Government of Tonga

Assessing progress towards the reduction of multidimensional, extreme and monetary poverty in the Kingdom of Tonga.
Report: 2021

Tonga Poverty Assessment Report

Tonga Statistics Department

Pacific Community
Communauté
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SDD
Statistics for Development Division

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Table of content

Acronyms and abbreviations

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AE	Adult equivalent
TOP	Tongan Paʻanga
BNPL	Basic needs poverty line
SPC	Pacific Community
FPL	Food poverty line
GNI	Gross national income
HIES	Household Income and Expenditure Survey
TSD	Tonga Statistics Department
UMICs	Upper Middle-Income Countries
NFPL	Non-food poverty line
PPP	Purchasing power parity
PSMB	Pacific Statistics Methods Board
USD	American dollar
CA	Consensual Approach

Acknowledgements

Introduction of the Overall Report

"*As we embark on this great collective journey, we pledge that no one will be left behind. Recognizing that the dignity of the human person is fundamental, we wish to see the goals and targets met for all nations and peoples and for all segments of society. And we will endeavour to reach the furthest behind first.*" (2030 Agenda for Sustainable Development)

This document in its entirety reflects the commitment of the Tonga Statistics Department to provide informed information on poverty status by assessing the progress made towards the reduction of **multidimensional**, **extreme** and **monetary poverty** of the people of the Kingdom of Tonga. By reporting on these three different approaches to poverty contained within one report, the Tonga Statistics Department believes that it will give a better understanding of national poverty to the users of this report, thereby contributing to the pledge of leaving no one behind by reducing those experiencing poverty in any of its forms.

While the analyses within this report uses the Household Income and Expenditure Survey (HIES) 2021 dataset, there are two distinct parts within, with different authorships; Part 1 under Dr. Hector Najera and Dr. Viliami Konifelenisi Fifita, and Part 2 under Dr. Jean-Paul Zoyem .

Part 1 reports in-depth on Multidimension Poverty using the Consensual Deprivation Approach, and provides the **multidimensional poverty line** which is also Tonga's **national poverty line**.

Part 2 reports in-depth on Income Monetary Poverty and Living standard Inequality using the Cost of Basic Needs approach for a Living methodology and provides the cost of basic needs to define the **poverty line**.

Rationale for the methodologies used are detailed within each of the 2 parts to assist the users of this report on deciding which statistics to use for the appropriate interventions.

It is to be noted that while the **international poverty line** is reported as the measure of **extreme poverty**, the use of this figure would not be appropriate for national purposes and targeting resources as it is not a reliable measure of poverty for Pacific Island Countries and Territories (PICTS).

In conclusion, by providing different methodologies and rationales within one report, the Tonga Statistics Department hopes that the users of the report are provided with sufficient information on Tonga's poverty status to accelerate the national, regional and international development agendas.

Part 1. Multidimensional poverty measurement in Tonga

Authorship:

Dr. Hector Najera and Dr. Viliami K. Fifita

Executive summary

This document uses data from the Household Income and Expenditure survey (HIES) of Tonga 2021/2022 to report the state of progress of three key poverty indicators of the Sustainable Developing Goals (SDG): Extreme income poverty (SDG 1.1.1), people below the national poverty line (SDG 1.2.1) and poverty in all its dimensions (multidimensional poverty) (SDG 1.2.2).

This part mainly focuses on the report of the Sustainable Development Goal (SDG 1.2.2) "*Proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions*".

Multidimensional poverty (SDG 1.2.2) is reported using the consensual deprivation

> According to the latest data, **multidimensional poverty** in Tonga **declined** from 27% in 2015 to **24%** in 2021. However, this reduction varied across different population groups. **Child poverty** experienced the most **significant decrease**, dropping from 33% to **28%**. On the other hand, poverty among **adults** had a **slight reduction**, from 23% to **21%**.

approach (CA), which was previously used to estimate this type of poverty in 2015/2016.

It's important to note that the decrease in multidimensional poverty was not the only improvement observed. Vulnerability to poverty resulting from low living standards (rising poor) also decreased across all groups. This trend suggests that there will likely be further reductions, as this group is expected to experience improvements in their living standards in the medium term.

In comparison to the other four main islands, Tongatapu has lower levels of multidimensional poverty. Likewise, deprivation in specific items is lower in the capital city relative to the rest of the islands. The gap in deprivation rates is more pronounced in items with higher rates of deprivation. Across different groups, deprivation decreased for individuals with higher levels of educational attainment and for older people. Some gender differences were noted for items with high deprivation rates.

These figures on multidimensional poverty are based on a participatory measure of poverty that takes into account the essential needs validated by the population of Tonga. Unlike poverty measures solely based on expert criteria, the multidimensional index used in this report incorporates the theory of relative deprivation and the consensual

approach (CA) to identify a representative set of essential needs for the people in Tonga and to identify those lacking such items due to resource constraints (Townsend, 1979; Mack and Lansley, 1985).

The results indicate that Tonga would have to reduce multidimensional poverty at a pace of .8 % on average every year to meet the 2030 SDG target. The results suggest that in order to meet the 2030 targets, Tonga must have a steady economic growth, preferably above 2.5% yearly on average, and continue efforts to reduce poverty via monetary transfers for the poor, in-kind transfers for children in school, job inclusion programmes together with investment in public infrastructure.

Tonga has succeeded in virtually eradicating the most extreme form of poverty (SDG 1.1.1), measured using the World Bank approach of the updated dollar a day. There is no evidence to conclude that the prevalence of this form of poverty is different from zero.

The cost of basic needs was used to estimate the proportion of people below the national poverty line (SDG 1.2.1). According to this approach, nearly 21% cannot afford the reference basket of basic needs which in 2021 was valued at TOP $6,058 per person on a yearly basis.

Both SDG measures (SDG 1.2.1 and SDG 1.2.2) suggest that although severity of poverty is lower in the main island relative to the other islands, most of the poor live in Tongatapu due to its population size. Across population groups, the rural population, the less educated, those living in households with children and those in non-skilled jobs are more likely to experience both types of poverty. With regards to gender, income poverty seems to be slightly higher among males but there are substantive differences when looking at multidimensional poverty.

Following recent recommendations of the literature about the importance of the statistical validation of multidimensional measures (Atkinson, 2019; Nájera and Gordon, 2020), this report thoroughly examined the properties of the index used to estimate multidimensional poverty. Building on Guio *et al.* (2017) and Guio, Gordon and Marlier (2012), a series of statistical methods (latent variable theory and methods) were employed to assess the extent of random and systematic errors. The conclusions

strongly indicate that the index enables valid and reliable inferences regarding the magnitude and distribution of multidimensional poverty in Tonga.

1. **Extreme and multidimensional poverty in Tonga**

In 2015-2016 the extent of extreme poverty was 3% and in 2022 this form of poverty dropped to less than 1%. Given the survey error, there is no evidence that such a figure is different from zero. So, it is **very likely and safe to affirm that Tonga has succeed in eradicating extreme poverty**. The extent of extreme poverty contrasts with the size of multidimensional poverty, which is based on standards of the XXI century. In both survey years, there is very little overlap between these two forms of poverty and from a policy perspective it is not advisable to focus on monetary extreme poverty as it is of little use to inform about the living standards of the population in Tonga.

