

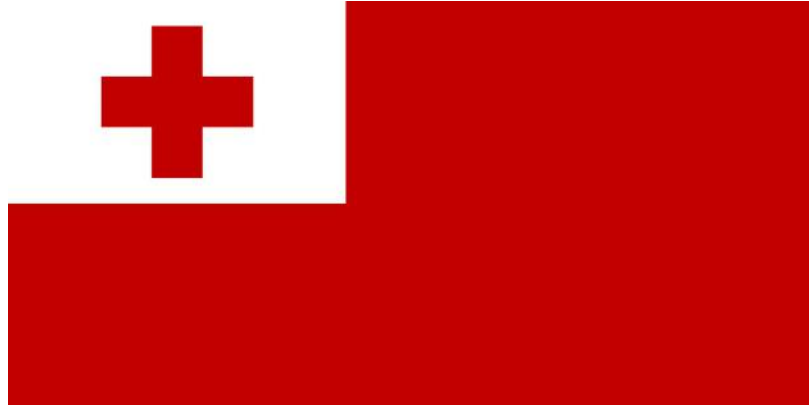


*Assessing progress towards the eradication of poverty
in the Kingdom of Tonga*



November 6, 2018

Assessing progress towards the eradication of poverty in the Kingdom of Tonga



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1 Poverty in Tonga: Key figures

The first Sustainable Development Goal (SDG) aims to eradicate poverty in all its forms everywhere and leave no-one behind- this requires countries to measure and reduce multidimensional adult and child poverty. SDG 1.1 aims to reduce monetary poverty as measured by the international \$1.90 per person per day poverty measure. SDG 1.2 requires countries to measure and reduce multidimensional adult and child poverty using national poverty measures. This document reports on Tonga’s progress towards both goals.

This approach is also in agreement with the conclusions of the World Bank commission on Global Poverty (World Bank, 2017, known as the Atkinson report) that recognised the multidimensional nature of poverty and encouraged countries to develop measures to reflect this. The data used in this report provides from the 2015/16 Household Income and Expenditure Survey (HIES).

1. Extreme poverty: population living with less than 1.90\$ a day

The first target of the SDGs (target 1.1) is to eradicate extreme poverty, measured as people living on less than the equivalent of \$1.90 per person per day. In Tonga **3%** of the population (around 3,200 Tongans) live with less than 3.1 Pa’anga a day (the equivalent of \$1.90 PPP in 2016 prices). The proportion of the population living in extreme poverty has remained relatively stable over the last 15 years (Table 1). The small variations visible in the table are not statistically significant and are likely to reflect variations in the data rather than actual change.

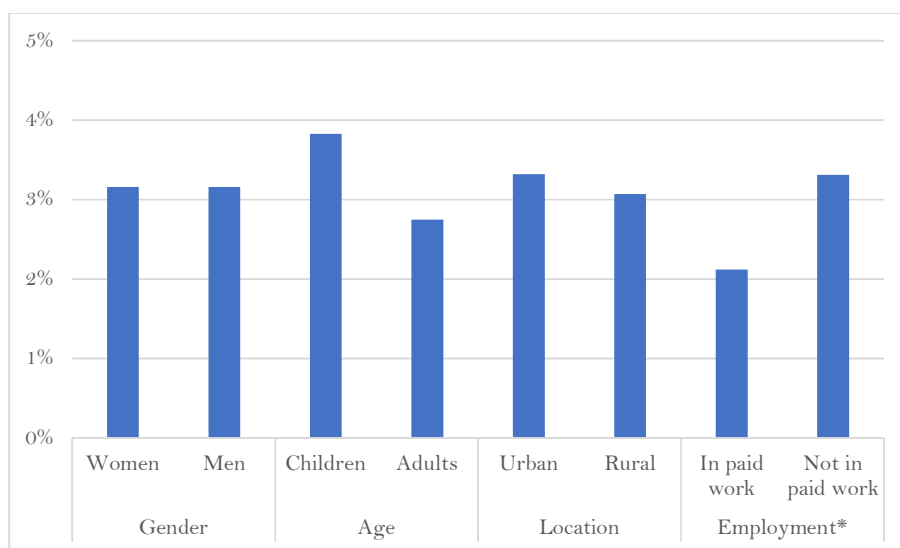
Table 1 Population living below 1.90\$ a day

| Year | 2001 | 2009 | 2016 |
|------|------|------|------|
| % | 2.8 | 1.1 | 3.1 |

Source: 2001, 2009 World Bank; 2016; authors

Extreme poverty is consistently low across sub-group as can be seen in Figure 1 that shows extreme poverty rate by gender, age, location (urban or rural) and whether the respondent is in paid work. The latter refers to the adult population only. The differences between groups are small and not statistically significant.

Figure 1 Population living with less than 1.90\$/day by sub-group



Note: (*) adult population only

2. Multidimensional poverty: applying Tonga's national poverty measure

Poverty is widely acknowledged to be a multidimensional phenomenon. Previous research in the region suggests that income poverty measures can underestimate the true extent of poverty. For instance, in research in Asia and the Pacific region Minujin (2011) found that income poverty measures can underestimate child poverty and deprivation. Similarly, in a study of poverty in Vanuatu, Deeming and Gubhaju (2015) reported that the World Bank's 'dollar-a-day' measure severely underestimated poverty. Designing effective anti-poverty policies requires the development of measures that go beyond income and appropriately reflect the experiences of the poor in a given society.

With that aim, the National Statistics Office developed Tonga's multidimensional poverty measure, which builds on the Consensual Approach (Mack and Lansley, 1985). The consensual approach combines data on income and deprivation in order to create a more valid and nuanced picture of poverty. The **poor** are those who experience both low income and are also materially and socially deprived. Income is measured at the household level -reflecting the sharing of resources among household members – and takes into account both monetary (e.g. wages) and non-monetary sources (e.g. self-production). Deprivation is captured through an index of socially perceived necessities -items and activities that the majority of people in Tonga consider that no-one should go without-. The index contains both individual and household level indicators and has been tested for suitability, validity, reliability and additivity¹. Different indices are used for children and adults to acknowledge the specific needs of children (Minujin and Nandy, 2012). The income poverty line is set at 944 adjusted² Pa'anga per month for children and 970 Pa'anga per month for adults.

According to this national definition, in Tonga, 27% of the population are poor: they are deprived and live in a low-income household. Child poverty rates are higher than adult poverty rates, with 33% of children – one in three- living in poverty compared to 23% of adults -almost one in four.

¹ For further details in the process see Guio et al., (2017)

² These are adjusted per capita figures, adjusted using the square root of the number of household members using the formula: adjusted income = income/square root (n members in household). This is preferable to a pure per capita measure in that it allows for economies of scale resulting from sharing resources within households.

Table 2 Multidimensional poverty (CA) by age group (%)

| | Population | Adults | Children |
|------------------------|------------|-----------|-----------|
| Poor | 27 | 23 | 33 |
| Vulnerable deprivation | 14 | 14 | 16 |
| Vulnerable income | 22 | 25 | 19 |
| Non-poor | 36 | 39 | 32 |
| N | 101,804 | 63,448 | 12,180 |

The **vulnerable by deprivation** experience material and or social deprivation but not low income. These may be households who have recently experienced an increase in their income (e.g. by a member gaining paid employment) after a period in poverty. This group is not currently poor but may benefit from support to cover their basic needs and constitutes 14% of the population.

The **vulnerable by income** have low income but are not experiencing deprivation. These households may be covering their needs through support from family and friends or may be able to draw on savings. This group is vulnerable to experiencing poverty in the future. Around one in five (or 22%) Tongans are vulnerable by income. Adults are more likely to be in this group compared with children.

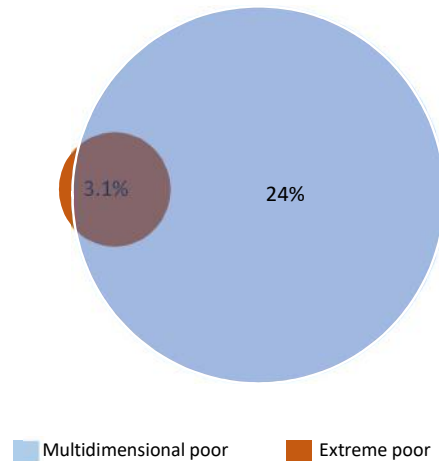
The fourth group are the **non-poor**. More than one in three Tongans (33%) are in this most advantaged group, they do not experience low income or deprivation.

3. Comparing multidimensional and extreme poverty

The World Bank's dollar a day and the multidimensional poverty measure capture different phenomena. The World Bank measure aims to measure extreme monetary poverty. The multidimensional measure on the other hand reflects the proportion of the population who are prevented from full participation in Tongan society due to a lack of sufficient resources.

The extreme poor are effectively a sub-set of the multidimensional poor. The majority of the population (73%) is not-poor by either measure. At the other end of the spectrum, 3% of the population are poor by either measure. Almost a quarter of Tongans (24%) are living above \$1.90 a day threshold but remain poor according to the multidimensional measure. This group is able to avoid the most extreme forms of poverty but still experiences deprivation and barriers to fully participate in Tongan society e.g. to replace worn out clothes or mend or replace broken furniture. Finally, a small group (less than 1%) live below \$1.90 a day but is not poor according to the national definition. This sub-group has very low monetary income but are able to cover their needs through other means, such as community support and self-production, and thus avoid deprivation. These are however a small minority as can be seen in Figure 2.

Figure 2 Extreme poor and multidimensional poor



Extreme poverty in Tonga, as measured by the international poverty line, is low (3%). This rate is consistent with Tonga's status as a middle-income country. However, income alone is not necessarily a good indicator of living standards and a substantial minority of the population experiences deprivation despite not living in extreme poverty. Furthermore, avoiding poverty requires more than covering basic needs such as food and shelter. The multidimensional measure reflects the perceptions of the Tongan population about the necessities of life in Tonga today. Using this more appropriate measure, 27% of the population are living in poverty. Reducing poverty in Tonga today requires both attending to the needs of the most vulnerable and improving the standards of living of those sections of the population that despite avoiding the most extreme forms of poverty still experience deprivation and want in their everyday lives.

4. Key findings on multidimensional poverty in Tonga

- There is remarkable consensus with regards to the necessities of life in the Kingdom of Tonga. The consensus exists for adult, household and child related items and activities. The items can be used to create a socially valid measure of poverty in Tonga.
- One in five (22%) adults in the Kingdom of Tonga are poor: they live in a low-income household that lacks 3 or more necessities. One in ten adults live in extreme poverty: their household income is very low and they lack 5 or more socially perceived necessities
- Children are more likely to be poor than adults: one in three children in Tonga (33%) live in poverty. Furthermore, almost half of those (15% of children) live in extreme poverty.

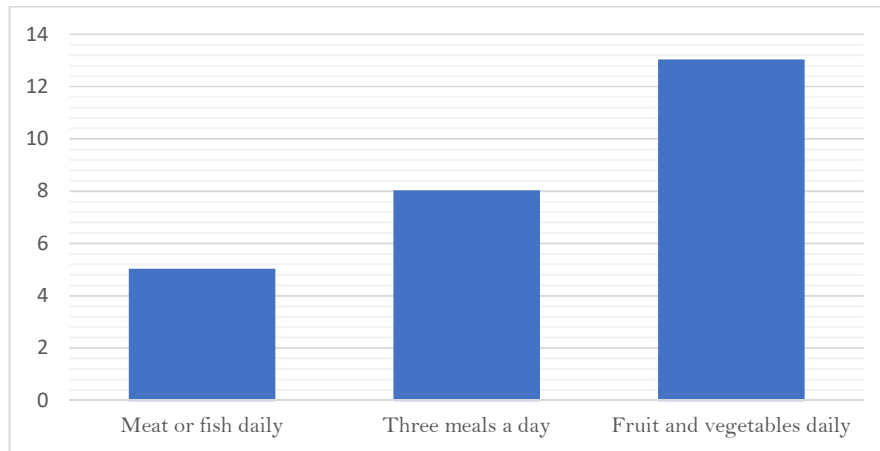
One in three children are poor compared with one in five adults



Food deprivation in Tonga is comparatively low. However, 5% of children cannot afford to eat meat or fish daily, and 8% cannot afford three meals a day. Around 13% of children cannot eat fruit and vegetables daily.

Food deprivation is an issue for a minority of children

Figure 3 Children who cannot afford (%)

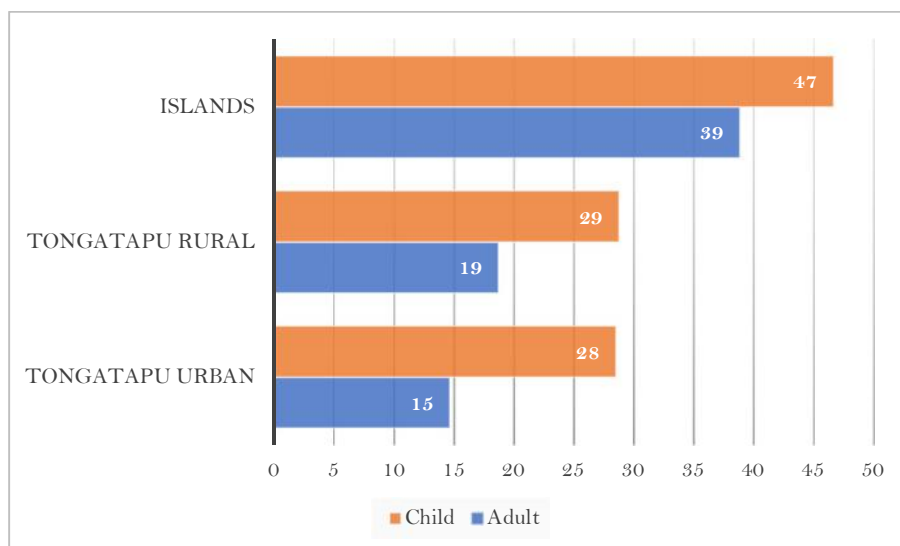


The most common forms of deprivation have to do with **household items**. A third of adults and children live in households who cannot afford to replace worn out or broken furniture, with a similar proportion not being able to afford to repair broken electrical goods (e.g. a refrigerator). Interventions to reduce **child poverty** must consider household conditions as well as the situation of children themselves.

Poverty is more common in the islands compared with Tongatapu. More than one in two children in the islands live in poverty compared with less than one in three in Tongatapu. While two in five adults in the islands are poor, less than one in five adults in Tongatapu experience poverty.

Poverty is more common in the islands

Figure 4 Child and adult poverty by location (%)



Despite only 25% of the population living in the islands, **40% of the poor (both children and adults) live in the islands**. Accordingly, **strategies to reduce poverty must target both Tongatapu and the islands**.

Unfortunately, given the survey sampling framework, at the time of writing, it is not possible for this report to provide island level poverty estimates. The generation of island by island estimates requires the use small area estimation methods. A forthcoming article by Najera, Fifita and Fainganuku will provide regional estimates for Tonga.

Poverty is associated with a reduced ability to secure access to basic human **rights**. Households living in poverty are more likely to have problems accessing safe drinking water and sanitation facilities (SDG 6).

The remainder of this report explores poverty in Tonga using the multidimensional poverty measure developed by the Department of Statistics in collaboration with experts from the University of Bristol. Chapter 2 Poverty in Tonga provides definitions and key concepts and poverty estimates for the child, adult and total population. Chapter 3 focuses on adult and household poverty, identifying how many adults are poor, who are the poor and what are the most common forms of adult deprivation in Tonga, and Chapter 4 does the same for children. The chapter also includes a comparison with previous child deprivation estimates (Fifita et al., 2015) to assess progress over time. Finally, Chapter 5 offers some methodological and policy suggestions based on the findings of this report.

2 Multidimensional Poverty in Tonga 2015/16

To act, we need to understand and, to understand, we need to measure. The first Sustainable Development Goal (SDG) aims to **eradicate poverty in** all its forms and everywhere - this requires countries to measure and reduce multidimensional adult and child poverty. Designing **effective anti-poverty policies** requires the development of measures that go beyond income and appropriately **reflect the experiences of the poor**. This report uses the Consensual Approach to develop age-specific poverty measures that are relevant to **Tonga today** and can be used to design context appropriate policy responses. This opening section provides key definitions that assist the reader in interpreting the results presented in this report.

2.1 Defining poverty: theoretical considerations

Following Townsend (1979), **poverty** is here defined as a lack of command of resources over time that limits individuals and households' ability to participate in society.

“Individuals, families and groups in the population can be said to be in poverty when they lack the resources to obtain the types of diet, participate in the activities and have the living conditions and amenities which are customary, or at least widely encouraged or approved, in the society to which they belong.” (Townsend, 1979, p. 31)

Resources are broadly defined by Townsend as cash income; capital assets, value of employment benefits, public and social services and private income in kind (1979, p.89), acknowledging that -in Tonga, and elsewhere- households rely on **multiple sources, besides monetary income**, in order to cover their needs. Accordingly, in the survey, income captures both monetary and non-monetary income (e.g. farming and self-production).

