA manual, the per capita age profile of other public consumption was assumed to be constant, i.e these goods and services were allocated equally to all members of the population.

Public consumption falls into public collective consumption and public individual consumption. However, in the case of Maldives no distinction has been made between these two due to limited data availability. Hence, public other consumption at the rate of 1.0 uniformly has been used, assuming each individual consumes the same amount of these services.

Unit cost for other consumption was then derived. This was done first by multiplying the consumption rate of 1.0 for each age by the projected population for each age and deriving the sum of it to get the number of persons who have consumed other services. SNA macro control was then applied, where macro control was divided by the total population who have consumed other services to get the unit cost. The unit cost value was then used to generate the per capita spending for each age (in this case it is the same amount across all ages).

2.8 CREATING LIFE CYCLE DEFICIT VARIABLES

The life cycle deficit (LCD) is the difference between consumption and income. If the LCD is negative, it is called a life cycle surplus.

The total consumption is the sum of private and public consumption. Income is the sum of earnings and self-employment labour income.

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