2016

27 %

Multidimensional poor

3% Extreme income poverty WB

2022

24 %

Multidimensional poor

<1% Extreme income poverty WB
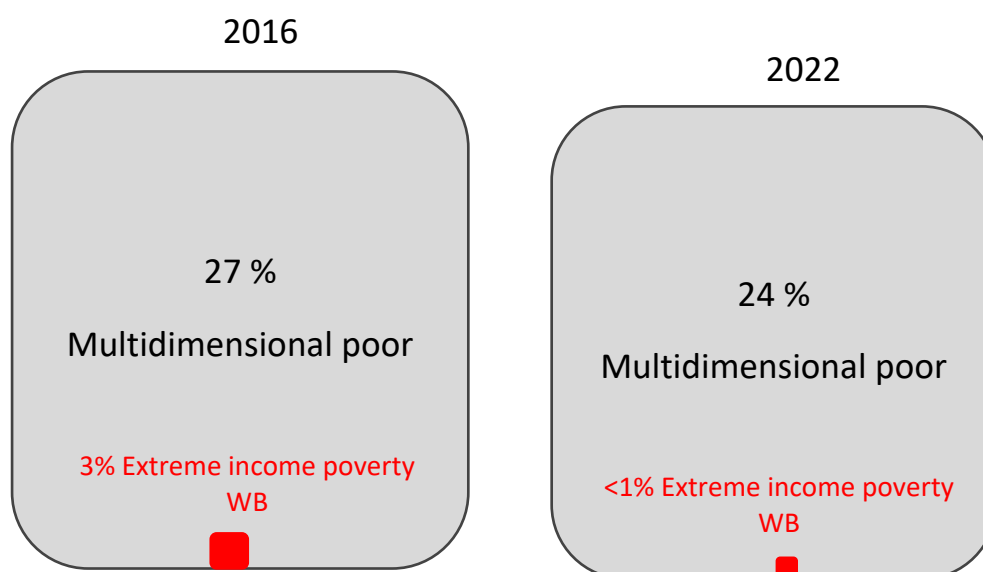
2. The measurement of multidimensional poverty

This report addresses the Sustainable Development Goal 1: No Poverty

INDICATOR 1.2.2

Proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions.

To have a valid, democratic and scientific approach to multidimensional poverty measurement in Tonga this report draws upon Townsend's (1979) theory of relative deprivation and Mack and Lansley's (1985) consensual approach to design and implement a survey module explicitly devised to measure poverty considering the living standards of the people in Tonga.

This approach has been used systematically in both developed and developing countries (Saunders and Bradbury, 1989; Saunders, Bradbury, *et al.*, 1991; Halleröd, 1995; Pantazis, Gordon and Levitas, 2006; Lau *et al.*, 2015; Nandy and Pomati, 2015; Guio *et al.*, 2017; Dermott and Main, 2017; Gordon *et al.*, 2019; Lanau and Fifita, 2020; UNICEF, 2020; Notten and Kaplan, 2021; Beccaria, Fernández and Nájera, 2022).

The poor population in Tonga are living in poverty: "*[W]hen they lack the resources to obtain the type of diet, participate in the activities and have the living conditions and the amenities which are customary, or at least widely encouraged or approved in the societies to which they belong. Their resources are so seriously below those commanded by the average family that they are in effect excluded from the ordinary living patterns, customs, and activities*" (Townsend (1979), p. 31).

This is, of course, not the only poverty concept (Spicker, Leguizamón and Gordon, 2007). Various traditions exist within the poverty research field, each with its own merits. These traditions can be valuable for scientific investigation as long as they meet certain basic criteria outlined by the philosophy of science. Regarding the relative deprivation theory, Gordon and Pantazis (1997) concludes that Townsend's definition of poverty adheres to these minimum criteria, including falsifiability, testability, predictive value, reproducible results, the ability to establish a definitive program, and the potential to uncover new phenomena on occasion. However, possessing these

properties does not imply that Townsend's framework is correct or superior to other possibilities; it simply indicates that it can serve as a foundation for meaningful research aimed at understanding and measuring poverty.

In academic literature, this particular understanding of poverty is commonly known as the initial perspective on poverty as a relative concept. In simpler terms, an individual's quality of life can only be properly and meaningfully assessed and quantified when compared to societal standards.

Mack and Lansley (1985) developed a methodology for identifying relevant needs and deprivation caused by resource scarcity. This methodology, called the Consensual Approach (CA), has evolved over time and employs a combination of research methods to create a survey module. This module aims to examine the perceived needs of the population and differentiate between a lack of essential goods, activities, and services that are enforced. The CA utilizes the theory of relative deprivation to measure poverty through a specific survey module. The module consists of two primary questions. Firstly, respondents are asked to identify items that are considered essential for life and should be accessible to all individuals. Subsequently, the module inquires whether respondents possess the mentioned items. If they do not possess them, the module includes a question to determine if the lack is due to insufficient resources.

Figure 1 shows the conceptualization of the relationship between deprivation and resources adopted by Townsend (approximated with income). The figure represents a double cut-point: k on the standard of living domain and Z on the resources domain. The optimal split leads to a meaningful identification of the poor, relative to the not poor.

Figure 1: *Theorized relationship between resources and living standards, and the identification of the multidimensionally poor.*
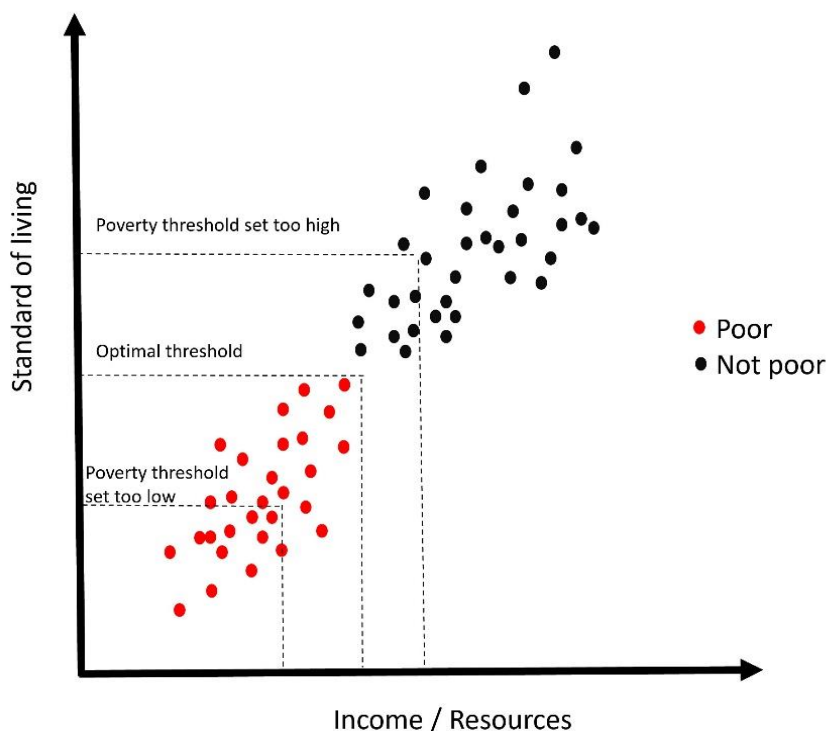
The report is organized as follows: The first section presents the results of the exploration of the necessities of life according to the population of Tonga. The second section revises the proportion of people deprived of the essential needs endorsed by the Tongan population. The third section presents the main results of the prevalence of multidimensional poverty. The fourth section looks at the technical aspects of estimating multidimensional poverty.