The consequence of poverty is **material and social deprivation**: the enforced lack of social perceived necessities (Mack and Lansley, 1985; Gordon et al, 2006). These are captured using the Consensual Approach (CA, Mack and Lansley, 1985). The CA allows for the development of poverty measures that are both methodologically robust and context specific.

“Those who have no choice but to fall below this minimum level can be said to be ‘in poverty’. This concept is developed in terms of those who have an enforced lack of socially perceived necessities. This means that the ‘necessities of life’ are identified by public opinion and not by, on the one hand, the views of experts or, on the other hand, the norms of behaviour per se.” (Mack and Lansley, 1985, p. 45)

Thus, the CA goes beyond income to look at deprivation and reflect the experiences of the poor as well as what society at large perceives all its members should have. The list of **socially perceived necessities** in Tonga reflects what society thinks all Tongans should have/be able to afford. These include both material necessities such as some new clothes and three meals a day, as well as social necessities such as inviting family and friends for a meal at home, or celebrating important events such as Christmas. The items vary for children and adults to reflect their different needs (e.g. education).

This report produces estimates for child, adult and household poverty based on age-specific measures. Using child specific measures results in two poverty lines, one for adults and one for children, and thus in increased complexity. However, this allows the development of age-specific measures that can be used to monitor adult and child poverty in accordance with the requirements of the SDGs, and fundamentally, it also allows for a more nuanced understanding of poverty among the child population.

Additionally, it is necessary to acknowledge that poverty is dynamic (Gordon, 2006). Individuals and households may experience periods of poverty following a drop in resources e.g. after someone falls ill or leaves the household, or there is an increase in needs following the birth of a new child. Other changes such as a new adult joining the household or a good crop season may result in new sources of income, lifting households out of poverty. Thus, both households' income,

their needs and their ability to cover these needs vary over time. As a result, cross-sectional measures of poverty, that capture the situation of households at one point in time, will by definition only offer a partial view of a dynamic phenomenon. Moreover, a reduction in resources may not automatically translate in deprivation. Often households can rely on wealth and assets accumulated during periods of higher income (e.g. savings, furniture, a car, etc.). However, a household that experiences low resources over a long period of time is likely to fall into poverty. By using both income and deprivation data, it is possible to obtain a better understanding of poverty.

“A cross-sectional ‘poverty’ survey can provide some limited but useful information on the dynamics of poverty since it is possible not only to identify the ‘poor’ and the ‘not poor’ but also those likely to be sinking into poverty (that is, people/households with a low income but a high standard of living) and those escaping from poverty (that is, people/households with a high income but a low standard of living).” (Gordon, 2006, p. 41).

Besides shedding light on poverty dynamics, the use of deprivation indicators helps to overcome some of the limitations of income measures. A household with a low income may have their needs covered by their family or the community. For instance, a single mother may have low income herself but receive support from her parents and siblings in the form of food and housing, and from the community or the church in order to cover school uniforms and clothes for her children. A valid poverty measure must account for the multiplicity of resources available to households (e.g. family, community, government and other forms of support) and their impact on deprivation.

Thus, examining both income and deprivation allows for a more nuanced understanding of poverty. Townsend’s approach allows four groups to be distinguished according to whether they experience low income and/or deprivation. The **poor** are those who experience both low income and are also deprived. Income is measured at the household level –reflecting the sharing of resources among household members – and takes into account both monetary (e.g. wages) and non-monetary sources (e.g. self-production). In Tonga about 27% of the population are poor. Child poverty rates are higher than adult poverty rates, with 36% of children living in poverty compared with 22% of adults.

The **vulnerable by deprivation** experience material and or social deprivation but not low income. These may be households who have recently experienced an increase in their income (e.g. by a member gaining employment) after a period in poverty. This group is not currently poor but may benefit from support to cover their basic needs and constitutes around 12% of the population.

The **vulnerable by income** have low income but are not experiencing deprivation. These households may be covering their needs through support from family and friends or be able to draw on savings. This group is vulnerable to experiencing poverty in the future. Around one in five Tongans are vulnerable by income.

The fourth group are the **non-poor**. This is the most protected group. Four in ten Tongans do not experience low income or deprivation.

Table 3 Poverty rates by age group, HIES 2015/16

| | Population | | Adults | | Children | |
|------------------------|------------|----------------|-----------|----------------|-----------|----------------|
| Poor | 27 | [24-30] | 23 | [20-26] | 33 | [30-37] |
| Vulnerable deprivation | 14 | [12-17] | 14 | [11-17] | 16 | [13-19] |
| Vulnerable income | 22 | [19-26] | 25 | [21-29] | 19 | [16-23] |
| Non-poor | 36 | [33-40] | 39 | [34-43] | 32 | [16-23] |
| N | 101,804 | | 63,448 | | 12,180 | |

Distinguishing these four groups will enable policy makers to identify priorities and design appropriate policy responses. This report will...

- Present estimates of poverty in Tonga for households, adults and children, using the Consensual Approach,
- Identify the groups most vulnerable to poverty and deprivation
- Produce recommendations for policy and measurement

The next section offers some more detail on the process used to develop a socially and scientifically valid measure of poverty in Tonga using the Consensual Approach. The consensual approach rests on two pillars, the identification of **socially perceived necessities** i.e. the things that no-one in Tonga should have to do without, and the notion of ‘**enforced lack**’ so that only individuals and households who lack these necessities because they cannot afford them are considered as deprived. Each item as well as the overall index are tested for validity, reliability and additivity in order to build a scientifically valid poverty measure.

2.2 Developing a poverty measure for the child and adult population in Tonga

To be meaningful, poverty measures must be both socially valid and scientifically robust. A measure is socially valid if it accurately reflects what society understands by poverty (Mack, 2017). The consensual method develops socially valid measures through the democratic identification of the necessities of life. The second requirement, scientific validity, requires that poverty is measured by identifying a set of indicators that result in a robust index (Guio et al., 2009).

This section details the results of the application of the consensual method to the national Household Income and Expenditure Survey (HIES) 2015/16 data to develop household, adult and child poverty measures. The sub-section examines the necessities of life in Tonga, for children and adults. The second part details the process (validity, reliability and additivity analyses) for building a robust poverty indicator that is stable over time and can be used to compare groups. Further detail are available in Appendix 3.

2.2.1 The necessities of life in Tonga

The cornerstone of the consensual approach is the identification of items that are essential for participation in society. Respondents were given a list of items relevant to life in Tonga and asked to identify whether these were “necessary for every adult/child/household in the country today”. The question specified that household items refer to all household members. All items included in the list were identified as essential by a substantial proportion of the population. Table 4 reports the proportion of the population that identified each adult, household and child related item as a necessity. In this table, as well as in the remaining tables in the report short descriptions are provided for brevity. The full description of each item, as used in the questionnaire, is provided in Appendix 1.

All items included in the deprivation module were identified by at least nine out of ten respondents as necessities of life in Tonga. That indicates a strong agreement with regards to the items and activities that no-one in Tongan society should go without irrespectively of personal circumstances, a finding that is in line with international research (Mack, 2017). The items that generate wider consensus are related to sufficient and quality food (two/three meals a day for adults, a proper meal on Sundays), properly fitting shoes for children and adults, all prescribed medicine for any member of the household and child items related to education such as having a place to study and school uniform and equipment. All items in the table are socially valid and are potentially appropriate indicators of poverty in Tonga.

Table 4 Essential necessities in Tonga

| | Essential (%) |
|--|------------------|
| ADULT ITEMS | |
| Two meals a day | 98 |
| A good meal with meat/fish on Sundays and other special occasions | 98 |
| Two pairs of properly fitting shoes, including a pair of all-weather shoes | 97 |
| A small amount of money to spend each week on yourself | 96 |
| Clothes for special occasions | 96 |
| Presents for friends or family once a year | 96 |
| Enough money to be able to visit friends and family in hospital | 96 |
| Fresh fruits and vegetables at least once a day | 96 |
| Replace worn-out clothes | 95 |
| Access to safe public transport such as buses and boats | 95 |
| Get together for a meal or drink monthly | 94 |
| HOUSEHOLD ITEMS | |
| All medicine prescribed by your doctor, when any person in this HH is sick | 97 |
| Regular savings for emergencies | 95 |
| Having your own means of transportation (car, boat, motorcycle etc). | 95 |
| Enough money to repair broken electrical goods such as refrigerator or washing machine | 94 |
| Enough money to replace any worn out furniture. | 92 |
| CHILD ITEMS (0-15) | |
| Properly fitting shoes | 98 |
| Three meals a day | 98 |
| One meal with meat, chicken, fish or vegetarian equivalent daily | 98 |
| Some new, not second-hand clothes. | 97 |
| All school uniform of correct size and equipment required (e.g. Books, pen) | 97 |
| A suitable place to study or do homework | 97 |
| Enough beds and bedding for every child in the household | 97 |
| Celebrations on special occasions such as birthdays, Christmas or religious festival | 96 |
| Fresh fruits and vegetables at least once a day | 96 |
| To participate in school trips and school events that cost money. | 95 |
| Books at home suitable for their age (including reference books and supplementary exercises) | 94 |
| Tutorial lessons after school at least once a week (during term time) | 93 |
| Leisure equipment (e.g., sports equipment or a bicycle) | 93 |

A risk with using democratic approaches based on the views of the majority, is that the views of minorities may be ignored. This potential drawback can be avoided by assessing to what extent there is consensus across social groups about what are the necessities of life. Variations in perceived necessities across population groups are detailed in Appendix 2. There is remarkable consensus with regards to the necessities of life in the Kingdom of Tonga. The consensus exists for adult, household and child related items and activities. The items can be used to create a

socially valid measure of poverty in Tonga. Further details on the process used to create the measure are given below.

2.2.2 Validity, reliability and additivity

A good measure of poverty and, by extension, a good poverty index, must be not only socially valid but also scientifically robust. Data and researchers are befouled by error. In order to appropriately identify the poor (and distinguish them from the non-poor) researchers must use measures that accurately reflect the multidimensional nature of poverty, are comparable across time and space and capture different degrees of poverty severity. An index that does not fulfil these criteria is likely to be a poor instrument for measuring poverty.

In a robust index, each item included must be a valid indicator of poverty and, together with the other items, add into a reliable and valid measure of the underlying concept –poverty. This section examines each item using the scientific method to develop a robust measure of poverty which fulfils the following characteristics (Guio et al., 2009):

- **Suitability:** The indicators of social and material deprivation should be regarded as necessities by the majority of the population, i.e. the necessities of life.
- **Validity:** An indicator has construct validity if it measures what it says it does. In this case for an indicator to be valid it should be a manifestation of poverty (i.e. low resources). Social and material deprivation should be associated with a higher risk of experiencing financial strain or measures that are known to consistently correlate with poverty (e.g. ill health).
- **Reliability:** The indicators should result in a homogenous index, so that poverty is measured consistently, and the poor can be clearly distinguished from the not poor.
- **Additivity:** An aggregate index should reflect degrees of severity, so that people with higher scores experience a more severe form of deprivation compared with those with lower scores. That is, people experiencing two deprivations should be worse off than people experiencing one deprivation.

All items in the survey have been classified as essential by a majority of the population and thus fulfil the suitability requirement (see Table 4 above). Table 5 summarises the results of the validity, reliability and additivity tests and discusses the implications for the selection of the items. The first panel presents the results for the adult population, while the second panel reproduces the same information for the child population. The stars (*) identify instances where a measure performed poorly in a specific test, with two stars (**) indicating particularly problematic items. Items that perform poorly in at least two dimensions were excluded from the deprivation index, this is identified in the last column by a cross (x).

Validity

In order to test whether the indicators are likely to be good measures of poverty, each item was tested for validity by examining its association with financial strain. Financial strain is a subjective measure that reflects household's ability to make ends meet. The HIES collects data on whether households struggle regularly to keep up with bills and credit commitments³, a well-known indicator of poverty (Bradshaw and Finch, 2003; Guio et al., 2009). It is expected that households who struggle to pay bills have less access to resources and are, all things being equal, more likely to be deprived. Items that show no or a negative association with difficulties to pay

³ Which one of the following statements best describes how well your household has been keeping up with bills and credit commitments in the last 12 months? (*Write the appropriate code in the box*)

Keeping up with all bills, ... :

1. ..., without any difficulties
2. ..., but it is a struggle from time to time
3. ..., but it is a constant struggle
4. ..., have fallen behind with some of them
5. ..., have fallen behind with many of them

bills were identified as potentially problematic. This is the case for four items in the adult index and ten items in the child index. The results partially reflect the low prevalence of some items (e.g. only 6% of adults cannot afford two meals a day and 5% cannot afford clothes for special occasions). Validity issues are reflected in Table 5 by a star in the validity column.

Reliability

Reliability assesses whether items can be aggregated into a homogeneous index that measures poverty consistently. For this purpose, the report draws on two measurement theories, Classical Test Theory (CTT) and Item Response Theory (IRT). CTT measures the total reliability of the scale using Cronbach's Alpha and considers whether excluding individual items would result in an improved measure. IRT tests the properties of individual indicators in particular, severity and discrimination. According to this approach a reliable measure will discriminate well between the poor and the non-poor and measure a low standard of living. An item that is too severe and which few people lack will not be useful in distinguishing the poor from the non-poor. Further details on these measures and how to interpret them are discussed in Appendix 3.

Three adult items show potential reliability issues: own means of transport in the household, shoes and a meal with fish or meat once a week. None of the child items shows reliability issues.

Additivity

Additivity checks that indicators add up, that is, to check that someone with a deprivation score of 5 is experiencing a more severe form of deprivation than someone with a score of 4 or with a score of 1. The expectation is that on average people and households with higher deprivation scores will have lower income compared with those with lower deprivation scores. Additivity has been assessed for each pair of items and potential issues are identified with a star. Here one star indicates additivity issues with one item, two stars with two items and so forth. For adults, some money to spend on self, clothes for special occasions, a get together once a month and fruit and vegetables daily have at least 5 additivity issues. For the children items, school uniform has additivity issues with 7 other items. The excluded items column identifies the items which have issues in two of the three dimensions (validity, reliability or additivity). These items have been excluded from the deprivation index but are still used when examining deprivations individually.

Table 5 Summary of the tests adults and children (= failed test)*

| Item Label | Valid- ity | Reliability | | Addi- tivity | Ex- clude d items |
|--------------------------------------|---------------|-------------|---------|-----------------|----------------------------|
| | | CT T | IR T | | |
| Replace worn-out furniture H | | | | | |
| Repair electrical goods H | | | | | |
| Regular savings for emergencies H | | | | | |
| Prescribed medicine H | | | | ** | X |
| Own transport H | | | | | |
| Adults Two pairs of shoes | * | | * | | |
| Two meals a day | * | | | | |
| Money for self (weekly) | | | | | |
| Clothes for special occasions | * | | | * | X |
| Replace worn-out clothes | * | | | | |
| Get together monthly | | | | * | |
| Presents once a year | * | | | | |

| | | | | | |
|----------|-----------------------------------|----|---|----|---|
| | Money for hospital visits | | | | |
| | Access to transport | | | | |
| | Meat or fish once a week | * | * | | X |
| | Fruit and vegetables | | | * | |
| | Replace worn-out furniture H | * | | | |
| | Repair electrical goods H | | | | |
| | Regular savings for emergencies H | | | * | |
| | Prescribed medicine H | | | ** | X |
| | Own transport H | | | | |
| | Two pairs of shoes | * | | | |
| | Three meals a day | * | | | |
| | New clothes | | | | |
| Children | Celebrations | * | | | |
| | Meat or fish daily | * | | ** | X |
| | School equipment | * | | * | X |
| | School trips | * | | * | X |
| | Homework space | * | | | |
| | Tutorial lessons | | | | |
| | Beds and bedding | * | | | |
| | Leisure equipment | | | * | |
| | Books for their age | | | * | |
| | Fruit and vegetables | ** | | | |

Note: (1) HH indicates items that are measured at the household level. Items were excluded if it violated more than two types of test result criterion

Table 6 lists the items included in each index and identifies the reference group, i.e. if the items refer to the household (HH), individuals (I) or to children in the household (CH). The final adult deprivation index is built from ten items: five household level items (replacing furniture when needed, being able to repair electrical goods, the ability to make small regular savings, to afford medicine for all members if needed, and for households to have their own means of transport e.g. a boat or a motorcycle) and five individual items (having two pairs of shoes, being able to replace worn out clothes, to make presents to friends or family once a year, to afford hospital visits to relatives or friends when necessary, and access to safe public transport). Six items were excluded from the adults' index because of reliability, validity and additivity issues: two meals a day, clothes for special occasions, a get together for a drink or meal monthly, and two meals a day were problematic in at least two tests. It is possible that the indicators are relevant, but the thresholds were too low (e.g. in the case two meals a day) and thus would be poor measures of poverty. Additionally, fruit and vegetables and money for self-presented severe additivity issues and were also dropped.