3. The necessities of life according to the people in Tonga

A sensible and valid poverty measure must consider a range of things, activities, and services that are considered or regarded as necessities for life by the population. Figure 1 plots the percentage of the population that considers a given item as necessary in Tonga for the years 2021-2022. According to these findings, all these items represent the needs that people regard as essential for any person living in Tonga.

The people in the sample were asked if they considered a given good, service, or activity as essential (something that everyone should have) for life in Tonga for the years 2021-

2022. In total, the survey asked about 29 items: 11 for the adult population, 13 for children, and 5 household-level items (Figure 2).

Figure 2 plots the percentage of the population that considered each item as necessary in Tonga. It has three main columns: adult, children, and household items. The red dashed line simply serves as a reference point at the 50% mark of the total population. The black lines represent the percentage of the population answering "Yes, it is essential." In all cases, the black lines surpass the red dashed line, indicating that the vast majority of the people in Tonga recognize these 29 necessities of life as essential. In all cases, more than 85% considered them a necessity.

Figure 2: Proportion endorsing the listed needs as necessary in Tonga 2021-2022
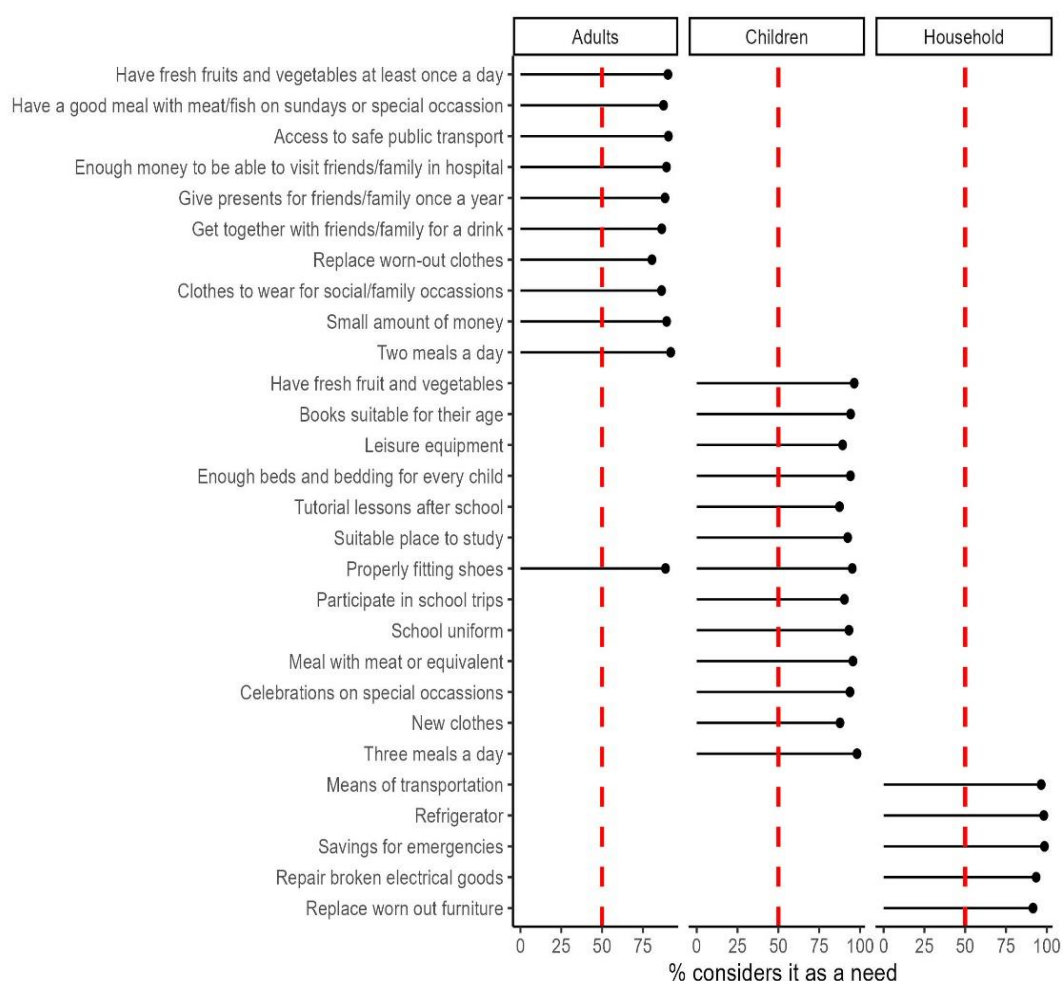
4. Enforced lack of necessities of life

Lacking these essential aspects of life due to a lack of resources is an expression of poverty in Tonga because people do not have the means to fulfill the activities, obtain goods, and access services necessary to participate in and enjoy the living standards that everyone should have in Tonga.

In the consensual approach, in a second step, people are asked whether or not they have the item in question. It also distinguishes between wishes and actual deprivation resulting from limited resources. Therefore, the reported deprivation rates correspond to those who experience enforced lack. Figure 3 shows the deprivation rates for the five household-level items. According to these results, 53% of people cannot replace worn-out furniture due to a lack of resources, 43% cannot repair broken electrical goods, 27%

cannot save for emergencies, 19% cannot have their own means of transportation, and 9% lack a refrigerator.

Figure 3: *Proportion deprivation of household-level items*
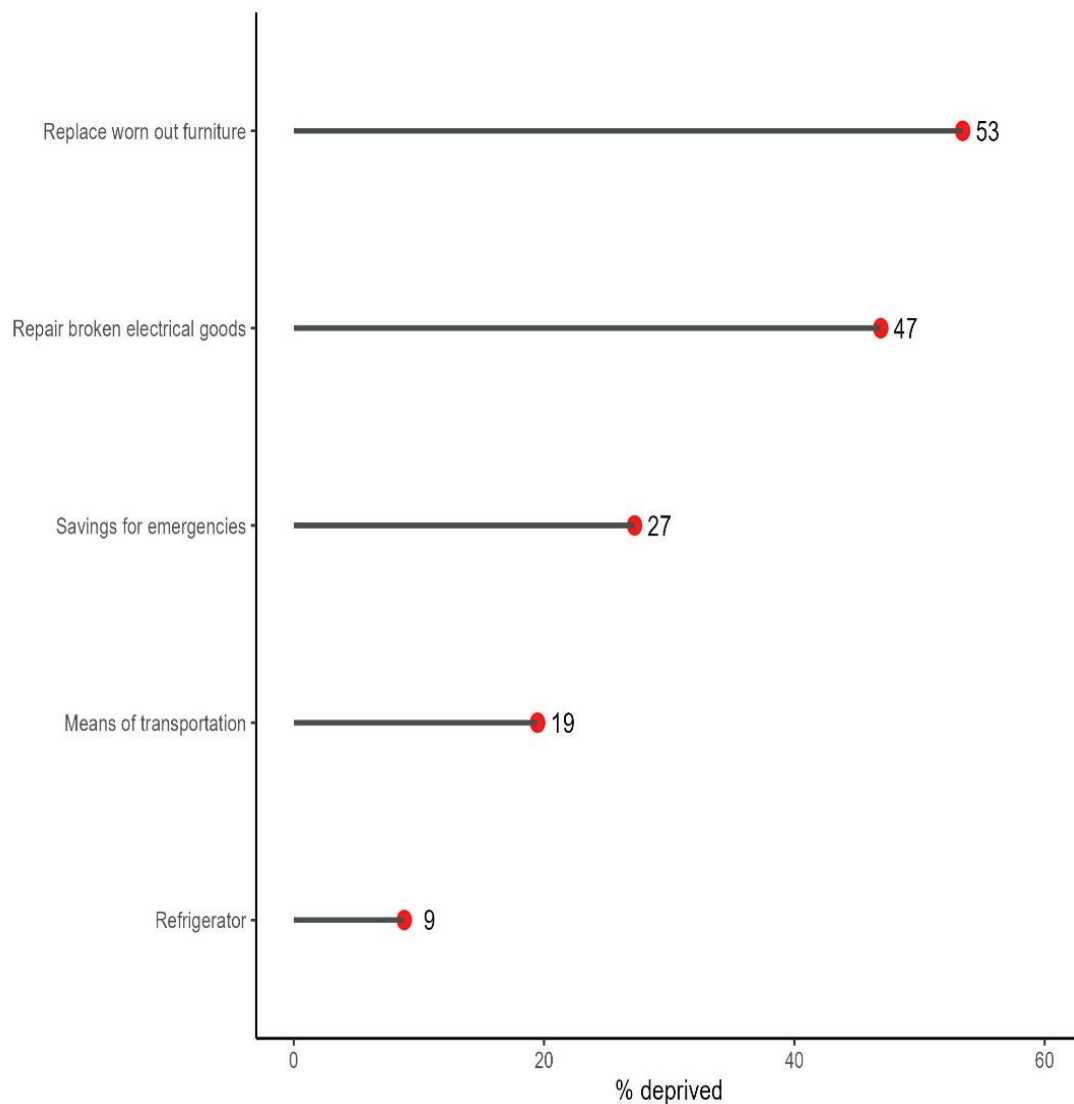
The same question (whether they have a given item or not) was asked to the adults (including children aged 15+) in the household. The item with the highest deprivation rate was the capacity to have a small amount of money for themselves, and the item with the lowest rate was lacking at least two meals a day due to the lack of resources. The vast majority of people aged 15+ in Tonga are able to afford clothes to wear for special occasions, properly fitting shoes, and have a meal on Sundays or special occasions.

Figure 4: *Proportion deprivation of Adult-level items*
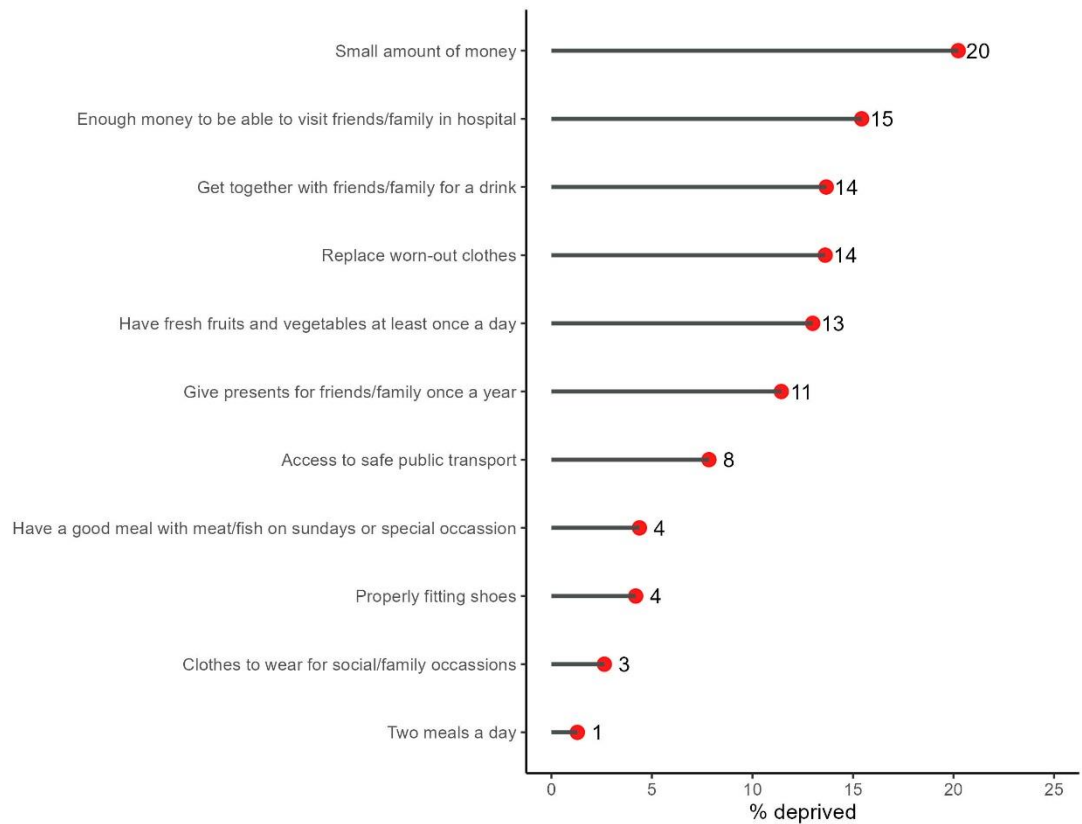
The consensual method permits exploring child-specific needs and thus allows estimating child-specific deprivation rates. Figure 4 shows that the item with the highest deprivation rate is the lack of leisure equipment for children (aged ≤ 14 years). Practically all children (>95%) have the following needs met: three meals a day, participation in school trips, a school uniform, properly fitting shoes, a meal with meat or an equivalent, a suitable place to study, celebrations on special occasions, and replacement of worn-out clothes with new ones.