The following items were excluded from the child deprivation index: a proper meal with meat or fish, school uniform and school trips. Prevalence of deprivation is very low for all three items. The child index is built from adding the household level items as well as ten child specific items.

Table 6 List of items included in the adult and child deprivation index and reference group

| | Item | HH | I | CH |
|----------------------|---------------------------------|----|---|----|
| Adults | Replace worn-out furniture | x | | |
| | Repair electrical goods | x | | |
| | Regular savings for emergencies | x | | |
| | Own transport | x | | |
| | Two pairs of shoes | | x | |
| | Two meals a day | | x | |
| | Money for self (weekly) | | x | |
| | Replace worn-out clothes | | x | |
| | Get together monthly | | x | |
| | Presents once a year | | x | |
| | Money for hospital visits | | x | |
| | Access to transport | | x | |
| | Fruit and vegetables | | x | |
| Children | Replace worn-out furniture | x | | |
| | Repair electrical goods | x | | |
| | Regular savings for emergencies | x | | |
| | Own transport | x | | |
| | Two pairs of shoes | | | x |
| | Three meals a day | | | x |
| | New clothes | | | x |
| | Celebrations | | | x |
| | Homework space | | | x |
| | Tutorial lessons | | | x |
| | Beds and bedding | | | x |
| | Leisure equipment | | | x |
| | Books | | | x |
| Fruit and vegetables | | | x | |

2.2.3 Identifying the poverty threshold

The poverty threshold reflects the minimum income deemed necessary in Tonga to avoid poverty. Households whose per capita adjusted income is below this threshold are deemed to live on low income. Income is adjusted to account for differences in household size, and the impact it has on the resources needed to cover individual needs. The poor are those who live on a low income and are also deprived. In order to identify the poverty threshold for the adult and child population in the Kingdom of Tonga, the Bristol Optimal Approach was then applied to the final deprivation indexes. The Bristol Optimal Approach examines the relationship between income per capita (adjusted by the square root of the total number of members of the household) and multiple deprivation for each group using ANOVA and Logit models. The ANOVA results suggest a two item poverty threshold for children, and a 3+ item threshold for adults. Additionally, the logit solution identifies a more severe threshold of 4+ items for adults and 5+ items for children⁴. For consistency and to ensure that the poorest are identified, the severe poor are defined as those who experience 5+ deprivations for both children and adults. This is thus a conservative estimate. The resulting income thresholds, in equivalised Pa'anga per month, are listed in the table below.

⁴ Given that the child index has more items than the adult index, the thresholds are not directly comparable, as indexes with a larger number of (relevant) items will generally result in higher deprivation scores.

Table 7 Thresholds per capita, adjusted income (a)

| | Population Group | Per capita adjusted income (Pa'anga per month) |
|----------|-------------------------------------|--|
| Children | Poverty: 2+ Child deprivation | 944 |
| | Severe poverty 5+ Child deprivation | 825 |
| Adults | Poverty: 3+ Adult deprivation | 956 |
| | Severe poverty 5+ Adult deprivation | 767 |

Note: (a) In order to reflect economies of scale and given the prevalence of large households in Tonga, income has been equivalised using the square root of the number of members of the household. For a household/individual to be categorised as poor they must both have a household income that is below the threshold and be deprived.

The last step is the identification of the poor. In accordance with Townsend's (1979) theory the poor are those who are both deprived and living on a low income. Different measures are used for children and adults, reflecting age differences in necessities. Thus, children are classified as poor if they are deprived of at least two items and their household's adjusted income is below 721.3 Pa'anga per month. They are severely poor if they experience five or more forms of deprivation and their household adjusted income is below 476.6 Pa'anga per month. Adults are categorised as poor when they experience 3 or more forms of deprivation and the household adjusted income is below 677.6 Pa'anga per month. The same thresholds are used to identify the vulnerable by income and by deprivation. The measure is further validated in the next section, which examines the association between poverty and access to rights.

2.2.4 Poverty, access to rights and the SDGs

Protecting human rights is a necessary, if not sufficient, condition for a just society (Pogge, 2005). The International Covenant on Economic, Social and Cultural Rights (UN, 1966) identifies a number of rights inherent to all people including the right to subsistence and non-discrimination. Poverty is associated with a reduced ability to secure access to rights such as a sufficient standard of living, housing, health, education and food. Individuals and households may also experience difficulty realising their rights due to causes other than poverty. For instance, people living in an island or region where water is scarce or safe sanitation systems are not implemented may not have access because these are not available.

While poverty is by no means the only challenge to the fulfilment of rights, we would expect to find a certain correspondence between poverty and rights. This section examines the association between poverty and access to rights, as a further validation of the poverty measure and to demonstrate the usefulness of assessing both income and deprivation when measuring poverty. A second objective is to assess access to rights (water and sanitation) as well as key services (e.g. electricity) among people living in poverty in Tonga.

According to Townsend's theory, we expect the poor to be worse off than those who are only suffering from deprivation or only from income poverty, and all three groups should be worse-off than the non-poor. This is precisely what we find for each of the outcomes observed here: access to water, sanitation and electricity. Access to clean water and safe sanitation is recognised in the SDGs (Goal 6: ensure access to water and sanitation for all) as a development priority. Limited access to water, poor water quality and poor sanitation facilities have negative effects on food security and health (UNSTAT, 2017). Water tanks, if protected from contamination, are regarded as a safe source of drinking water. Most households in Tonga obtain drinking water mainly from a household water tank (88%, see Table 8). The majority (two thirds of all households) rely on their own water tank. Around one in five relies on another household's water

tank, and a substantial minority (8%) reports bottled water as their main source of drinking water. Virtually no respondents, even among the poor, use unprotected wells as their main source of water.

Table 8 Access to water by poverty status (%)

| | Poor | Vulnerable deprivation | Vulnerable income | Non- poor | Total |
|------------------------------|------|---------------------------|----------------------|--------------|-------|
| Household tank | 56 | 65 | 69 | 71 | 66 |
| Another household water tank | 38 | 20 | 20 | 14 | 22 |
| Bottled water | 3 | 9 | 5 | 12 | 8 |
| Other safe sources* | 4 | 6 | 6 | 3 | 4 |
| Other unsafe sources* | 0 | 0 | 0 | 0 | 0 |
| Total | 100 | 100 | 100 | 100 | 100 |

Note: *Safe sources include: public piped water, community and church supply. Unsafe sources include unprotected wells, open sources.

Household water tanks are the preferred source of drinking water regardless of poverty status. There are however some differences. The poor are less likely to own a household tank (56% do compared to 71% of the non-poor), and more likely to rely on another household's water tank. As many as 38% of the poor rely on another household's water tank, which may result in limited access to water. Households with higher incomes are most likely to rely on bottled water. The differences in access to water are influenced by household resources but also by regional variations. Analyses (not shown) suggest that the use of household tanks is more common in the islands compared with Tongatapu, while in Tongatapu households are somewhat more likely to use other household tanks. In both cases the household tank remains the most common form of access to water.

Safe sanitation facilities are key to reducing the risk of disease while systems such as simple pit latrines, are associated with increased risk of contaminated water (Graham, and Polizzotto, 2013). Most households in Tonga use a septic tank system. More than 90% of the non-poor have access to a septic system but the proportion drops to 74% among the poor. The rest use either a pour-flush latrine (11% of the poor) or a simple pit latrine (14% of the poor). Differences in access to sanitation are apparent not only between the poor and the non-poor but also between the vulnerable groups and the rest. The findings in Table 9 show a gradient where the poor are worse off than the vulnerable who in turn are worse off than the non-poor.

Table 9 Access to sanitation by poverty status (%)

| | Poor | Vulnerable deprivation | Vulnerable income | Non-poor | Total |
|--------------------|------|---------------------------|----------------------|----------|-------|
| Public sewer | 1 | 0 | 0 | 0 | 0 |
| Septic system | 74 | 83 | 83 | 93 | 85 |
| Pour-flush latrine | 11 | 6 | 11 | 4 | 8 |
| Simple pit latrine | 14 | 8 | 5 | 2 | 6 |
| Other (a) | 1 | 2 | 0 | 1 | 1 |

Note: (a) No sanitation, bucket, ventilated pit latrine.

Part of the differences observed are likely to reflect the availability of resources in the islands and Tongatapu (Table 10). Both poverty and unimproved sanitation facilities are more common in the islands. For instance, simple pit latrines are rare in Tongatapu (1%) but common in the islands where one in five individuals (19%) live in a household that relies on a simple pit latrine. Efforts to improve safe sanitation should focus on the islands.

Table 10 Access to sanitation by location (%)

| | Tongatapu Urban | Tongatapu Rural | Other Islands | Total |
|--------------------|-----------------|-----------------|---------------|-------|
| Public sewer | 0 | 0 | 1 | 0 |
| Septic system | 88 | 90 | 73 | 85 |
| Pour-flush latrine | 10 | 8 | 6 | 8 |
| Simple pit latrine | 1 | 1 | 19 | 6 |
| Other | 1 | 1 | 1 | 1 |

SDG Goal 7 prompts governments to ‘ensure access to affordable, reliable, sustainable and modern energy for all’. In Tonga the vast majority of households (93%) are currently connected to the power grid. However, 21% of the poor do not have access to electricity in their homes.

Table 11 Connected to the power grid by poverty status (%)

| | Poor | Vulnerable Deprivation | Vulnerable Income | Not poor | Total |
|-------|------|------------------------|-------------------|----------|-------|
| Yes | 79 | 93 | 93 | 98 | 93 |
| No | 21 | 7 | 7 | 2 | 7 |
| Total | 100 | 100 | 100 | 100 | 100 |

Access to electricity is chiefly an issue in the islands where 17% of inhabitants are not connected to the power grid (Table 12).

Table 12 Connected to the power grid by location (%)

| | Tongatapu Urban | Tongatapu Rural | Other Islands | Total |
|-------|-----------------|-----------------|---------------|-------|
| Yes | 98 | 96 | 83 | 93 |
| No | 2 | 4 | 17 | 7 |
| Total | 100 | 100 | 100 | 100 |

As expected, those who experience poverty are also more likely to have limited access to water and sanitation and to lack access to the power grid. This finding is consistent with Townsend’s theory of relative deprivation and suggests that the consensual poverty measures are effective at identifying disadvantaged individuals and households. The combination of income and deprivation measures is more successful at identifying individuals with limited access to rights compared with using only low income or deprivation: the poor are consistently worse off than the vulnerable groups, which are in turn are worse off than the non-poor. However, some of the variations in access to rights e.g. sanitation, partially reflect local conditions. Thus, **policy interventions should prioritise poor households as well as poor areas.**

2.3 Conclusion

There is a wide consensus in Tonga with regards to the necessities of life for adults and children. The homogeneity of views across social groups – regardless of age, household composition or educational attainment- suggests a widespread agreement about what represents an appropriate minimum standard of living.

Those whose command over resources is so low so as to prevent them from fully participating in society are considered to live in poverty. Two separate poverty measures are used for children and adults, reflecting the specific needs to children and adults. This is in line with the reporting requirements for the SDGs.

This section has reported the development of socially and scientifically valid measures of poverty for adults and children based on socially perceived necessities. By combining information on low income and material deprivation the consensual measure allows identifying the most vulnerable in terms of access to basic rights such as water, sanitation and electricity. The next sections use the poverty measures developed here in order to understand poverty in Tonga examining how many are poor, who are the poor and what are the most common forms of deprivation.

3 Adult and household poverty in Tonga

The results presented in this section build on the work presented above in order to produce poverty estimates for adults and households in Tonga. It addresses three key questions (1) how common is poverty among adults and households in Tonga? (2) who are the poor?, in terms of individual (e.g. gender, age) and household characteristics (number of children, gender and education of the household head)-, and (3) which forms of deprivations are more/ less common in Tonga?

3.1 How common is poverty among adults and households?

The first question addressed in this chapter is, which proportion of adults are poor? In other words, what is the size of the problem? Table 13 reports the poverty estimates for households and adults in the Kingdom of Tonga. Columns 1 and 3 report the poverty estimates for households and adults, respectively. Around 24% of households and 22% of adults live in poverty. Columns 2 and 4 identify the proportion of the poor who experience severe poverty. These are a subset of poor living in households experiencing 5 or more deprivations a situation that affects one in ten adults and households. Additionally, around 9% of households and 12% of adults are deprived but not living on a low income, while one in four have a low income but not deprived. In total, roughly 6 in 10 adults and households are vulnerable in terms of deprivation or income or both.

Table 13 Poverty estimates adults and households (%)

| | Households | HH severe | Adults | Ad Severe |
|------------------------|-------------------|-------------------|-------------------|-------------------|
| Poor | 24 [21-27] | 13 [11-15] | 23 [20-26] | 13 [11-15] |
| Vulnerable deprivation | 21 [10-14] | | 14 [11-17] | |
| Vulnerable income | 25 [22-29] | | 25 [21-29] | |
| Not poor | 39 [35-42] | | 39 [34-43] | |
| Weighted total (N) | 18,007 | | 63,448 | |

Note: (1) Poor: income poor and above the deprivation threshold, Vulnerable deprivation: above the deprivation threshold but not income poor, Vulnerable income: income poor but not deprived, Not poor: neither income poor nor deprived

(2) The severe poor are a subset of the poor who experience a more severe form of poverty (deprivation 5+ & a lower income).

In Tonga, poverty affects between one in four and one in five households and adults. A similar proportion in each group experience low income but not deprivation, which suggests that a substantial proportion of households are able to avoid deprivation through relying on other resources, such as savings, self-production and extended networks (e.g. family, community and church).

3.2 Who is deprived? The distribution of adult poverty in Tonga

Not all individuals experience the same risk of entering poverty. This section identifies the characteristics associated with increased or decreased risk of poverty among the adult population in Tonga. We examine variations by individual (gender and age) as well as household characteristics (gender and educational attainment of the household head, number of children, number of adults and location). Educational attainment is a key marker of disadvantage: 44% of those who live in a household where the head has no qualifications are poor, compared to 16% for those who have a degree or higher. Both those living in households with larger number of children (5+) and those with lower number of adults (one or two) are more likely to be poor. In terms of location, poverty is higher in rural compared with urban areas, and substantially is

lower in Tongatapu (14/17%) compared with the rest of the islands (46%). Finally, the data does not suggest substantial differences in the risk of poverty by age, gender of the respondent or of the household head.

Table 14 Poverty estimates for adults by adult and household characteristics (%)

| | Poor | Vulnerable deprivation | Vulnerable income | Not poor | Total |
|--|-----------|------------------------|-------------------|-----------|------------|
| Gender | | | | | |
| Male | 23 | 14 | 24 | 39 | 100 |
| Female | 23 | 13 | 25 | 39 | 100 |
| Age group | | | | | |
| Early adulthood (18-39) | 23 | 14 | 24 | 39 | 100 |
| Late adulthood (40-59) | 22 | 14 | 24 | 41 | 100 |
| Old (60+) | 25 | 11 | 26 | 38 | 100 |
| Highest qualification of the household head | | | | | |
| No qualification | 48 | 30 | 6 | 16 | 100 |
| Secondary School | 30 | 21 | 32 | 17 | 100 |
| Certificate diploma | 30 | 13 | 27 | 30 | 100 |
| First degree, BA or higher | 18 | 13 | 23 | 46 | 100 |
| Gender of the household head | | | | | |
| Male | 23 | 14 | 24 | 40 | 100 |
| Female | 24 | 13 | 28 | 36 | 100 |
| Number of children | | | | | |
| 0 | 21 | 10 | 22 | 48 | 100 |
| 1 | 18 | 19 | 24 | 40 | 100 |
| 2 | 19 | 13 | 28 | 40 | 100 |
| 3 | 23 | 11 | 28 | 38 | 100 |
| 4 | 24 | 11 | 23 | 42 | 100 |
| 5 | 33 | 16 | 25 | 26 | 100 |
| 6+ | 31 | 19 | 22 | 29 | 100 |
| Number of adults | | | | | |
| 1 | 28 | 12 | 25 | 35 | 100 |
| 2 | 31 | 8 | 26 | 35 | 100 |
| 3 | 20 | 13 | 29 | 38 | 100 |
| 4 | 23 | 13 | 21 | 44 | 100 |
| 5 | 21 | 15 | 25 | 39 | 100 |
| 6+ | 20 | 20 | 22 | 38 | 100 |
| Location | | | | | |
| Urban | 15 | 11 | 32 | 43 | 100 |
| Rural | 25 | 15 | 22 | 38 | 100 |
| Location 2 | | | | | |
| Tongatapu Urban | 15 | 11 | 32 | 43 | 100 |
| Tongatapu Rural | 19 | 11 | 25 | 45 | 100 |
| Islands | 39 | 21 | 17 | 23 | 100 |
| Total Poverty | 23 | 14 | 25 | 39 | 100 |

The most vulnerable to poverty are those living in households with a large number of children (5+) or few adults (1-2) as well as those with low educational attainment. Interventions aimed at reducing poverty in the Kingdom of Tonga should prioritise those with no or low educational qualifications, large families – with four or more children –, and households with few adults. In terms of geography, poverty is far more common in the islands compared with Tongatapu. Almost half the adults who live in poverty live in the islands. Accordingly, strategies to reduce poverty among the adult population must have a double focus targeting both Tongatapu and the islands.