Figure 5: *Proportion deprivation of Children-level items*
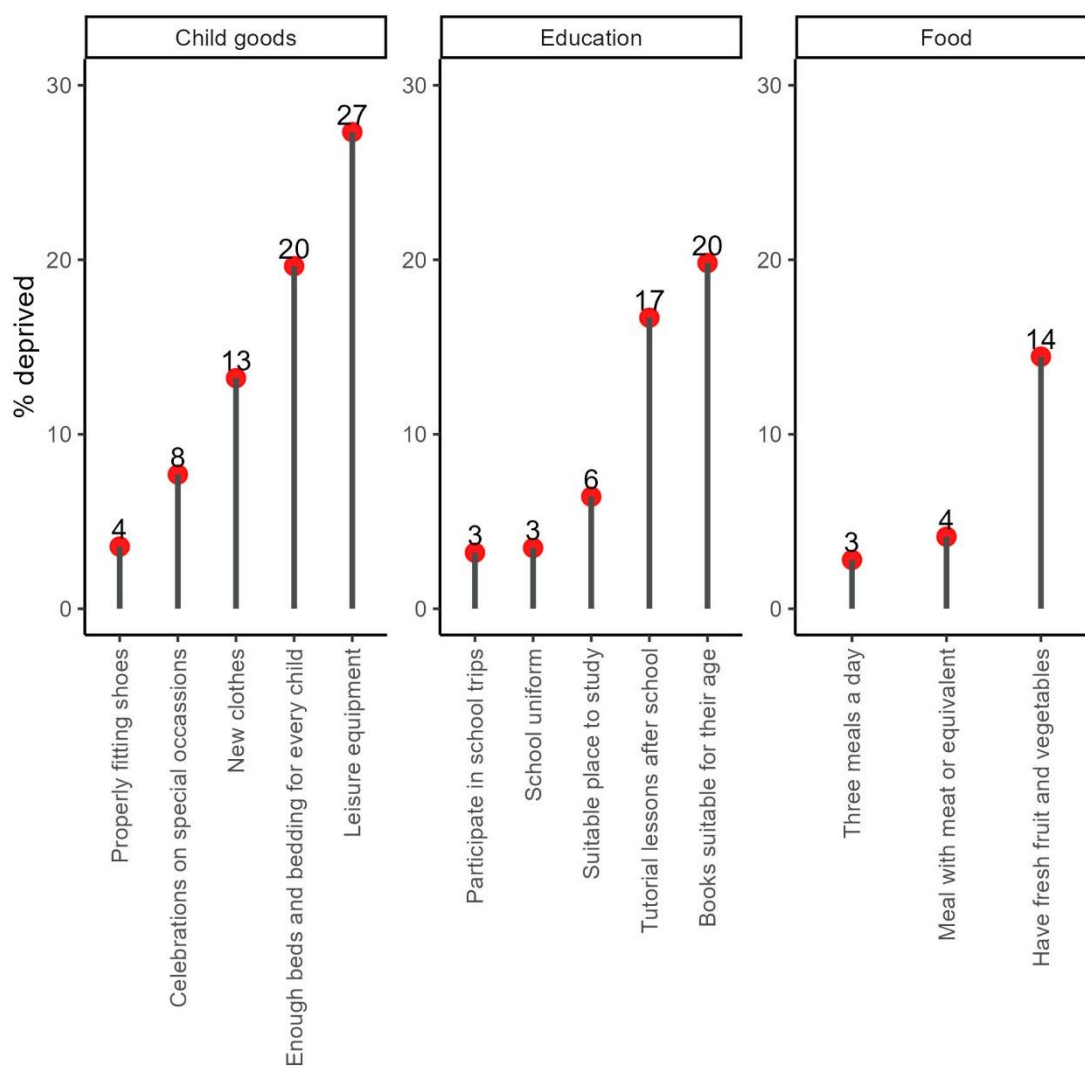
4.1. Deprivation by sex

Figure 6 compares the proportion of people deprived of each of the five household-level items included in the CA module by sex. The plot clearly shows that there are no significant differences in deprivation. This result is expected due to the fact that the gender shares are proportional at the aggregate level in Tonga.

Figure 6: *Proportion deprivation of Household-level items by Sex*
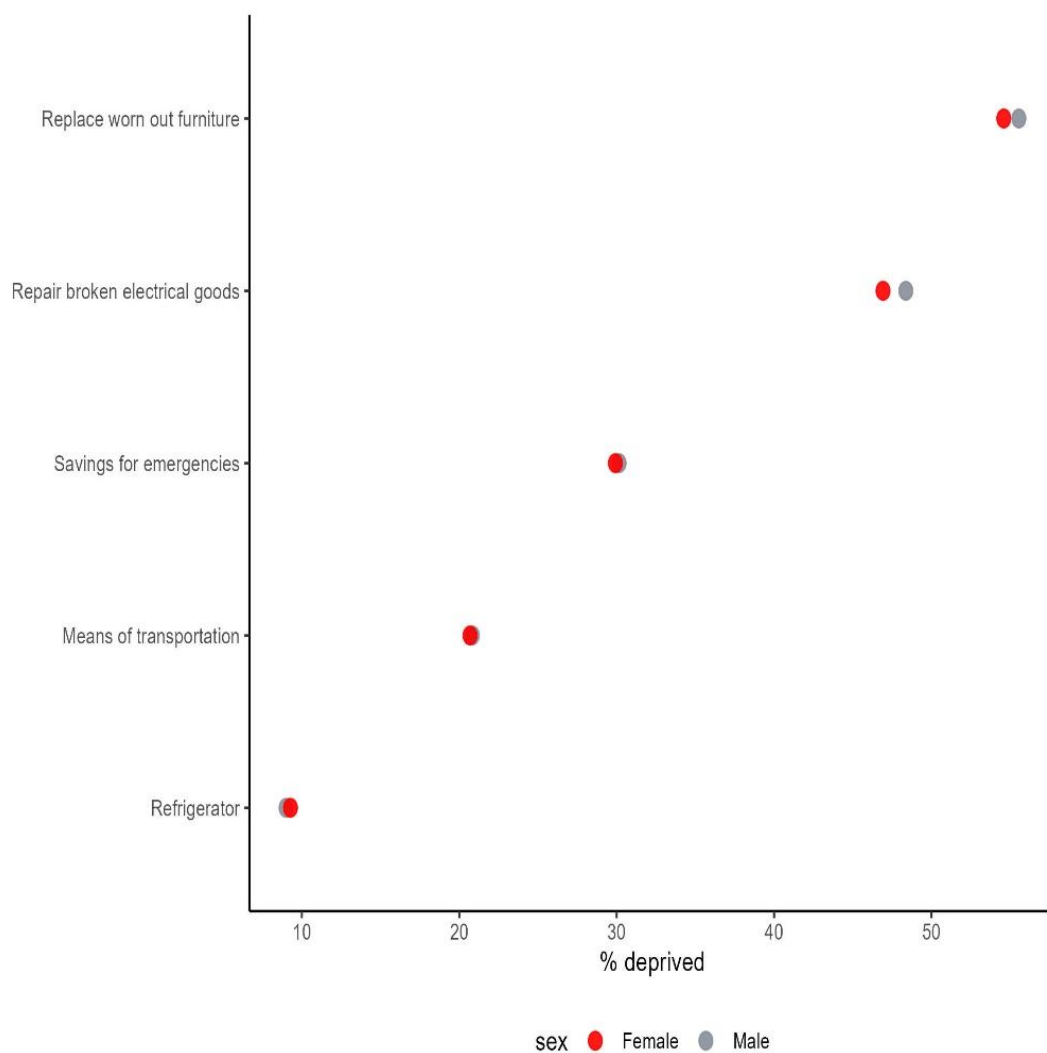
The deprivation of adult-level items by sex is displayed in Figure 7. Overall, women are just slightly more likely than men to be deprived in almost all items. However, for the items showing lower deprivation rates, the differences are not distinguishable beyond the sampling error. Saving a small amount of money for themselves is the item with the biggest gap between men and women.

Figure 7: *Proportion deprivation of Adult-level items by Sex*
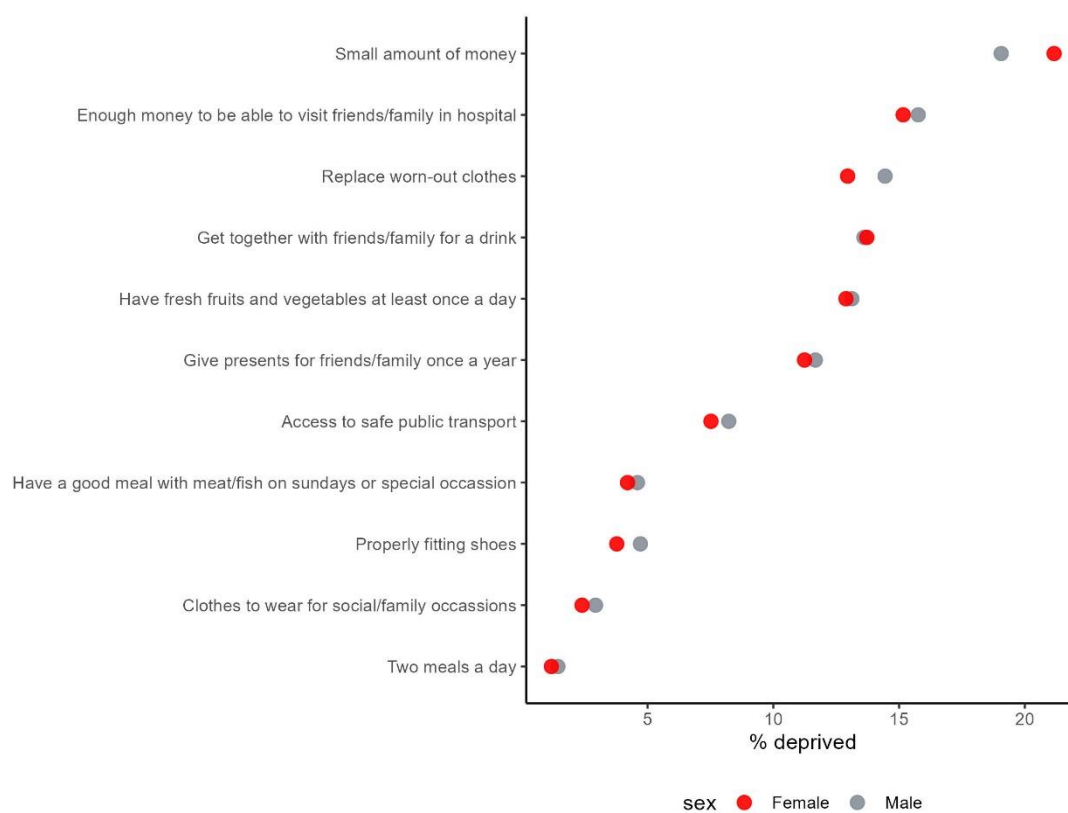
The child deprivation rates show that boys are slightly more likely than girls to be deprived. For example, deprivations of new clothes, books, and enough beds seem to be more prevalent among boys than girls. As for the rest of the items, the differences are small and not significant after considering the survey sampling error.

Figure 8: *Proportion deprivation of Children-level items by Sex*
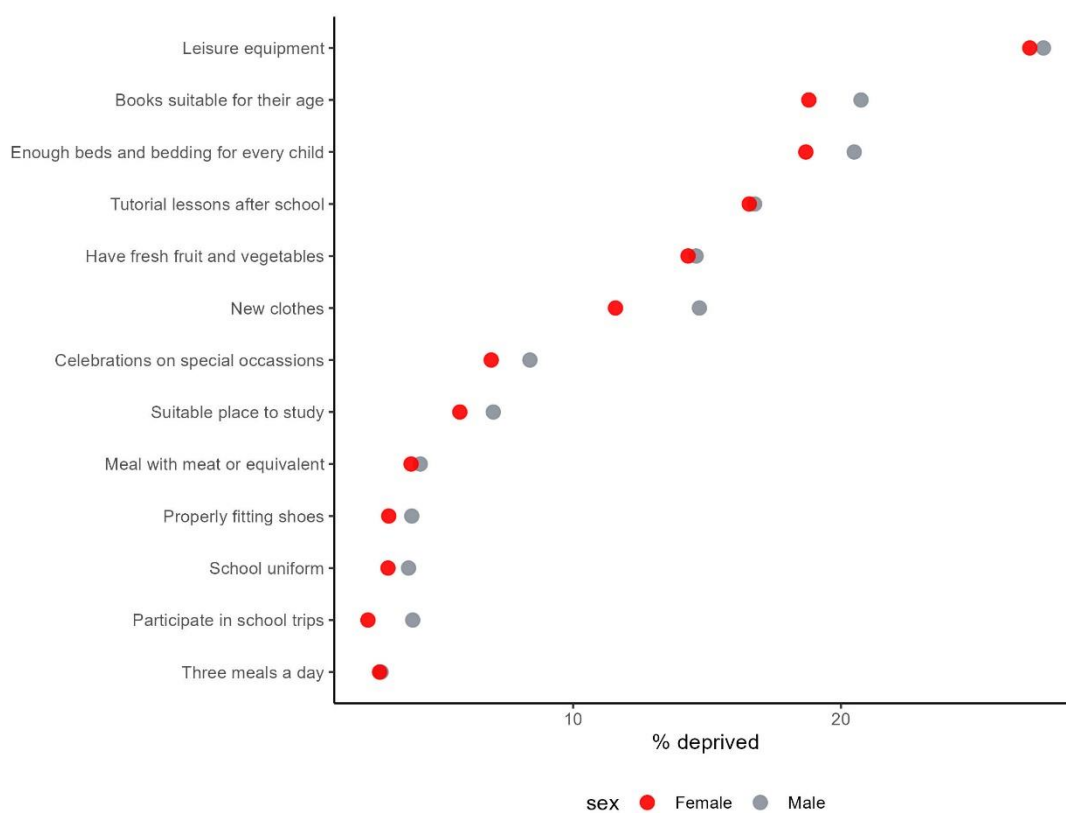
4.2. Deprivation by island group

One of the key factors explaining differences in the chances of being deprived in Tonga is location. Figure 9 contrasts the proportion of deprived people of household-level items that live in the main island (Tongatapu) with those that do not live elsewhere. The results show that, in all items but refrigerator, people living in the capital are clearly less likely of suffering from these forms of deprivation.