3.3 Which forms of deprivation are most common?

Access to resources such as farming land, family and community support all have an effect on deprivation. This section examines which forms of deprivation are more common among adults/households in Tonga and whether and how these vary by geography and individual and family characteristics. All the necessities of life in the survey are reported on here, regardless of whether the items were included in the deprivation index. The proportion of adults/households who do not have an item because they are not able to afford it is shown in Table 15. The first column reports the proportion of adults in Tonga who lack a particular item because they cannot afford it, while the second column reports the same for households. For individual level items (e.g. replace worn-out clothes), households where at least one adult reports not being able to afford the item are classified as deprived. Since there may be other adults in the household who are not deprived, household deprivation rates are expected to be higher than adult deprivation rates.

The most common forms of deprivation relate to household items. Around a third of adults live in a household that does not own its own means of transport, 35% do not have cash to repair furniture and 29% cannot replace household appliances, while 28% cannot afford to save regularly.

The less common forms of deprivation are concerned with the everyday basic needs of food and clothing. Food deprivation is comparatively low: 6% of adults cannot afford three meals a day, and only 2% lack a meal with protein once a week. In contrast, 15% cannot afford fresh fruit and vegetables regularly. Besides meals, the least common forms of deprivation are to do with clothing: shoes (3%), clothes for special occasions (5%). By comparison, not being able to replace everyday clothes is far more common: 15% cannot afford to replace used everyday clothes.

As many as 14% of households cannot afford all prescribed **medicine**. This has potentially serious health implications, particularly when the medication is necessary to manage existing conditions or to control infectious diseases.

Finally, between one in five and one in seven adults cannot afford to fulfil key social obligations such as get together with family and/or friends once a month, buying presents once a year on special occasions (e.g. Christmas or birthdays) and visiting friends and family in hospital when necessary. A similar proportion cannot afford to spend a small sum of money on themselves regularly.

Table 15 Item-level Deprivation rates, % deprived

| | Adults | | Households | |
|---------------------------------|--------|---------|------------|---------|
| Replace worn-out furniture | 35 | [31-39] | 34 | [31-38] |
| Own transport | 32 | [28-35] | 34 | [30-37] |
| Repair electrical goods | 29 | [26-34] | 29 | [26-33] |
| Regular savings for emergencies | 28 | [24-32] | 27 | [24-31] |
| Prescribed medicine | 14 | [12-17] | 14 | [13-18] |
| Fruit and vegetables | 14 | [11-16] | 14 | [16-22] |
| Money for hospital visits | 14 | [11-17] | 18 | [12-18] |

| | | | | |
|-------------------------------|----|---------|----|---------|
| Money for self (weekly) | 14 | [11-16] | 18 | [15-21] |
| Get together monthly | 13 | [11-16] | 15 | [12-17] |
| Access to transport | 13 | [11-16] | 15 | [13-19] |
| Replace worn-out clothes | 12 | [10-14] | 14 | [12-16] |
| Presents once a year | 11 | [9-14] | 14 | [12-16] |
| Two meals a day | 5 | [4-8] | 6 | [5-7] |
| Clothes for special occasions | 4 | [3-5] | 5 | [4-7] |
| Two pairs of shoes | 2 | [1-2] | 3 | [2-3] |
| Meat or fish once a week | 1 | [1-2] | 2 | [2-3] |

The risk of experiencing deprivation varies geographically. Overall deprivation rates are high(er) outside Tongatapu. Table 16 reports the incidence of adult deprivation by item and location. The items with the highest deprivation rates are highlighted in red, while those with the lowest rates appear in green. **Food** deprivation is an issue for a substantial minority of adults in the islands. More than one in three cannot afford to eat fresh fruit and vegetables daily, and 16% cannot afford three meals a day. Access to protein is less problematic but still affects 6% of the population. Four in ten adults in the islands experience some form of food deprivation. Interventions to improve food security, therefore should prioritise the islands as well as poor households.

About 46% of adults outside Tongatapu do not have access to safe public **transport**, 42% do not own their own transport and 30% do not have either (although other household members may have some mode of transportation). Access to own transportation is also unaffordable for around 30% of the inhabitants in Tongatapu, but in this case more than 95% of adults report access to safe public transport.

Fulfilling **social obligations** is also more challenging in the islands. Between 30 and 40% of adults living outside Tongatapu report financial difficulties stop them from fulfilling social obligations such as visiting someone in hospital, gifts once a year and a get together once a month.

While overall clothing deprivation is low, 45% of people in the islands – or two out of five people – cannot afford to replace worn-out **clothes**. This is in sharp contrast to Tongatapu where this deprivation affects less than 10% of adults. Additionally, 14% of people in the islands cannot afford clothes for special occasions, and 8% cannot afford two pairs of shoes.

In terms of **health**, one in three adults in the islands live in a household that cannot afford prescription medicines when needed, compared with less than 10% in Tongatapu. This suggests that access to medication is particularly an issue in the islands.

The exception to the pattern observed above of higher deprivation in the islands is the ability to make regular savings, reported as an issue by 22% of adults in Urban Tongatapu compared with 29% of those in rural areas/the islands, and to a lesser extent the ability to replace/repair household items such as furniture and appliances. Thus, it is household items that have the highest deprivation scores and where differences between Tongatapu and the rest of the country are smaller.

Table 16 Adult deprivation by item and location (% deprived)

| | Tongatapu | | Other islands |
|---------------------------------|-----------|-------|---------------|
| | Urban | Rural | Rural |
| Own transport HH | 4 | 3 | 46 |
| Replace worn-out clothes | 5 | 4 | 45 |
| Access to public transport | 29 | 28 | 42 |
| Replace worn-out furniture | 24 | 37 | 41 |
| Get together monthly | 11 | 8 | 39 |
| Repair electrical goods | 24 | 27 | 39 |
| Fruit and vegetables | 7 | 9 | 36 |
| Money for hospital visits | 13 | 15 | 34 |
| Money for self (weekly) | 16 | 17 | 34 |
| Presents once a year | 13 | 7 | 32 |
| Prescribed medicine | 8 | 6 | 31 |
| Regular savings for emergencies | 22 | 29 | 29 |
| Two meals a day | 3 | 3 | 16 |
| Clothes for special occasions | 2 | 2 | 14 |
| Two pairs of shoes | 1 | 0 | 8 |
| Meat or fish once a week | 1 | 0 | 6 |

Deprivation in Tonga varies geographically, with islanders more likely to experience all forms of deprivation compared with those living in Tongatapu. Some forms of deprivation are almost non-existent among households in Tongatapu, but still prevalent in the islands. Food deprivation is an issue for a substantial minority of inhabitants in the islands, as is the inability to afford prescribed medicine. Both issues have potential implications for health and deserve further attention.

4 Child Poverty in Tonga

Children have specific needs as recognised by the UN Convention on the Rights of the Child (1989). The Convention recognises the rights of children to education, to play, to participation and safety. Children also face specific deprivations that are different from adults (Delamonica, 2014). The specific needs of children are reflected in the deprivation measure (e.g. in terms of education and nutritional needs), alongside items that capture the household conditions in which children live. Thus, the CA allows for the development of child specific measures of poverty.

In most countries, children and households with children are more likely to be poor than the rest of the population (Bradshaw et al., 2012; Gordon et al., 2003). This is also the case in Tonga where 36% of children live in poverty compared with around 22% of adults. This chapter addresses three key questions with regards to child poverty, (1) how common is poverty among children in Tonga?, (2) who are the poor?, in terms of individual (e.g. gender, age) and household characteristics (number of children, gender and education of the household head), and (3) which forms of deprivations are more/ less common amongst children in Tonga? Thus, the structure of the chapter mirrors that used in the previous chapter about adult and household poverty. In this case, an additional section is included that builds on previous research by Fifita et al., (2015) to assess changes in child deprivation between 2012 and 2016 . Unfortunately, different methodologies (the survey used in 2012 did not contain data on income) mean that child poverty estimates are not directly comparable. However, deprivation data provides useful insight with regards to changes in the material and social conditions of children in Tonga.

The child deprivation data has some limitations compared with the adult data. One key difference between the two sets of indicators is that, while questions for adults reflected access to resources for each individual adult in the household, in the case of children, an adult respondent replied to the questions thinking of all children in the household. Thus, if one child in the household is deprived on one item e.g. some new rather than second-hand clothes, all children in the household are counted as deprived. This is relevant as it may over-estimate child deprivation for some items. Another implication is that it is harder to estimate differences between children e.g. according to age or gender

4.1 How common is poverty among children in Tonga?

Around one in three children in Tonga live in poverty (36%) i.e. experience low income and at least two deprivations (Table 17). A further 32% are vulnerable i.e. experience either deprivation or low income. Around 14% of children are deprived but do not live in a low income household, a similar proportion to that observed for adults. Vulnerability by income affects 18% of children. Finally, one in three are neither income poor nor deprived.

Table 17 Child poverty and severe child poverty rate

| | Child poverty | Child Severe |
|------------------------|---------------|--------------|
| Poor | 33 [30-37] | 15 [13-18] |
| Vulnerable deprivation | 16 [13-19] | |
| Vulnerable income | 19 [16-23] | |
| Not poor | 32 [28-36] | |
| Total (N) | 38'357 | |

Overall, including the poor and the deprivation only group, about one in two children experience some amount of deprivation. More worryingly, 15% of children -40% of the poor- live in severe poverty, i.e. in a low income household and deprived of at least 5 socially perceived necessities.

Policy interventions aimed at the most vulnerable should aim to target this group of severely poor children, as well as child poverty more broadly.

4.2 Who are the poor? The distribution of child poverty

Looking now at the factors that put children at increased/reduced risk of poverty, Table 18 below reflects variations in child poverty rates by child and household characteristics. The risk factors identified for children are similar to those observed for adults. Living in a rural area, or in the islands is associated with increased risk of poverty, as is low educational attainment of the household head. Household composition also matters: households with a large number of children as well as those where there are only one or two adults are more likely to live in poverty. There are no significant differences in the risk of poverty according gender, regardless of whether the gender of the child, or the gender of the household head is examined. This finding is consistent with that observed for the adult population. Thus, the findings of this report do not support the notion of gender differences in poverty risk in Tonga.

Table 18 Child poverty estimates by individual and household characteristics (%)

| | Poor | Vulnerable deprivation | Vulnerable income | Not poor | Total |
|--|------|------------------------|-------------------|----------|-------|
| Gender | | | | | |
| Male | 33 | 15 | 20 | 32 | 100 |
| Female | 33 | 17 | 19 | 31 | 100 |
| Highest qualification of the household head | | | | | |
| No qualification | 52 | 32 | 5 | 10 | 100 |
| Secondary School | 43 | 24 | 20 | 13 | 100 |
| Certificate diploma | 44 | 17 | 19 | 20 | 100 |
| First degree, BA or higher | 27 | 14 | 19 | 39 | 100 |
| Gender of the household head | | | | | |
| Male | 33 | 16 | 20 | 31 | 100 |
| Female | 36 | 16 | 15 | 33 | 100 |
| Number of children | | | | | |
| 1 | 26 | 15 | 16 | 43 | 100 |
| 2 | 30 | 16 | 22 | 33 | 100 |
| 3 | 33 | 14 | 20 | 34 | 100 |
| 4 | 35 | 16 | 14 | 35 | 100 |
| 5 | 36 | 15 | 24 | 25 | 100 |
| 6+ | 35 | 18 | 18 | 29 | 100 |
| Number of adults | | | | | |
| 1 | 29 | 11 | 24 | 36 | 100 |
| 2 | 40 | 12 | 21 | 27 | 100 |
| 3 | 33 | 14 | 22 | 31 | 100 |
| 4 | 31 | 15 | 18 | 35 | 100 |
| 5 | 29 | 17 | 17 | 38 | 100 |
| 6+ | 27 | 28 | 13 | 32 | 100 |
| Location 1 | | | | | |
| Urban | 28 | 13 | 28 | 31 | 100 |
| Rural | 35 | 17 | 17 | 32 | 100 |
| Location 2 | | | | | |
| Tongatapu Urban | 28 | 13 | 28 | 31 | 100 |

| | | | | | |
|----------------------|-----------|-----------|-----------|-----------|------------|
| Tongatapu Rural | 29 | 14 | 17 | 41 | 100 |
| Islands | 47 | 23 | 16 | 15 | 100 |
| Total Poverty | 36 | 14 | 18 | 33 | 100 |

Interestingly, children living in households with a large number of adults have higher risk of deprivation only (but not poverty) compared with households with one or two adults. This pattern is not fully explained by the higher poverty rate among the latter group. Future reports could examine this phenomenon in more detail.

In sum, the characteristics more closely associated with poverty are household size and educational attainment. Child poverty is lowest in households where the head has achieved university education and highest where they have no or only primary education qualifications. Households with more children or less adults are more likely to be poor, although the differences are less sharp than those observed for adults (Chapter 3). Finally, the risk of poverty is higher in the islands compared with the mainland.

4.3 Which forms of deprivation are most common among children in Tonga?

This section explores in further detail child deprivation in Tonga and contrast it with the most recent estimates (Fifita et al., 2015). It is worth noting that the majority of the children's items included in the deprivation index are related to key rights granted by the International Convention on Rights of the Child. The right to quality education (art 28) requires not only access to education but also to the means necessary to make the most of educational opportunities, such as books and school materials. Article 27 grants children the right to have their basic needs met including food, clothing and a safe place to live. Article 24 grants access to medication when needed and sufficient quality food as both are related to the right to health.

Table 19 reports the incidence of deprivation for each child item. The first column reflects the deprivation rate for all children in 2016. The second offers the same information for 2012. As some new variables were added in the 2016 round, there is no information for some indicators in the 2012 column. Finally, column 3 shows the absolute difference between 2016 and 2012. Since small differences can emerge from sampling errors, only differences above 5% are shown.

In 2016, the most common forms of child deprivation are household items. Around a third of children in Tonga live in a household that cannot afford to replace worn-out furniture or to repair electrical goods, cannot afford making regular savings for emergencies and does not own its own means of transportation (e.g. a boat, a motorbike or a car). More than 50% of all children are deprived of at least one household item. That said, the findings point to a reduction, since 2012, in the proportion of children who are deprived of a range of household level items.

Access to **health** is measured at the household level by the proportion of children living in households who cannot afford all prescribed medicine when someone is sick, a situation experienced by one in seven children (15%). The measure is however not child specific, so it is possible that households are in fact prioritising the health of children although no information about this issue is available in the survey. There has also been an absolute decrease in health deprivation rates from 24% in 2012 to 10% in 2016.

Food deprivation is, in comparison, relatively low but still an issue for a large minority with no substantial changes observed between 2012 and 2016. Almost one in ten children (8%) cannot afford three meals a day. Additionally, 5% cannot afford to eat meat or fish daily and 13% cannot afford fruit and vegetables daily. In total, around 18% of children are deprived of at least one food item.

School equipment and shoes are the two items with the lowest deprivation scores (3-4%), the latter having experienced a substantial drop compared with the 2012 survey. By contrast,

deprivation from complementary activities and items such as tutorial lessons, books and leisure equipment is more common, at around 20% each with one in three children deprived from at least one of these items. Additionally, one in ten do not have a space where they can do their homework at home. A similar proportion cannot afford school trips and events that cost money, an activity that has both educational and social implications. The findings also show that 13% of children cannot afford celebrations on special occasions.

Table 19 Child Deprivation in Tonga in 2012/2016 (%)

| | 2016 | 2012 | Change |
|--|------|------|--------|
| Replace worn-out furniture (H) | 36 | 44 | -8 |
| Own means of transportation (H) | 33 | 33 | |
| Repair electrical goods (H) | 31 | 43 | -12 |
| Regular savings for emergencies (H) | 29 | 32 | |
| Leisure equipment (e.g. sports equipment) | 23 | 24 | |
| Tutorial lessons once a week | 22 | | |
| Books suitable for their age | 22 | | |
| All prescribed medicine when someone is sick (H) | 15 | 24 | -9 |
| Fruit and vegetables daily | 13 | | |
| Celebrations on special occasions | 13 | 17 | |
| Some new not second-hand clothes | 11 | 15 | |
| School trips and events that cost money | 10 | 11 | |
| A suitable space for homework | 9 | 10 | |
| Beds and bedding for every child | 9 | 11 | |
| Three meals a day | 8 | 8 | |
| Meat or fish daily | 5 | 8 | |
| School equipment (uniform, books, pen) | 4 | 6 | |
| Properly fitting shoes | 3 | 12 | -9 |

Overall, a comparison between the 2016 and the 2012 data suggests that the situation of children in Tonga improved marginally, with fewer children deprived of at least one item as well as reductions in the proportion of children who are deprived of a range of socially perceived necessities. The deprivation items that show most improvement are household level items such as replacing electrical goods and furniture. The improvement has also benefitted the most deprived, with a slight reduction in the number of children experiencing five or more deprivations from 29% to 24%. Future research, possibly using qualitative data would allow a better understanding of the factors that have led to this positive change.