Figure 9: *Proportion deprivation of Household-level items by Island Group*
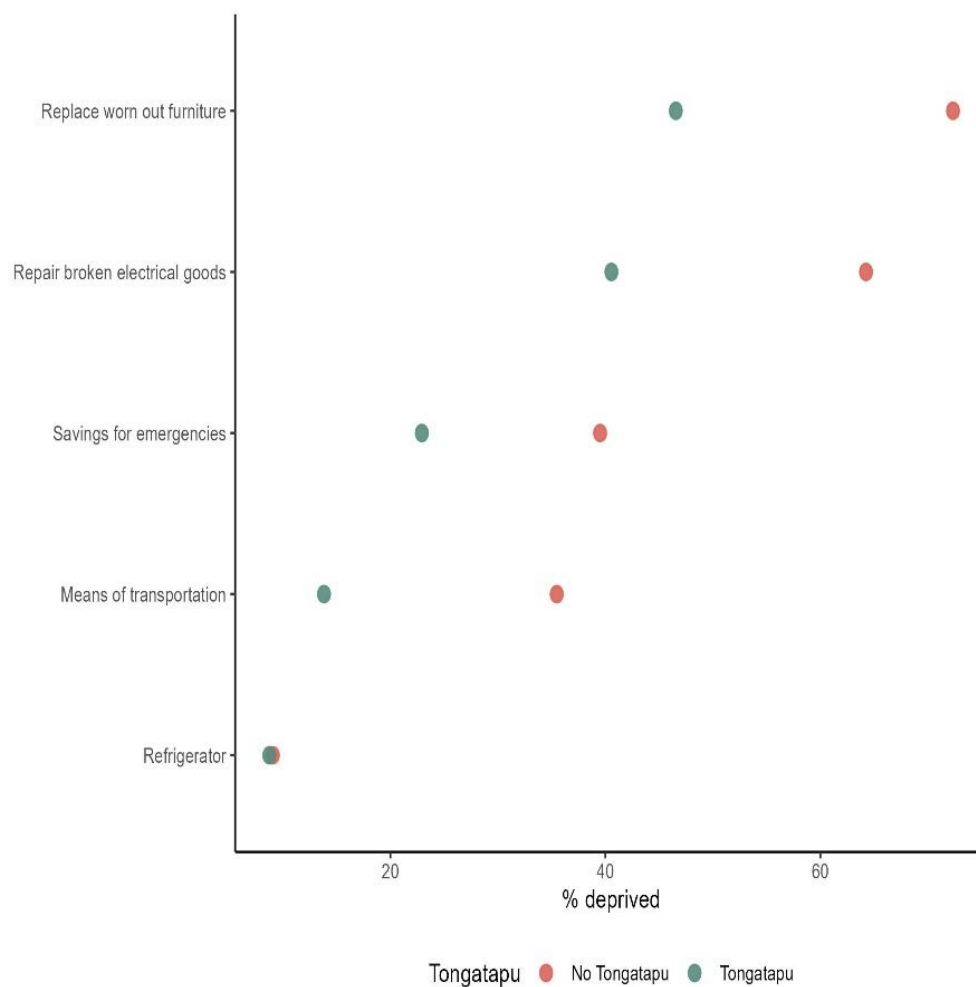
The prevalence of adult deprivation for each item shows a clear pattern. Overall, adults living on the main island are much less likely to lack the listed items due to low resources when compared to the adult population living on the other islands. However, there are some items where there are no differences: replacing worn-out clothes, properly fitting shoes, meals for special occasions, clothes for special occasions, and two meals a day.

Figure 10: *Proportion deprivation of Adult-level items by Island Group*
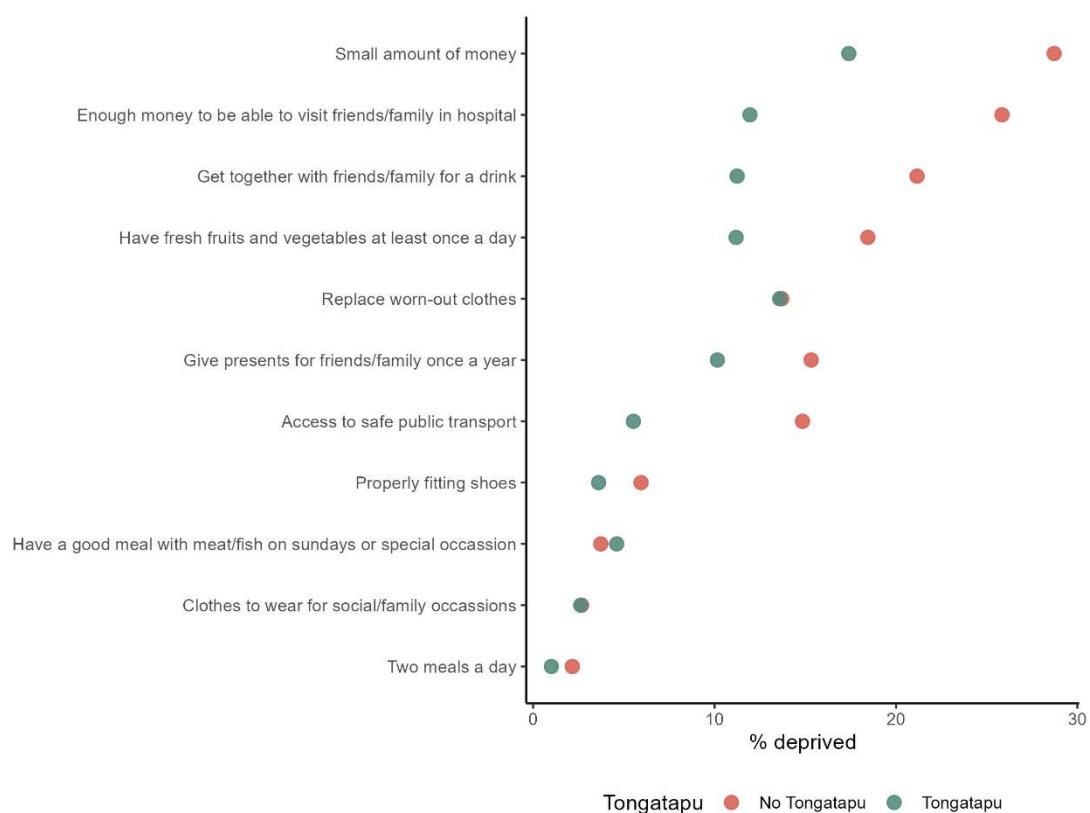
Child deprivation has a mixed distribution when comparing children in Tongatapu with children in the other islands (Figure 11). The items with higher deprivation rates seem to present the biggest differences. Children living in the main island have lower chances of being deprived of leisure equipment, for example. Items with deprivation rates around 5% have very small differences between the two groups.