4.4 Conclusion

The International Convention on the Rights of the Child grants all children, the right to live healthy lives (art 24), to an education (art 28) and to have their basic needs met (art 27, including food, clothing and a safe place to live).

In terms of **education**, children in Tonga are largely equipped to go to school: the vast majority of children, more than 95%, have their own school uniforms and other equipment. The challenge in this domain lies with improving access to the items that help to support study at home such as books suitable for their age, a study space and additional tutoring if needed.

The deprivation measure contains two sets of indicators that are relevant to children's **health**: access to medicine and access to food – both quantity and quality. The costs of prescribed **medication** are a potential barrier for around 15% of children. However, there have been

improvements since 2012, when nearly one in four children (24%) lived in a household that could not afford all prescribed medication for all its members when needed.

Around 8% of children live in a household that cannot afford to provide three meals a day for all their children, while 13% cannot afford daily fruit and vegetables. Insufficient access to **food** has potential implications for children's health and development as well as for their educational attainment.

Deprivation of basic needs such as clothing and shoes affects only a small minority of children. The most common forms of deprivation among children have to do with household level items -i.e. items that are shared by all household members- such as electrical goods and making regular savings for emergencies. The same pattern is apparent for adults. Further information on housing conditions would be useful to inform policy interventions.

The findings presented in this chapter paint a mixed picture of child poverty and deprivation in Tonga. One in three children live in poverty. At the same time, the evidence suggests that child deprivation is decreasing, both for children as a whole and among the most deprived. Efforts are needed to support this positive trend.

5 Conclusion: Considerations for policy and methodological suggestions

Categorising someone as poor carries an implicit obligation to act (Lister, 1998). To act, we need to understand and, to understand, we need to measure. This report has provided key evidence on the extent and nature of poverty and deprivation in Tonga using the consensual approach, currently the only method that allows the development of country specific and multidimensional measures of child and adult poverty. Key questions have been answered as to how many people are poor, who are the poor and what are the main forms of deprivation in the Kingdom of Tonga?

Considerations for policy

Children have a higher risk of poverty than adults (36% compared to 22%). This suggests the need for a child poverty strategy that prioritises the most vulnerable. Comparisons between the 2012 and 2016 deprivation data suggest that there are grounds for optimism as the situation of Tongan children improved during that period. Future analyses could examine the factors leading to such improvements so as to help maximise their impact.

Adequate nutrition is fundamental for child development. A substantial minority of children experience food deprivation, with 8% unable to afford three meals a day and 13% unable to afford fruit and vegetables daily. Furthermore, hunger and malnutrition have long lasting effects on child development, affecting their ability to concentrate in school as well as their health (Chinton Chyatte and Breaux, 2007; Minujin and Nandy, 2012).

Food programmes addressed at improving nutrition among children are likely to have a positive impact on wider development including education and health. For example, a school meal for children will not only allow children to escape food deprivation but also it will help change diets for children throughout their lifetime. A practical strategy in Tonga to address food deprivation is the use of the contextual communal strategies (*kautaha* in Tongan) that works best for Tongans to implement a common school meal for children.

Such strategy of *kautaha* fits perfectly well with all aspects of Tongan life such as *toutuú* (group of men growing yams together or any other crops); and *toulalanga* (group of women weaving mats by all work to get one mat at a time for each and every member of the group). Similarly, with the *kokaánga* or group of women producing big tapas one at a time for each and every member until the group have each had a turn. So for the school meal, a *kautaha* or the parents, teachers association or PTA can work together sharing the preparations of school meals in such a way that will be sustainable throughout the academic year. This is doable and easy to implement in the pre-schools and primary schools in Tonga.

Such initiatives will not only act as a source of nutritious meals but also act as an incentive for children to go to school and be punctual to class. School meals provide food security at times of crisis and help children to become healthy and productive adults, thus helping to escape poverty for those who are vulnerable or living in poverty. It allows children to focus on their studies, without hunger as a distraction (Adelman et al., 2008).

It is recommended that Tonga provide free meals to pupils in compulsory education, regardless of their ability to pay. This is because when they are not provided to all students, free school meals can stigmatize children who do receive them. Studies have shown that many children entitled to free meals do not take them and those who do may suffer negative consequences. Additionally, not all children who could benefit from free school meals qualify for it. Organizations such as the UK Child Poverty Action Group have called for school meals to be provided free of charge for all pupils to address these issues. This will be work best in Tonga using the communal practice of the *kautaha* discussed above.

Children's education can further be supported by enhanced access to educational resources, such as appropriate books, in the household. Investment in young children is essential for a successful society and for the development of the national economy.

Until, 1988 children in Tonga took the New Zealand School Certificate Exam at year 11 (in form 5) and the New Zealand University Entrance Exam in year 12 (form 6). These exams are summary assessments where the final marks in the exam will become the final grade. The exam system changed in 1989 with a change from New Zealand exams to Pacific exams and in the past 5 years to all national exams. Such shifts increasingly implement internal assessments with , some subjects reaching more than 50% internal assessment. This means that consistent learning is required and the new indicators collected in this data such as 'tutorial lessons once a week'; 'books suitable for their age'; 'be able to participate in school trips and school events that cost money'; 'suitable space at home for homework'; 'school equipment (uniforms, stationeries etc.' are necessities and crucial elements for successful sustainable education of children in Tonga.

These aspects of education deprivation provide additional information which complements the traditional enrolment rate and other such statistical measures. The policy implication will be to formalized homework clubs, provision of public libraries and communal places for homework studies if certain areas have a high proportion of households who do not have space or study places for their children.

It is notable that the most common forms of deprivation among children have to do with household level items -i.e. items that are shared by all household members- such as electrical goods and making regular savings for emergencies. Interventions to reduce poverty among children must consider household conditions as well as the situation of children themselves.

The same pattern is apparent for adults, with household level items showing the highest deprivation rates. Currently, the survey does not collect information on housing conditions, e.g. state of repair or roofs and walls. Further information on housing conditions would be useful to inform policy interventions.

Similar risk factors have been identified for child and adult poverty. Households with a large number of children, as well as those with one or two adults are at higher risk of poverty. Policies addressed at reducing child poverty are likely to improve the conditions of those households.

The evidence presented in this report indicates that education is effective in protecting households from poverty. The association between poverty and education is consistent across educational levels. Households where the head has university qualifications or higher are the least likely to be poor, followed by those with secondary qualifications. The highest poverty rates correspond to households where the head has primary or no qualifications.

In terms of geography, poverty is more common in the islands compared with Tongatapu. Despite being only 25% of the total population, the inhabitants of the islands represent almost half of the poor (49%). Accordingly, strategies to reduce poverty must target both Tongatapu and the islands.

Methodological suggestions

This report has highlighted the potential of the CA to further the understanding of poverty and deprivation in Tonga (and other small island states). Instead of using a list of items identified by experts, the CA uses a democratic approach where socially perceived necessities are identified by the public. This allows the creation of a measure that reflects the Tongan context.

That is not to say that the measures cannot be improved, for example, by replacing indicators identified as problematic in terms of reliability, validity or additivity by more suitable ones. Specifically, items such as money for one's self in the case of adults and school equipment in the case of children could be replaced by other socially relevant items. These items could be

identified through focus groups including diverse population groups such as households with and without children, living in different locations, etc.

The findings consistently identify the poor as worse off than the deprived only or income poor only households, with all three groups doing worse than the non-poor. The inclusion of the consensual module in the Household Income and Expenditure Survey (HIES) has substantial advantages compared to the previous data collected in the DHS. Notably, the availability of income data allows for a more accurate identification of the poor. It is recommended that in the future the deprivation module remains a feature of the HIES.

Appendix 1: Adult, child and household items included in the survey

| Full description | Short description |
|--|---------------------------------|
| ADULT ITEMS | |
| Two pairs of properly fitting shoes, including a pair of all-weather shoes | Two pairs of shoes |
| Two meals a day | Two meals a day |
| A small amount of money to spend each week on yourself | Money for self |
| Clothes for special occasions | Clothes for special occasions |
| Replace worn-out clothes | Replace worn-out clothes |
| Get together for a meal or drink monthly | Get together monthly |
| Presents for friends or family once a year | Presents once a year |
| Enough money to be able to visit friends and family in hospital or other institutions | Money for hospital visits |
| Access to safe public transport such as buses and boats | Access to transport |
| A good meal with meat/fish on Sundays and other special occasions | Meat or fish once a week |
| Fresh fruits and vegetables at least once a day | Fruit and vegetables |
| HOUSEHOLD ITEMS | |
| Enough money to replace any worn out furniture. | Replace worn-out furniture |
| Enough money to repair broken electrical goods such as refrigerator or washing machine | Repair electrical goods |
| Regular savings for emergencies. | Regular savings for emergencies |
| All medicine prescribed by your doctor, when any person in this HH is sick | Prescribed medicine |
| Having your own means of transportation (car, boat, motorcycle etc). | Own transport |
| CHILD ITEMS (0-15) | |
| Properly fitting shoes | Shoes |
| Three meals a day | Three meals |
| Some new, not second-hand clothes. | New clothes |
| Celebrations on special occasions such as birthdays, Christmas or religious festival | Celebrations |
| One meal with meat, chicken, fish or vegetarian equivalent daily. | Meat or fish daily |
| All school uniform of correct size and equipment required (e.g. Books, pen) | School equipment |
| To participate in school trips and school events that cost money. | School trips |
| A suitable place to study or do homework. | Homework space |
| Tutorial lessons after school at least once a week (during term time) | Tutorial lessons |
| Enough beds and bedding for every child in the household. | Beds and bedding |
| Leisure equipment (e.g., sports equipment or a bicycle) | Leisure equipment |

| | |
|--|----------------------|
| Books at home suitable for their age (including reference books and supplementary exercises) | Books |
| Fresh fruits and vegetables at least once a day | Fruit and vegetables |

Appendix 2: Necessities of life, adult, household and child items

The tables below report the proportion of the population within each population group who has identified an item as a necessity. The table indicates a consensus exists in the Kingdom of Tonga with regards to the necessities of life. A substantial degree of agreement around the necessities of life is apparent across all groups including age, educational attainment levels and locations. The lowest levels of agreement are attained in the islands where 82% identify a monthly get together as a necessity, and 84% daily fruit and vegetables.

Table A2.1 Adult items identified as essential by group

| | Two pairs of shoes | Two meals a day | Money for self weekly | Clothes for special occasions | Replace worn-out clothes |
|---|--------------------|-----------------|-----------------------|-------------------------------|--------------------------|
| Gender | | | | | |
| Male | 97 | 98 | 96 | 96 | 95 |
| Female | 97 | 98 | 95 | 96 | 95 |
| Highest qualification of the household head | | | | | |
| No qualification | 96 | 97 | 94 | 95 | 94 |
| Secondary School | 98 | 99 | 97 | 98 | 96 |
| Certificate diploma | 98 | 98 | 96 | 97 | 97 |
| First degree, BA or higher | 99 | 100 | 99 | 99 | 97 |
| Age group | | | | | |
| Early adulthood(18-39) | 97 | 98 | 96 | 96 | 94 |
| Late adulthood(40-59) | 97 | 98 | 96 | 96 | 95 |
| Old (60+) | 96 | 98 | 95 | 95 | 93 |
| Gender of the household head | | | | | |
| Male | 97 | 98 | 96 | 96 | 95 |
| Female | 97 | 97 | 95 | 97 | 95 |
| Number of children | | | | | |
| 0 | 97 | 98 | 96 | 95 | 94 |
| 1 | 95 | 97 | 94 | 96 | 94 |
| 2 | 97 | 99 | 96 | 96 | 95 |
| 3 | 97 | 98 | 96 | 97 | 94 |
| 4 | 98 | 98 | 96 | 96 | 95 |
| 5 | 97 | 98 | 95 | 96 | 95 |
| 6+ | 99 | 100 | 96 | 98 | 97 |
| Number of adults | | | | | |
| 1 | 97 | 98 | 98 | 94 | 91 |
| 2 | 96 | 97 | 95 | 96 | 95 |
| 3 | 96 | 97 | 94 | 95 | 95 |
| 4 | 97 | 98 | 95 | 96 | 94 |
| 5 | 99 | 100 | 96 | 97 | 96 |

| | | | | | |
|-----------------|----|-----|-----|----|----|
| 6+ | 98 | 99 | 97 | 97 | 96 |
| Location 1 | | | | | |
| Urban | 99 | 100 | 100 | 99 | 96 |
| Rural | 97 | 98 | 94 | 95 | 95 |
| Location 2 | | | | | |
| Tongatapu Urban | 99 | 100 | 100 | 99 | 96 |
| Tongatapu Rural | 99 | 100 | 98 | 99 | 99 |
| Islands | 92 | 93 | 88 | 90 | 86 |

Table A2.2 Adult items identified as essential by group (% ctd)

| | Get together monthly | Presents for friends or family once a year | Money for hospital visits | Access to transport | Meat or fish once a week | Fruit and veg daily |
|---|----------------------|--|---------------------------|---------------------|--------------------------|---------------------|
| Gender | | | | | | |
| Male | 94 | 96 | 96 | 96 | 99 | 96 |
| Female | 94 | 95 | 96 | 95 | 98 | 96 |
| Highest qualification of the household head | | | | | | |
| No qualification | 92 | 95 | 95 | 96 | 98 | 94 |
| Secondary School | 96 | 96 | 98 | 96 | 99 | 98 |
| Certificate diploma | 96 | 97 | 97 | 97 | 99 | 97 |
| First degree, BA or higher | 100 | 99 | 100 | 98 | 100 | 100 |
| Age group | | | | | | |
| Early adulthood (18-39) | 95 | 97 | 97 | 96 | 99 | 96 |
| Late adulthood (40-59) | 93 | 95 | 96 | 95 | 98 | 95 |
| Old (60+) | 94 | 95 | 95 | 94 | 97 | 96 |
| Gender of the household head | | | | | | |
| Male | 94 | 96 | 96 | 95 | 99 | 95 |
| Female | 95 | 96 | 97 | 96 | 97 | 97 |
| Number of children | | | | | | |
| 0 | 96 | 96 | 96 | 95 | 97 | 96 |
| 1 | 94 | 96 | 96 | 96 | 98 | 96 |
| 2 | 95 | 96 | 97 | 96 | 99 | 96 |
| 3 | 93 | 94 | 95 | 94 | 99 | 95 |
| 4 | 94 | 96 | 96 | 96 | 99 | 96 |
| 5 | 95 | 95 | 95 | 95 | 97 | 96 |
| 6+ | 90 | 97 | 96 | 98 | 100 | 94 |
| Number of adults | | | | | | |
| 1 | 94 | 93 | 95 | 91 | 91 | 95 |
| 2 | 94 | 95 | 95 | 94 | 98 | 95 |
| 3 | 95 | 95 | 96 | 96 | 97 | 95 |
| 4 | 95 | 95 | 96 | 94 | 99 | 96 |
| 5 | 96 | 96 | 97 | 96 | 99 | 98 |
| 6+ | 92 | 97 | 97 | 98 | 100 | 96 |
| Location 1 | | | | | | |
| Urban | 97 | 98 | 100 | 99 | 100 | 100 |

| | | | | | | |
|-----------------|----|----|-----|----|-----|-----|
| Rural | 93 | 95 | 95 | 94 | 98 | 94 |
| Location 2 | | | | | | |
| Tongatapu Urban | 97 | 98 | 100 | 99 | 100 | 100 |
| Tongatapu Rural | 99 | 99 | 99 | 99 | 99 | 100 |
| Islands | 83 | 87 | 87 | 85 | 96 | 84 |

Table A2.3 Household items identified as essential by group (%)

| | Replace worn-out furniture | Repair electrical goods | Regular savings for emergencies | Prescribed medicine | Own transport |
|---|----------------------------|-------------------------|---------------------------------|---------------------|---------------|
| Gender | | | | | |
| Male | 93 | 94 | 95 | 97 | 95 |
| Female | 92 | 94 | 95 | 97 | 95 |
| Highest qualification of the household head | | | | | |
| No qualification | 90 | 93 | 95 | 96 | 94 |
| Secondary School | 97 | 97 | 97 | 99 | 96 |
| Certificate diploma | 95 | 96 | 96 | 98 | 97 |
| First degree, BA or higher | 96 | 99 | 99 | 100 | 98 |
| Age group | | | | | |
| Early adulthood(18-39) | 93 | 95 | 96 | 97 | 96 |
| Late adulthood(40-59) | 92 | 94 | 94 | 96 | 95 |
| Old (60+) | 94 | 95 | 95 | 96 | 93 |
| Gender of the household head | | | | | |
| Male | 92 | 94 | 95 | 97 | 95 |
| Female | 94 | 95 | 96 | 98 | 96 |
| Number of children | | | | | |
| 0 | 95 | 95 | 94 | 96 | 94 |
| 1 | 94 | 91 | 95 | 96 | 95 |
| 2 | 94 | 96 | 95 | 97 | 95 |
| 3 | 92 | 93 | 94 | 96 | 94 |
| 4 | 93 | 96 | 97 | 97 | 95 |
| 5 | 91 | 93 | 94 | 97 | 95 |
| 6+ | 89 | 95 | 97 | 98 | 97 |
| Number of adults | | | | | |
| 0 | | | | | |
| 1 | 94 | 94 | 92 | 95 | 89 |
| 2 | 92 | 93 | 94 | 95 | 94 |
| 3 | 92 | 93 | 95 | 97 | 95 |
| 4 | 93 | 94 | 94 | 97 | 94 |
| 5 | 94 | 95 | 97 | 97 | 97 |
| 6+ | 91 | 96 | 97 | 99 | 96 |
| Location | | | | | |
| Urban | 98 | 98 | 99 | 100 | 99 |
| Rural | 90 | 93 | 94 | 96 | 94 |
| Location 2 | | | | | |
| Tongatapu Urban | 98 | 98 | 99 | 100 | 99 |
| Tongatapu Rural | 94 | 98 | 99 | 100 | 99 |
| Islands | 84 | 83 | 83 | 88 | 84 |

Table A2.4 Child items identified as essential by group (%)

| | Properly fitting shoes | Meat or fish daily | Three meals a day | Beds and bedding | Home work space | School equipment | New clothes |
|---|------------------------|--------------------|-------------------|------------------|-----------------|------------------|-------------|
| Gender | | | | | | | |
| Male | 99 | 99 | 98 | 97 | 98 | 97 | 96 |
| Female | 98 | 98 | 98 | 97 | 97 | 97 | 96 |
| Highest qualification of the household head | | | | | | | |
| No qualification | 98 | 98 | 98 | 97 | 97 | 97 | 96 |
| Secondary School | 99 | 99 | 99 | 98 | 98 | 98 | 98 |
| Certificate diploma | 99 | 99 | 98 | 98 | 98 | 98 | 97 |
| First degree, BA or higher | 100 | 100 | 99 | 100 | 100 | 100 | 100 |
| Age group | | | | | | | |
| Early adulthood (18-39) | 98 | 99 | 98 | 98 | 98 | 98 | 97 |
| Late adulthood (40-59) | 98 | 98 | 98 | 97 | 97 | 97 | 96 |
| Old (60+) | 98 | 98 | 98 | 97 | 97 | 97 | 95 |
| Number of children | | | | | | | |
| 0 | 98 | 98 | 98 | 97 | 97 | 97 | 97 |
| 1 | 97 | 98 | 97 | 97 | 96 | 96 | 96 |
| 2 | 98 | 98 | 98 | 97 | 97 | 97 | 96 |
| 3 | 98 | 98 | 98 | 97 | 97 | 97 | 95 |
| 4 | 98 | 98 | 98 | 98 | 97 | 97 | 97 |
| 5 | 98 | 99 | 98 | 96 | 98 | 97 | 95 |
| 6+ | 100 | 99 | 100 | 98 | 99 | 98 | 97 |
| Number of adults | | | | | | | |
| 1 | 98 | 98 | 98 | 96 | 94 | 95 | 96 |
| 2 | 97 | 97 | 97 | 96 | 96 | 96 | 95 |
| 3 | 98 | 98 | 98 | 96 | 97 | 97 | 96 |
| 4 | 99 | 99 | 99 | 98 | 97 | 98 | 96 |
| 5 | 99 | 99 | 99 | 99 | 98 | 98 | 98 |
| 6+ | 99 | 99 | 98 | 98 | 99 | 98 | 98 |
| Location 1 | | | | | | | |
| Urban | 100 | 100 | 100 | 100 | 99 | 100 | 100 |
| Rural | 98 | 98 | 98 | 97 | 97 | 96 | 95 |
| Location 2 | | | | | | | |
| Tongatapu Urban | 100 | 100 | 100 | 100 | 99 | 100 | 100 |
| Tongatapu Rural | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Islands | 94 | 93 | 94 | 89 | 90 | 89 | 85 |

Table A2.5 Child items identified as essential by group (% , ctd)

| | Celebrations | School trips | Books | Tutorial lessons | Leisure equipment | Fruit and vegetables |
|---|--------------|--------------|-------|------------------|-------------------|----------------------|
| Gender | | | | | | |
| Male | 97 | 96 | 96 | 95 | 94 | 94 |
| Female | 97 | 96 | 95 | 95 | 94 | 94 |
| Highest qualification of the household head | | | | | | |
| No qualification | 97 | 95 | 95 | 94 | 94 | 93 |
| Secondary School | 97 | 97 | 97 | 96 | 96 | 96 |
| Certificate diploma | 96 | 96 | 96 | 97 | 95 | 95 |
| First degree, BA or higher | 97 | 100 | 98 | 100 | 97 | 98 |
| Age group | | | | | | |
| Early adulthood (18-39) | 97 | 96 | 95 | 94 | 94 | 97 |
| Late adulthood (40-59) | 96 | 95 | 94 | 94 | 94 | 96 |
| Old (60+) | 96 | 96 | 94 | 95 | 94 | 96 |
| Number of children | | | | | | |
| 0 | 97 | 97 | 96 | 97 | 96 | 96 |
| 1 | 95 | 97 | 94 | 95 | 95 | 95 |
| 2 | 97 | 97 | 96 | 94 | 94 | 94 |
| 3 | 96 | 96 | 93 | 95 | 91 | 92 |
| 4 | 96 | 97 | 96 | 96 | 94 | 94 |
| 5 | 96 | 96 | 96 | 92 | 93 | 93 |
| 6+ | 99 | 93 | 97 | 95 | 97 | 95 |
| Number of adults | | | | | | |
| 1 | 96 | 95 | 95 | 94 | 94 | 92 |
| 2 | 95 | 95 | 94 | 93 | 92 | 92 |
| 3 | 97 | 97 | 95 | 95 | 94 | 93 |
| 4 | 96 | 97 | 95 | 95 | 95 | 94 |
| 5 | 98 | 96 | 97 | 95 | 94 | 95 |
| 6+ | 97 | 96 | 97 | 97 | 96 | 97 |
| Location 1 | | | | | | |
| Urban | 99 | 99 | 98 | 99 | 98 | 97 |
| Rural | 96 | 95 | 95 | 94 | 93 | 93 |
| Location 2 | | | | | | |
| Tongatapu Urban | 99 | 99 | 98 | 99 | 98 | 97 |
| Tongatapu Rural | 99 | 100 | 100 | 99 | 97 | 99 |
| Islands | 90 | 86 | 86 | 83 | 85 | 82 |

Appendix 3: Developing child and adult poverty measures for Tonga

This appendix details the application of the Consensual Method to develop socially valid and scientifically robust measures of child (3.A) and adult (3.B) poverty in Tonga. Each part is structured as follows:

Section 1 deals with the identification of socially perceived necessities (SPNs): items and activities that a majority of the population (i.e. >50%) consider to be necessary for a minimally acceptable living standard for children in Tonga in 2015.

Section 2 reports deprivation rates for each of the socially perceived necessities. This allows identifying the most common forms of deprivation for children/adults in Tonga as well as items with potential validity, reliability and or additivity issues.

Section 3 analyses the validity of individual SPNs for measuring poverty, i.e. we examine whether the risk of being deprived of an item is associated with a measure which is known to correlate with poverty, such as a household's ability to keep up with the payment of bills.

Section 4 examines whether the SPNs in the survey can be aggregated into a single, index that measures poverty reliably. For this purpose, the report draws on two measurement theories: Classical Test Theory (CTT) and Item Response Theory (IRT) are utilized to assess this property.

Section 5 analyses the additivity of the indicators, that is, whether the deprivation items can be aggregated to create an index that reflects degrees of severity. Two items are additive is those lacking two items are worse off than those lacking only one item.

The final section summarises the results of the previous analyses and uses the Bristol Optimal Approach to identify a poverty threshold for Tonga that best distinguishes the "poor" from the "non-poor". The full list of items included in the CA module of the Tonga HIES can be consulted in Appendix 1 alongside a key for the short labels used in the tables in this report.

3. A. Child Poverty Measure

1. Suitability

The first step in the consensual method is to identify socially perceived necessities. This is achieved by asking a representative sample of the population whether a range of items/activities should be considered as necessities -items or activities that no-one should go without-, as opposed to other which are 'nice to have' but not necessities. This section considers whether individual items and activities are 'socially perceived necessities' (SPNs). SPNs here are defined as those items that a majority (>50%) of the population consider to be essential for children, and which no child should have to go without due to a lack of money. When something is considered as necessary, it is likely to be a good indicator of deprivation (i.e. those who cannot afford the item are likely to have a low standard of living).

From table A3.1 it is clear there is almost unanimous agreement in Tonga about the items and activities which no child should have to go without due to a lack of money. **Agreement on all items is 90% or above. This suggests all of the items on the list can be taken to be SPNs.**

Table A3.1. Suitability of the items

| Item | % Yes: It is essential |
|--------------------------------------|------------------------|
| Shoes | 100 |
| Three meals | 100 |
| Prescribed medicine (HH) | 98 |
| New clothes | 98 |
| School equipment | 98 |
| Beds and bedding | 97 |
| Own transport (HH) | 97 |
| Repair electrical goods (HH) | 97 |
| Fruit and vegetables | 97 |
| Homework space | 97 |
| Meat or fish daily | 97 |
| School trips | 96 |
| Replace worn-out furniture (HH) | 96 |
| Celebrations | 96 |
| Books their age | 96 |
| Regular savings for emergencies (HH) | 96 |
| Tutorial lessons | 96 |
| Leisure equipment | 95 |

Note: HH indicates items measured at the household level, all other items refer to children in the household.

2. Deprivation rate by Item

Table A3.2 shows the percentage of children deprived of each item. From here onwards the analyses are limited to households with children. **The most common deprivations are for household-level items** such as money to replace furniture or appliances and a household-owned form of transport. The highest deprivation rates for child-specific items were a place for study, access to sport or leisure equipment, and books appropriate for their age, with prevalence rates of around 20%.

There were a few items for children that were perhaps too severe for the Tonga context– i.e. no children were deprived of them; these related food-related items (i.e. having three meals a day and being able to have “One meal with meat, chicken, fish or vegetarian equivalent daily”). Almost no children in the sample were deprived of 3 meals a day, and thus this indicator dropped from the analysis. In contrast, around 13% of children were could not afford to eat fresh fruit and vegetables daily. These findings suggest that in **measuring child food deprivation in Tonga, it is key to go beyond access and consider issues of quality.**

Table A3.2. Item-level Deprivation rates

| | % Children deprived |
|--------------------------------------|---------------------|
| Replace worn-out furniture (HH) | 36 |
| Own transport (HH) | 33 |
| Repair electrical goods (HH) | 31 |
| Regular savings for emergencies (HH) | 29 |
| Leisure equipment | 23 |
| Tutorial lessons | 22 |

| | |
|--------------------------|----|
| Books | 22 |
| Prescribed medicine (HH) | 15 |
| Fruit and vegetables | 13 |
| Celebrations | 13 |
| New clothes | 11 |
| School trips | 10 |
| Homework space | 9 |
| Beds and bedding | 9 |
| Three meals | 8 |
| Meat or fish daily | 5 |
| School equipment | 4 |
| Shoes | 3 |

3. Validity:

Validity is a statistical property which informs whether a scale or index or indicators of deprivation measures what we are intending to measure. In poverty research, what we expect to see is whether deprivation of an item is associated with known correlates of poverty. For example, we might want to check whether someone deprived of shoes is also more likely to have a greater risk of financial strain. Here item validity is tested by assessing the association between each item and the ability to keep up with bills, a widely accepted indicator of financial strain. We use Relative Risk Ratios (RRR), to show the difference in risk of being deprived on an item for those struggling to keep up with bills (RRR>1) and those who are not. The validity of items which display an inverse relationship (or a negative association) between their deprivation and the measure of financial strain can be questioned. The results of validity tests are presented below (table A3.3) for households (HH) and respondents (A). Items that have some potential validity issues are identified with a star.

Table A3.3. Validity Analysis. Children and Full Sample

| | RRR (HH) | RRR (A) | Validity Issues |
|--------------------------------------|----------|---------|-----------------|
| Leisure equipment | 1.75*** | 1.72*** | |
| New clothes | 1.73*** | 1.74*** | |
| Tutorial lessons | 1.56*** | 1.66*** | |
| Books | 1.38*** | 1.36*** | |
| Regular savings for emergencies (HH) | 1.31*** | 1.30*** | |
| Prescribed medicine (HH) | 1.31*** | 1.41*** | |
| School equipment | 1.16 | 1.06** | |
| Own transport (HH) | 1.12* | 1.06 | |
| Replace worn-out furniture (HH) | 1.06 | 0.97 | * |
| Repair electrical goods (HH) | 1.05 | 1.07** | |
| Shoes | 1.04 | 1.01 | * |
| Homework space | 1.04 | 1.01 | * |
| Celebrations | 1.01 | 1.05 | * |
| Meat or fish daily | 0.92 | 1.03 | * |
| Beds and bedding | 0.91 | 0.89*** | * |
| Three meals | 0.9 | 0.97 | * |
| Fruit and vegetables | 0.84* | 0.78*** | * |

| | | | |
|---------------------|---------|---------|---|
| School trips | 0.72*** | 0.74*** | * |
| Household size | 1.01 | 1.01** | |
| Household education | 0.91*** | 0.88*** | |

A range of items show potential validity problems as no significant association is found between lacking the item and an inability to keep up with bills, with three items showing a significant negative association. Using additional indicators to test for validity may be desirable in the future.

4. Reliability analysis:

We test the reliability of items and the index using Classical Test Theory (CTT) and Item Response Theory (IRT). CTT assumes that a perfect poverty index is possible, given an infinite number of items one could use to capture poverty. However, given costs and other obvious constraints, developing such a 'perfect' index is not possible. Thus, what we have in practice are imperfect measures, which are an observed measure plus an element of systematic or random error. When a set of indicators in an index are shown to be reliable measures of the underlying construct (e.g. poverty), it is very likely that the observed measure (based on such items) is highly correlated with the true/perfect score. Reliability of items and the overall scale are reflected by Cronbach's Alpha; i.e. Alpha tell us how reliable the index is as a whole. Alpha values above 0.7 are desirable; values below 0.7 are considered not to be reliable, requiring the use of other indicators to measure poverty more reliably. In the case of Tonga, the index is reliable, with Alpha values above 0.8. No items appear as problematic.

Table A3.4. Reliability analysis. Classical Test Theory

| | Household-level Alpha (if de- leted) | Children- level (if de- leted) | Reliability Sum- mary (*=Prob- lem) |
|--------------------------------------|--|--------------------------------------|---|
| School equipment | 0.899 | 0.895 | |
| Own transport (HH) | 0.898 | 0.893 | |
| Meat or fish daily | 0.898 | 0.893 | |
| Shoes | 0.897 | 0.892 | |
| Regular savings for emergencies (HH) | 0.895 | 0.89 | |
| Beds and bedding | 0.895 | 0.889 | |
| Replace worn-out furniture (HH) | 0.894 | 0.889 | |
| Homework space | 0.894 | 0.89 | |
| Prescribed medicine (HH) | 0.894 | 0.889 | |
| School trips | 0.894 | 0.889 | |
| Three meals | 0.894 | 0.889 | |
| Tutorial lessons | 0.894 | 0.889 | |
| Fruit and vegetables | 0.893 | 0.889 | |
| Repair electrical goods (HH) | 0.893 | 0.888 | |
| Celebrations | 0.893 | 0.887 | |
| New clothes | 0.892 | 0.887 | |
| Leisure equipment | 0.892 | 0.886 | |
| Books | 0.891 | 0.886 | |
| Alpha Total | 0.900 | 0.895 | |

IRT does not assume a perfect measure. Instead, it is more concerned with the properties of the indicators, and in particular, with two properties: **Discrimination and Severity**.

Severity informs about the depth of (material or social) deprivation reflected by an indicator; i.e. items with high(er) severity scores are more likely to be associated with deeper poverty. Thus, if the indicators discriminate well and reflect a low standard of living, then it is very likely that the eventual scale made up of these items will form a reliable measure of poverty. The indicator reflects standard deviations from the average household/person's living standards in Tonga. Negative values for an item suggest that the item is indicative of a high standard of living, and so is not really a good measure of deprivation. Values above 3 mean an item is reflecting severe manifestations of deprivation.

Discrimination shows how well a given indicator separates the deprived and the non-deprived populations. Discrimination values below 0.8 (raw estimates) suggest an item does not discriminate well, and as such may be unreliable.

The IRT scores for items in the child index for Tonga are shown in Table A3.5. Thus, no items in the index are shown to be problematic with regards reliability, based on either IRT or CTT.

Table A3.5. Two-parameter IRT Model. Household-Level

| Item | Severity | Discrimination |
|--------------------------------------|----------|----------------|
| School equipment | 2.1 | 2.5 |
| Meat or fish daily | 1.9 | 2.8 |
| Shoes | 1.9 | 4.5 |
| Beds and bedding | 1.6 | 3.3 |
| Homework space | 1.6 | 3.1 |
| Three meals | 1.5 | 3.4 |
| School trips | 1.5 | 2.8 |
| New clothes | 1.4 | 3.4 |
| Celebrations | 1.3 | 3.3 |
| Fruit and vegetables | 1.3 | 2.9 |
| Prescribed medicine (HH) | 1.2 | 2.8 |
| Tutorial lessons | 1.0 | 2.3 |
| Books | 1.0 | 3.2 |
| Leisure equipment | 0.9 | 3.0 |
| Regular savings for emergencies (HH) | 0.8 | 2.1 |
| Own transport (HH) | 0.7 | 1.4 |
| Repair electrical goods (HH) | 0.6 | 2.8 |
| Replace worn-out furniture (HH) | 0.5 | 2.5 |

5. Additivity:

Scales and indexes can also be checked for additivity i.e. people experiencing two deprivations should be poorer (or financially worse-off) than people experiencing only one. Those experiencing three deprivations should be worse off than those experiencing only two, etc. Items that are not additive may be problematic, even if they are shown to be reliable and valid.

In testing additivity, the first step is to estimate the mean income for two items of those who are deprived and not deprived of each item. This results in mean income estimates for the following categories:

- i. Not deprived of item “a” and not deprived of item “b”
- ii. Deprived of item “a” and not deprived of item “b”
- iii. Not deprived of item “a” and deprived of item “b”
- iv. Deprived of both item “a” and “b”

Additivity is tested using ANOVA second order interaction plots of material deprivation items by income. We would expect that the mean income of people the fourth group to be the lowest (i.e. given they are deprived of both items, and thus, in this example, should be poorer than everyone one else). If this not the case, it means that perhaps an item is not additive and its inclusion in the index would potentially lead to measurement problems and misclassification.

The estimates are to be interpreted with caution. In some cases, there are wide confidence intervals, e.g. for items with low prevalence, which result in overlapping error bars. Additionally, running multiple tests in a small sample is likely to lead some spurious results. Our rule for additivity is that when additivity issues are found for more than 10% of the items (here at least two other items), the indicator in question should be regarded as potentially “problematic”. While items that present issues with four or more other items are categorised as having severe additivity issues.

The numbers in the second column in Table A3.6 indicates the number of other items with which that particular item had additivity problems. The third column identifies items that have issues with 2-3 (*) or more items (**). Prescribed medicine and meat or fish daily present the more severe additivity issues and thus will be removed from the final index. Additionally, five items have additivity issues with at least two other items. These will be noted in the summary table.

Table A3.6. Summary of the Additivity test

| Item | Number of Overlapping Confidence Intervals | Summary (Additivity issues=*, Severe issues=**) |
|--------------------------------------|--|---|
| Replace worn-out furniture (HH) | | |
| Repair electrical goods (HH) | 1 | |
| Regular savings for emergencies (HH) | 3 | * |
| Prescribed medicine (HH) | 5 | ** |
| Own transport (HH) | | |
| Shoes | | |
| Three meals | | |
| New clothes | | |
| Celebrations | | |
| Meat or fish daily | 4 | ** |
| School equipment | 3 | * |
| School trips | 2 | * |
| Homework space | | |
| Tutorial lessons | | |
| Beds and bedding | 1 | |
| Leisure equipment | 2 | * |
| Books | 3 | * |
| Fruit and vegetables | | |

6. Child poverty measure

In order to create a socially and scientifically valid poverty measure two further steps are required. First, select the items that fulfils the required criteria of suitability, reliability, validity and additivity and can be used to create a robust deprivation index that is suitable to the Tongan context. Second, the identification of the poverty threshold for child poverty in Tonga.

The deprivation index

The selection of items to be included in the index is based on the scientific criteria described above. Items identified as potentially problematic in two or more areas, as well as those presenting severe additivity issues, are dropped from the final index. Table A3.7 summarises the results of the tests. The results suggest that four items should be dropped: *prescribed medicine*, *replace worn clothes*, and *gifts for family and friends once a year*. These have been excluded from further analyses.

Table A3.7. Summary of the tests

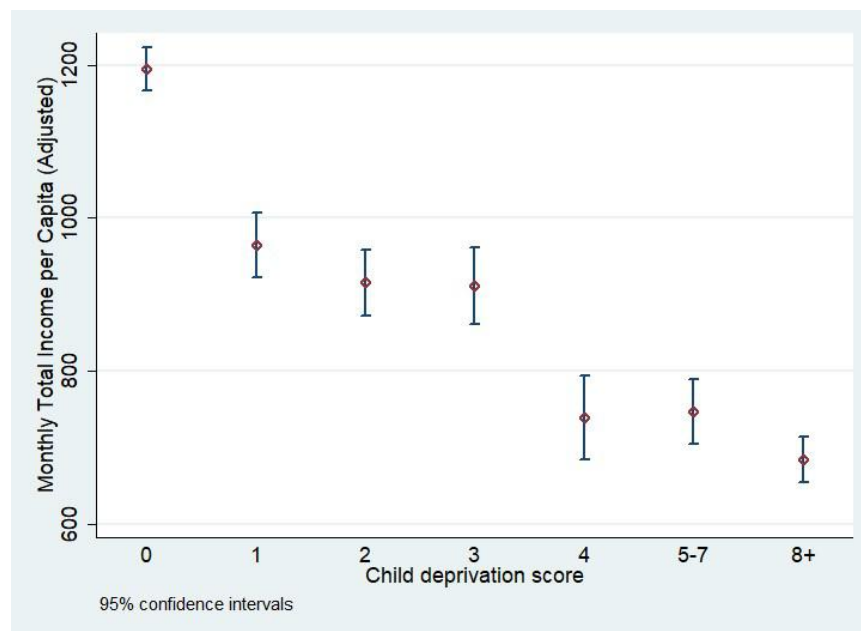
| Item Label | Suitabil- ity | Valid- ity | Reliability | | Addi- tivity | Sum- mary |
|--------------------------------------|------------------|---------------|-------------|---------|-----------------|--------------|
| | | | CT T | IR T | | |
| Replace worn-out furniture (HH) | | * | | | | |
| Repair electrical goods (HH) | | | | | | |
| Regular savings for emergencies (HH) | | | | | * | |
| Prescribed medicine (HH) | | | | | ** | x |
| Own transport (HH) | | | | | | |
| Shoes | | * | | | | |
| Three meals | | * | | | | |
| New clothes | | | | | | |
| Celebrations | | * | | | | |
| Meat or fish daily | | * | | | ** | x |
| School equipment | | * | | | * | x |
| School trips | | * | | | * | x |
| Homework space | | * | | | | |
| Tutorial lessons | | | | | | |
| Beds and bedding | | * | | | | |
| Leisure equipment | | | | | * | |
| Books | | | | | * | |
| Fruit and vegetables | | ** | | | | |

Poverty estimates based on the Bristol Method

According to Townsend's work on poverty in the UK, deprivation is the result of insufficient command over resources to ensure participation in patterns of living considered customary or the norm. He showed that as resources fell or declined, the experience of deprivation(s) increased, and that below a certain level, the experience of multiple deprivation increased much more considerably. It was at this point or inflection, where deprivations begin to rise sharply, that Townsend suggested the poverty be set or identified – at a level where people did not have command over sufficient resources.

Figure A3.1 uses data on average adjusted monthly income in Tonga, to plot the relationship between Income per capita and Deprivation. The figures should read with some caution given the wide confidence intervals, particularly at the higher end of the deprivation scale.

Figure A3.1 Average adjusted monthly income and child deprivation scores



The Bristol Optimal Method seeks to find the inflection point that best distinguishes the poor from the non-poor (i.e. a scientifically informed, socially-realistic poverty line). The ANOVA results suggests a two items poverty threshold for children (marked in the figure above with a horizontal line). Additionally, the logit solution identifies a more severe threshold 5+ items for children.

Poverty estimates are reported in Table A3.8. Additionally, we provide also the 5+ threshold estimate for severe poverty. This is in accordance with the practice used for the adult group and offers an estimate of the proportion of the population that experiences deeper forms of poverty. A key finding is that around half of poor children experience severe poverty (5+).

Table A3.8. Child poverty and severe poverty rate

| | Child poverty | Child Severe |
|------------------------|---------------|--------------|
| Poor | 36 | 15 |
| Vulnerable deprivation | 14 | |
| Vulnerable income | 18 | |
| Not poor | 33 | |
| Total | 38,357 | |

Note: The “poor” are those experiencing low income and 2+ deprivations, vulnerable deprivation identifies those who experience 2+ deprivation but not low income, while the “vulnerable income” group experience low income but less than 2 deprivations Not poor (income above threshold and dep<2)

3. B. Adult Poverty measure

1. Suitability

The first step in the consensual method is to identify socially perceived necessities. This is achieved by asking a representative sample of the population whether a range of items/activities should be considered as necessities -items or activities that no-one should go without-, as opposed to other which are 'nice to have' but not necessities. This section considers whether individual items and activities are 'socially perceived necessities' (SPNs). SPNs here are defined as those items that a majority (>50%) of the population consider to be essential for children, and which no adult should have to go without due to a lack of money. When something is considered as necessary, it is likely to be a good indicator of deprivation (i.e. those who cannot afford the item are likely to have a low standard of living).

Table A3.9. Suitability Adult and Household level items

| Item | % Yes: Essential (Adults) |
|--------------------------------------|---------------------------------|
| Replace worn-out clothes | 98 |
| Repair electrical goods (HH) | 98 |
| Replace worn-out furniture (HH) | 97 |
| Meat or fish once a week | 97 |
| Prescribed medicine (HH) | 96 |
| Money for self (weekly) | 96 |
| Two meals a day | 96 |
| Get together monthly | 96 |
| Regular savings for emergencies (HH) | 96 |
| Clothes for special occasions | 95 |
| Access to transport | 95 |
| Fruit and vegetables | 95 |
| Own transport (HH) | 95 |
| Money for hospital visits | 94 |
| Two pairs of shoes | 94 |
| Presents once a year | 93 |

All items pass the suitability test and are then kept for further analyses.

2. Deprivation rate by Item

The most common deprivations are for household-level items such as money to replace furniture or appliances and a household-owned form of transport (table A3.10). The highest deprivation rates for individual items were Access to safe public transport, some money to spend on one-self weekly and enough money to visit friends and family in hospitals and other institutions when necessary.

There are two items for adults that are perhaps too severe for the Tonga context– i.e. very few adults are deprived: two pairs of shoes and meat or fish once a week. The deprivation rate for the latter item is 1%, and thus the item is likely to have problems in the reliability, validity and additivity tests.

Table A3.10. Item-level Deprivation rates,

| | % Adults Deprived | % Households deprived |
|--------------------------------------|-------------------|-----------------------|
| Replace worn-out furniture (HH) | 35 | 34 |
| Own transport (HH) | 32 | 34 |
| Repair electrical goods (HH) | 29 | 29 |
| Regular savings for emergencies (HH) | 28 | 27 |
| Prescribed medicine (HH) | 13 | 14 |
| Fruit and vegetables | 13 | 14 |
| Money for hospital visits | 13 | 18 |
| Money for self (weekly) | 12 | 18 |
| Get together monthly | 12 | 15 |
| Access to transport | 12 | 15 |
| Replace worn-out clothes | 11 | 14 |
| Presents once a year | 10 | 14 |
| Two meals a day | 5 | 6 |
| Clothes for special occasions | 4 | 5 |
| Two pairs of shoes | 2 | 3 |
| Meat or fish once a week | 1 | 2 |

3. Validity:

Validity is a statistical property which informs whether a scale or index or indicators of deprivation measures what we are intending to measure. In poverty research, what we expect to see is whether deprivation of an item is associated with known correlates of poverty. For example, we might want to check whether someone deprived of shoes is also more likely to have a greater risk of financial strain. Here two indicators are used to test the validity of the items: a) the ability to keep up with bills, a widely accepted indicator of financial strain, and an asset index that is an indirect measure of household wealth. We use Relative Risk Ratios (RRR), to show the difference in risk of being deprived on an item for those struggling to keep up with bills ($RRR > 1$) and those who are not in the first case, and between the top and bottom quintiles of the asset index in the second case (table A3.11). The validity of items which display an inverse relationship (or a negative association) between their deprivation and the measure of financial strain can be questioned. The results of validity tests are presented below for adults and households (HH).

Table A3.11. Validity Analysis. Adults and Full Sample

| | RRR (HH) | RRR (A) | Validity Check |
|--------------------------------------|----------|---------|----------------|
| Replace worn-out furniture (HH) | 1.09 | 1.06* | |
| Own transport (HH) | 1.38*** | 1.34*** | |
| Repair electrical goods (HH) | 1.19** | 1.18*** | |
| Regular savings for emergencies (HH) | 1.08 | 1.26*** | |
| Prescribed medicine (HH) | 1.33*** | 1.14*** | |
| Fruit and vegetables | 1.43** | 1.80*** | |
| Money for hospital visits | 0.71*** | 0.66*** | |
| Money for self (weekly) | 1.77*** | 1.68*** | |
| Get together monthly | 0.9 | 0.79*** | |

| | | | |
|-------------------------------|---------|---------|---|
| Access to transport | 1.35*** | 1.35*** | |
| Replace worn-out clothes | 1 | 1.09* | * |
| Presents once a year | 0.74*** | 0.74*** | * |
| Two meals a day | 1.31*** | 1.29*** | * |
| Clothes for special occasions | 1.66*** | 1.64*** | * |
| Two pairs of shoes | 0.93 | 0.93 | * |
| Meat or fish once a week | 1.46*** | 1.39*** | * |
| Household Size | 1.03*** | 1 | |
| Household Education | 1 | 0.94*** | |

Six items have been flagged as potentially having validity issues: replace worn-out clothes, presents once a year, two meals a day, clothes for special occasions, two pairs of shoes and meat or fish once a week. This will be noted in the summary table.

4. Reliability analysis:

We test the reliability of items and the index using Classical Test Theory (CTT) and Item Response Theory (IRT). CTT assumes that a perfect poverty index is possible, given an infinite number of items one could use to capture poverty. However, given costs and other obvious constraints, developing such a 'perfect' index is not possible. Thus, what we have in practice are imperfect measures, which are an observed measure plus an element of systematic or random error. When a set of indicators in an index are shown to be reliable measures of the underlying construct (e.g. poverty), it is very likely that the observed measure (based on such items) is highly correlated with the true/perfect score. Reliability of items and the overall scale are reflected by Cronbach's Alpha; i.e. Alpha tell us how reliable the index is as a whole. Alpha values above 0.7 are desirable; values below 0.7 are considered not to be reliable, requiring the use of other indicators to measure poverty more reliably.

In the case of Tonga, the index is reliable, with Alpha values above 0.8 (Table A3.12). Three items appear as problematic: meat or fish once a week, two pairs of shoes and prescribed medicine would improve the overall reliability of the scale. This is noted in the summary table.

Table A3.12. Reliability analysis. Classical Test Theory

| | Individual-level Alpha (if deleted) | Household-level Alpha (if deleted) | Reliability Summary (*=Problem) |
|--------------------------------------|-------------------------------------|------------------------------------|---------------------------------|
| Meat or fish once a week | 0.878 | 0.882 | * |
| Two pairs of shoes | 0.876 | 0.882 | * |
| Prescribed medicine (HH) | 0.873 | 0.878 | * |
| Clothes for special occasions | 0.873 | 0.879 | |
| Repair electrical goods (HH) | 0.869 | 0.873 | |
| Replace worn-out furniture (HH) | 0.868 | 0.873 | |
| Fruit and vegetables | 0.868 | 0.874 | |
| Two meals a day | 0.867 | 0.873 | |
| Regular savings for emergencies (HH) | 0.866 | 0.872 | |
| Own transport (HH) | 0.866 | 0.871 | |
| Access to transport | 0.866 | 0.872 | |
| Money for self (weekly) | 0.866 | 0.871 | |

| | | |
|---------------------------|-------|-------|
| Money for hospital visits | 0.863 | 0.868 |
| Presents once a year | 0.862 | 0.867 |
| Replace worn-out clothes | 0.861 | 0.867 |
| Get together monthly | 0.858 | 0.865 |
| Alpha Total | 0.875 | 0.875 |

IRT does not assume a perfect measure. Instead, it is more concerned with the properties of the indicators, and in particular, with two properties: **Discrimination and Severity**.

Severity informs about the depth of (material or social) deprivation reflected by an indicator; i.e. items with high(er) severity scores are more likely to be associated with deeper poverty. Thus, if the indicators discriminate well and reflect a low standard of living, then it is very likely that the eventual scale made up of these items will form a reliable measure of poverty. The indicator reflects standard deviations from the average household/person's living standards in Tonga. Negative values for an item suggest that the item is indicative of a high standard of living, and so is not really a good measure of deprivation. Values above 3 mean an item is reflecting severe manifestations of deprivation.

Discrimination shows how well a given indicator separates the deprived and the non-deprived populations. Discrimination values below 0.8 (raw estimates) suggest an item does not discriminate well, and as such may be unreliable.

The IRT scores for items in the adult index for Tonga are shown in Table A3.13.

Table A3.13. Two-parameter IRT Model. Household-Level

| Item | Severity | Discrimination |
|--------------------------------------|----------|----------------|
| Meat or fish once a week | 2.4 | 2.6 |
| Two pairs of shoes | 2.3 | 2.3 |
| Clothes for special occasions | 2.0 | 2.3 |
| Two meals a day | 1.6 | 4.4 |
| Regular savings for emergencies (HH) | 1.3 | 2.5 |
| Access to transport | 1.3 | 2.3 |
| Fruit and vegetables | 1.3 | 2.2 |
| Replace worn-out clothes | 1.2 | 4.1 |
| Presents once a year | 1.1 | 4.1 |
| Get together monthly | 1.0 | 6.1 |
| Money for self (weekly) | 1.0 | 2.3 |
| Money for hospital visits | 1.0 | 3.1 |
| Repair electrical goods (HH) | 0.8 | 1.8 |
| Prescribed medicine (HH) | 0.8 | 1.2 |
| Own transport (HH) | 0.7 | 2.2 |
| Replace worn-out furniture (HH) | 0.5 | 2.0 |

There are no items with severity above 3. No items have low discrimination. Thus, no item is identified as having reliability problems.

5. Additivity:

Scales and indexes can also be checked for additivity i.e. people experiencing two deprivations should be poorer (or financially worse-off) than people experiencing only one. Those experiencing three deprivations should be worse off than those experiencing only two, etc. Items that are not additive may be problematic, even if they are shown to be reliable and valid.

In testing additivity, the first step is to estimate the mean income for two items of those who are deprived and not deprived of each item. This results in mean income estimates for the following categories:

- v. Not deprived of item “a” and not deprived of item “b”
- vi. Deprived of item “a” and not deprived of item “b”
- vii. Not deprived of item “a” and deprived of item “b”
- viii. Deprived of both item “a” and “b”

Additivity is tested using ANOVA second order interaction plots of material deprivation items by income. We would expect that the mean income of people the fourth group to be the lowest (i.e. given they are deprived of both items, and thus, in this example, should be poorer than everyone one else). If this not the case, it means that perhaps an item is not additive and its inclusion in the index would potentially lead to measurement problems and misclassification.

The estimates are to be interpreted with caution. In some cases, there are wide confidence intervals, e.g. for items with low prevalence such as clothes for special occasions, which result in overlapping error bars. Additionally, running multiple tests in a small sample is likely to lead some spurious results. Our rule for additivity is that when additivity issues are found for more than 10% of the items (here at least two other items), the indicator in question should be regarded as potentially “problematic”. While items that present issues with four or more other items are categorised as having severe additivity issues.

The numbers in the second column in Table A3.14 indicates the number of other items with which that particular item had additivity problems. The third column identifies items that have issues with 2-3 (*) or more items (**). Prescribed medicine has severe additivity issues and will be excluded from the final index. Three other items have some additivity issues. These will be reflected in the summary table.

Table A3.14. Summary of the Additivity analysis

| Table 6. Summary of the Additivity analysis | Number of Overlapping Confidence Intervals | Summary (Additivity issues=*, Severe issues=**) |
|---|--|---|
| Replace worn-out furniture (HH) | | |
| Repair electrical goods (HH) | | |
| Regular savings for emergencies (HH) | | |
| Prescribed medicine (HH) | 4 | ** |
| Own transport (HH) | | |
| Two pairs of shoes | 1 | |
| Two meals a day | 1 | |
| Money for self (weekly) | 1 | |
| Clothes for special occasions | 2 | * |
| Replace worn-out clothes | 1 | |
| Get together monthly | 3 | * |

| | | |
|---------------------------|---|---|
| Presents once a year | | |
| Money for hospital visits | | |
| Access to transport | 1 | |
| Meat or fish once a week | | |
| Fruit and vegetables | 2 | * |

A number of items present additivity issues, with six items presenting severe additivity issues (against four or more other items): money for self-weekly, get together monthly, replace worn out clothes, two meals a day, two pairs of shoes and meat or fish once a week. All additivity issues are reflected in the final table with a star.

6. Adult poverty measure

In order to create a socially and scientifically valid poverty measure two further steps are required. First, select the items that fulfils the required criteria of suitability, reliability, validity and additivity and can be used to create a robust deprivation index that is suitable to the Tongan context. Second, the identification of the poverty threshold for adult poverty in Tonga.

The deprivation index

The selection of items to be included in the index is based on the scientific criteria described above. Items identified as potentially problematic in two or more areas, as well as those presenting severe additivity issues, are dropped from the final index. Table A3.15 summarises the results of the tests. Three items have been identified as problematic and dropped from the index on the basis of severe additivity issues: some money for one-self weekly, clothes for special occasions and a get together monthly. Two other items -two pairs of shoes, two meals a day-presented either reliability and/or validity issues in addition to additivity and were also excluded from the final index.

Table A3.15. Summary of the tests

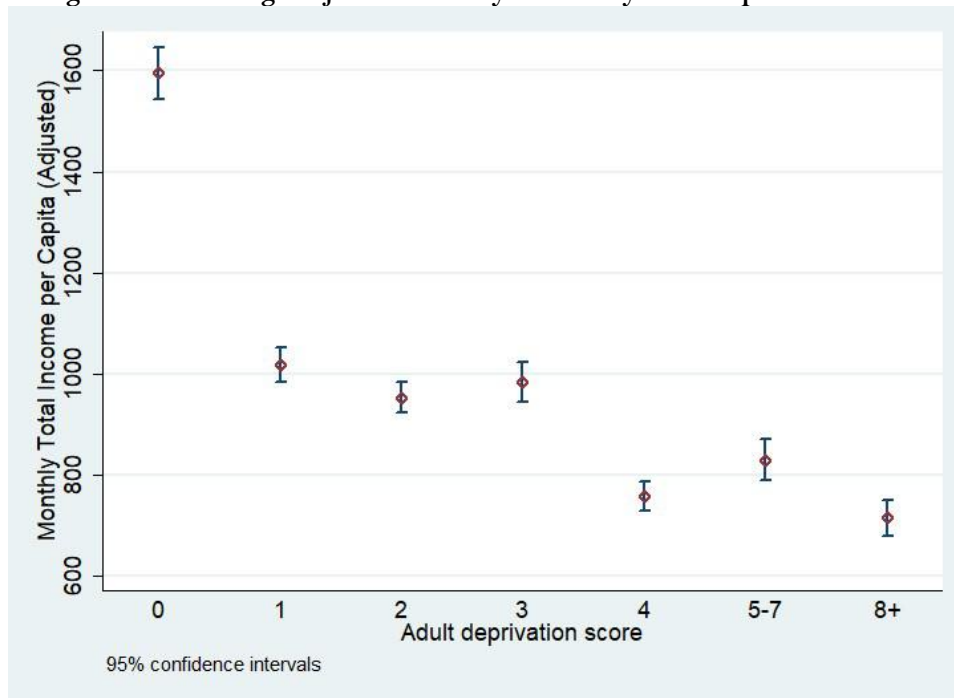
| Item Label | Suitabil- ity | Valid- ity | Reliability | | Addi- tivity | Sum- mary |
|--------------------------------------|------------------|---------------|-------------|---------|-----------------|--------------|
| | | | CT T | IR T | | |
| Replace worn-out furniture (HH) | | | | | | |
| Repair electrical goods (HH) | | | | | | |
| Regular savings for emergencies (HH) | | | | | | |
| Prescribed medicine (HH) | | | | | ** | X |
| Own transport (HH) | | | | | | |
| Two pairs of shoes | | * | * | | | |
| Two meals a day | | * | | | | |
| Money for self (weekly) | | | | | | |
| Clothes for special occasions | | * | | | * | X |
| Replace worn-out clothes | | * | | | | |
| Get together monthly | | | | | * | |
| Presents once a year | | * | | | | |
| Money for hospital visits | | | | | | |
| Access to transport | | | | | | |
| Meat or fish once a week | | * | * | | | X |
| Fruit and vegetables | | | | | * | |

Poverty estimates based on the Bristol Method

According to Townsend's work on poverty in the UK, deprivation is the result of insufficient command over resources to ensure participation in patterns of living considered customary or the norm. He showed that as resources fell or declined, the experience of deprivation(s) increased, and that below a certain level, the experience of multiple deprivation increased much more considerably. It was at this point or inflection, where deprivations begin to rise sharply, that Townsend suggested the poverty be set or identified – at a level where people did not have command over sufficient resources.

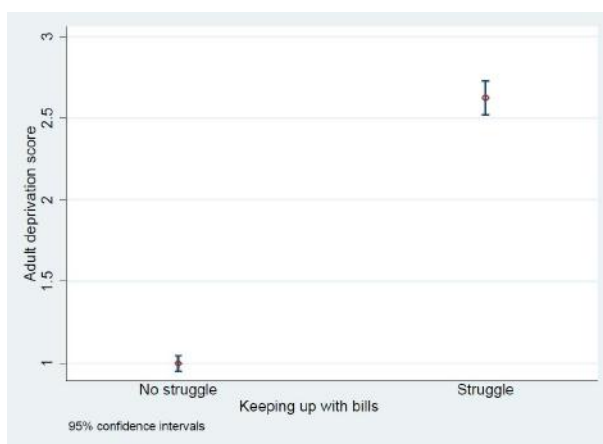
Figure A3.3 uses data on average adjusted monthly income in Tonga, to plot the relationship between Income per capita and Deprivation. The figures should read with some caution given the wide confidence intervals, particularly at the higher end of the deprivation scale. The figure identifies one group who has comparatively high income and experiences no deprivation, which contrasts with the rest of the population who experience both much lower incomes and some deprivation.

Figure A3.3 Average adjusted monthly income by adult deprivation scores



The Bristol Optimal Method aims to find the poverty line that best distinguishes the poor from the non-poor. In this case logistic regression identifies 4 as the optimal threshold and the ANOVA identifies 3 items. Additionally, mean deprivation scores for several population sub-groups were calculated. The figure below indicates that the mean deprivation scores for all groups are below 3 with no group having a score of 4 or more. For example, the average adult deprivation score for the population group regularly struggling with bills is in the range of 2.5/3 (Figure A3.4).

Figure A3.4 Average adult deprivation scores by ability to keep up with bills



After considering the distribution of deprivation for these sub-groups, as well as the association between income and deprivation in figure A3 three is selected as the optimal threshold. Additionally, for consistency with the child poverty measure, a 5+ threshold is used to identify those experiencing more severe forms of poverty. The resulting poverty estimates for the adult population are reported below (Table A3.16).

Table A3.16 Poverty estimates adults and households

| | Households | HH severe | Adults | Ad Severe |
|------------------------|---------------|-----------|---------------|-----------|
| Poor | 24 | 10 | 22 | 9 |
| Vulnerable deprivation | 9 | | 12 | |
| Vulnerable income | 24 | | 23 | |
| Not poor | 43 | | 44 | |
| Weighted total | 18,007 | | 63,448 | |

In sum, the analyses presented here used data from the 2015/16 HIES for Tonga. They showed how a valid and reliable index of multidimensional child and adult poverty can be developed and used, based on national definitions using socially perceived necessities. The results show clear disparities in multidimensional poverty between Tongatapu and the other islands. The analysis has also shown that some of the questions asked to reflect consensual poverty could be modified to take further into account the particular context of Tonga. One way to do this would be through the use of focus groups, to discuss the relevance and appropriateness of items in the index.

References:

- Adelman, S., Gilligan, D., and Lehrer, K. (2008) *How effective are food for education programs?: a critical assessment of the evidence from developing countries*. Food Policy Review 9. Washington: International Food Policy Research Institute.
- Bradshaw, J. and Finch, N. (2003) 'Overlaps in dimensions of poverty', *Journal of Social Policy*, 32(4), pp. 513–525.
- Bradshaw, J., Y. Chzhen, C. de Neubourg, G. Main, B. Martorano and L. Menchini (2012), 'Relative Income Poverty among Children in Rich Countries', Innocenti Working Paper 2012-01, UNICEF Innocenti Research Centre, Florence. www.unicef-irc.org/publications/pdf/iwp_2012_01.pdf
- Chinton, M. Chyatte, M. and Breaux, J. (2007) 'The negative effects of poverty & food insecurity on child Development', *Indian Journal of Medical Research*, 126, Oct 2007, p. 262-272
- Deeming, P. and Gubhaju, (2015) The mismeasurement of extreme global poverty: a case study in the Pacific islands, *Journal of Sociology*, 51(3), p. 689-706
- Delamonica, E. (2014) 'Multiple approaches to the measurement of multidimensional poverty are used internationally, based on varying understandings of poverty and dimensions'. *CROP Poverty Brief* 23.
- Fifita Konifelenisi, V., Nandy, S., and Gordon, D. (2015) *Child poverty in Tonga*. Bristol: Townsend Centre for International Poverty Research.
- Gordon, D., Nandy, S., Pantazis, C., Pemberton, S. and Townsend P. (2003) *Child Poverty in the Developing World*. Bristol: Policy Press.
- Gordon, D. (2006) The concept and measure of poverty, in Pantazis, C., Gordon, D. and Levitas, R. (Eds.) *Poverty and Social Exclusion in Britain*, Bristol: Policy Press, pp. 29-69 Available at: <http://www.poverty.ac.uk>
- Graham J.P. and Polizzotto, M. (2013) Pit Latrines and Their Impacts on Groundwater Quality: A Systematic Review. *Environmental Health Perspectives*; 212, DOI:10.1289/ehp.1206028
- Guio, A.C., Fusco, A. and Marlier, E. (2009) 'Measuring material deprivation in the EU: Indicators for the whole population and child specific indicators', *Eurostat Methodologies and Working Papers*, Luxembourg: Publications Office of the European Union
- Guio, A.C., Gordon, D., Najera, H and Pomati, M (2017) *Revisiting the EU material deprivation variables. Statistical working papers*. Luxembourg: Publications Office of the European Union.
- Lister, R. (2004) *Poverty*. Cambridge: Polity.
- Mack, J. & Lansley, S. (1985) *Poor Britain*. London: George Allen & Unwin
- Mack, J. (2017) 'Fifty years of poverty in the UK', in Bramley, G and Bradley, N. (Eds.) *Poverty and social exclusion in the UK. Volume 2 - The dimensions of disadvantage*. Bristol: Policy Press, pp. 27-55
- Minujin, A. (2011) *Child Poverty in East Asia and the Pacific*. Bangkok: UNICEF East Asia.
- Minujin, A., & Nandy S. (eds.) (2012), *Global Child Poverty and Well-being: Measurement, concepts, policy and action*. Bristol: Policy Press.
- Nájera Catalán, H.E (2018) Reliability, Population Classification and Weighting in Multidimensional Poverty Measurement: A Monte Carlo Study, *Social Indicators Research*. <https://doi.org/10.1007/s11205-018-1950-z>
- Nájera, H E., Fifita, V and Faingaanuku, W. (Under review) 'Small-area multidimensional poverty estimates for Tonga 2016: drawn from a hybrid hierarchical Bayesian estimator' *Applied Spatial Analysis and Policy*.
- Pogge, T. (2005) 'Severe poverty as a violation of negative duties', *Ethics & International Affairs*, 19 (1), 55-83.
- Townsend, P (1979) *Poverty in the United Kingdom*. London: Allen Lane ad Penguin Books. Available at: <http://www.poverty.ac.uk>
- UN (1989) Convention on the Rights of the Child. Available at: <https://www.unicef.org.uk/what-we-do/un-convention-child-rights/>
- UN (1966) International Covenant on Economic, Social and Cultural Rights <https://www.ohchr.org/en/professionalinterest/pages/cescr.aspx>

UNSTAT (2017) The sustainable development goals report 2017 New York: United Nations
<https://unstats.un.org/sdgs/report/2017/>
World Bank (2017) *Monitoring Global Poverty: Report of the Commission on Global Poverty*.
Washington, DC: World Bank

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