Figure 11: *Proportion deprivation of Children-level items by Island Group*
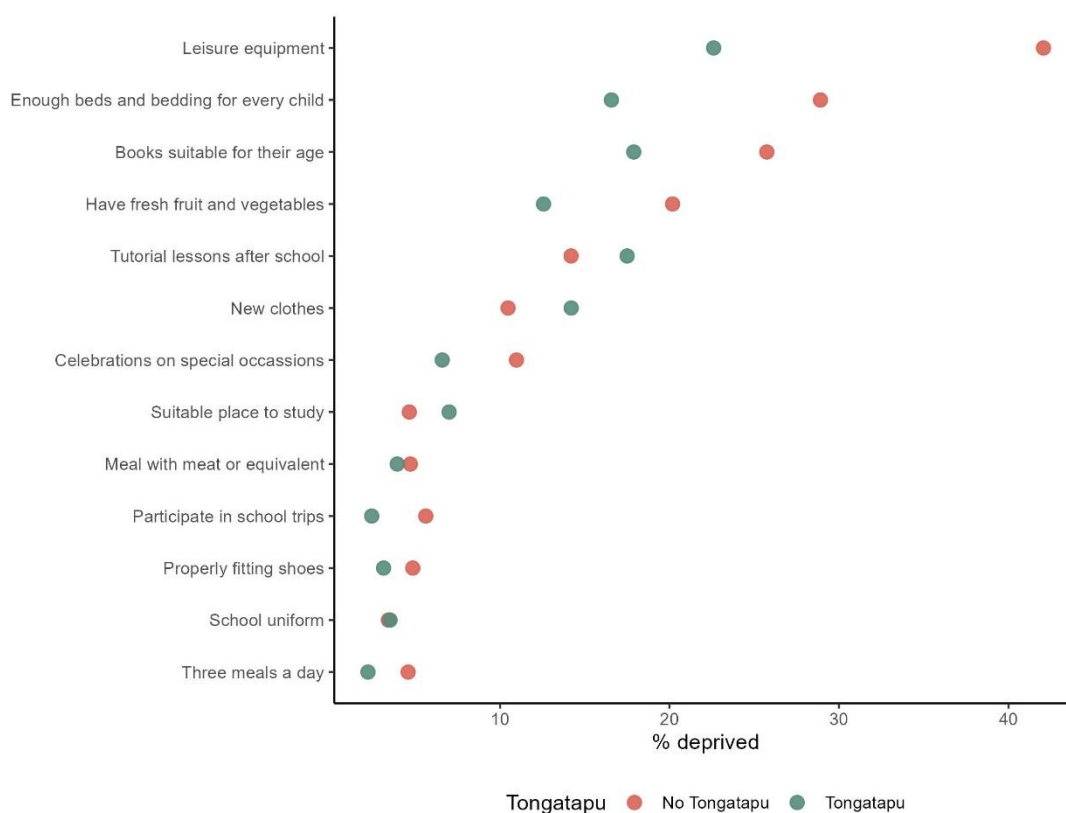
5. Multidimensional poverty in Tonga.

Figure 12 compares the change in the national, adult and child poverty rates between 2015 and 2022. The total poverty rate decreased from 27% to 24% between 2015 and 2002. This reduction is mainly explained by a drop in child poverty from 33% to 28%. Adult poverty decreased 2% in the same period.

Figure 12: *Changes in poverty 2015 - 2022*
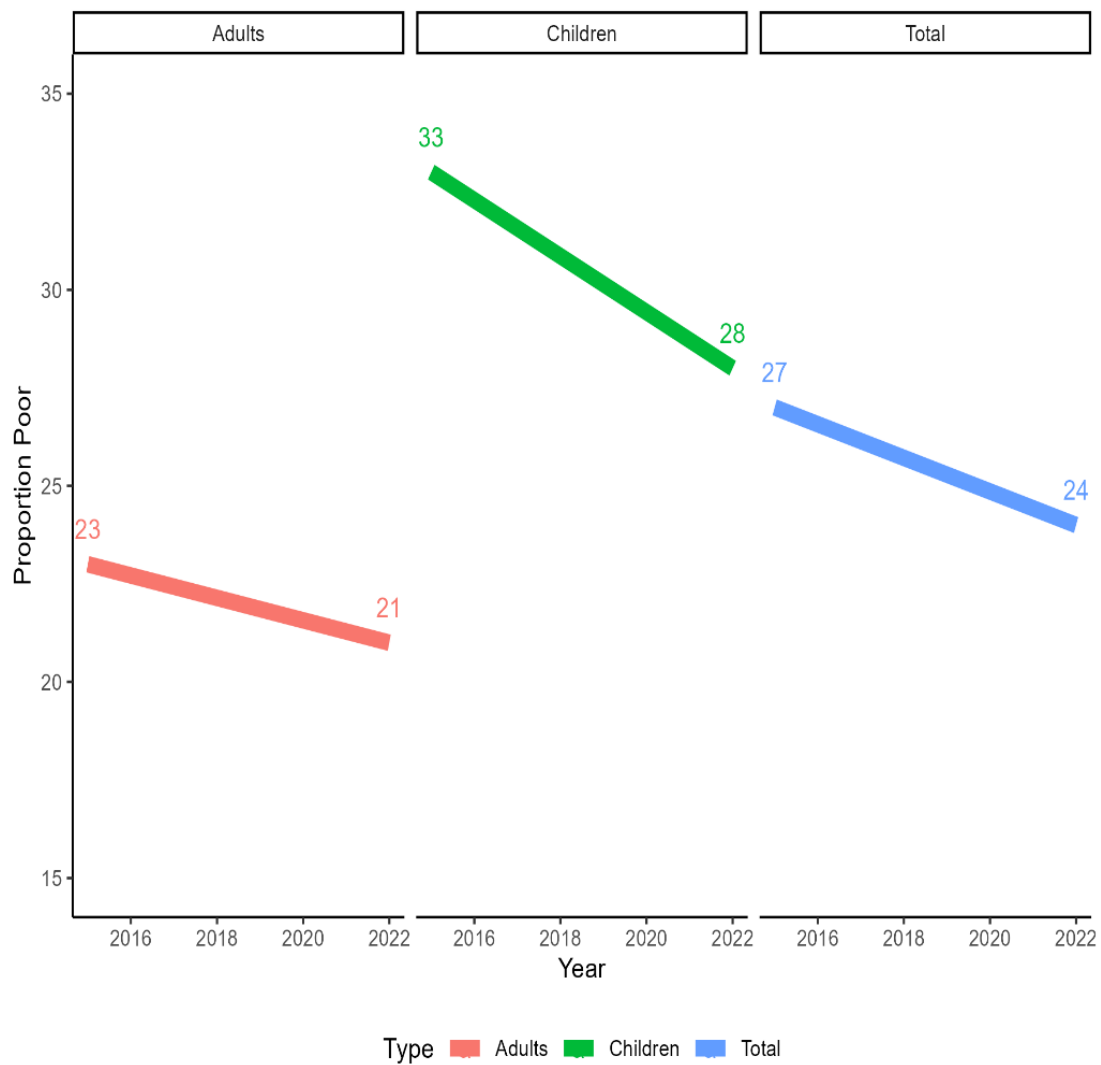
The multidimensionally poor are identified using the Bristol Optimal method approach (Nájera and Gordon, 2023). This method uses the intersection of income and deprivation to identify the poor. Those with low income and low living standards comprise the poor population. For 2022, the income poverty line was equal to 770 monthly per capita Tongan Pa'anga (For reference, the poverty rate using the World Bank $2.19 a day standard is almost zero percent), and the deprivation cut-off was three or more deprivations. This approach allows classifying the population into four groups: the not poor, the vulnerable due to income (i.e., low income but relatively high living standards), and the vulnerable due to low living standards (i.e., low living standards but high income).

Figure 13: Distribution of poverty and vulnerability to poverty. Total Population. 2022
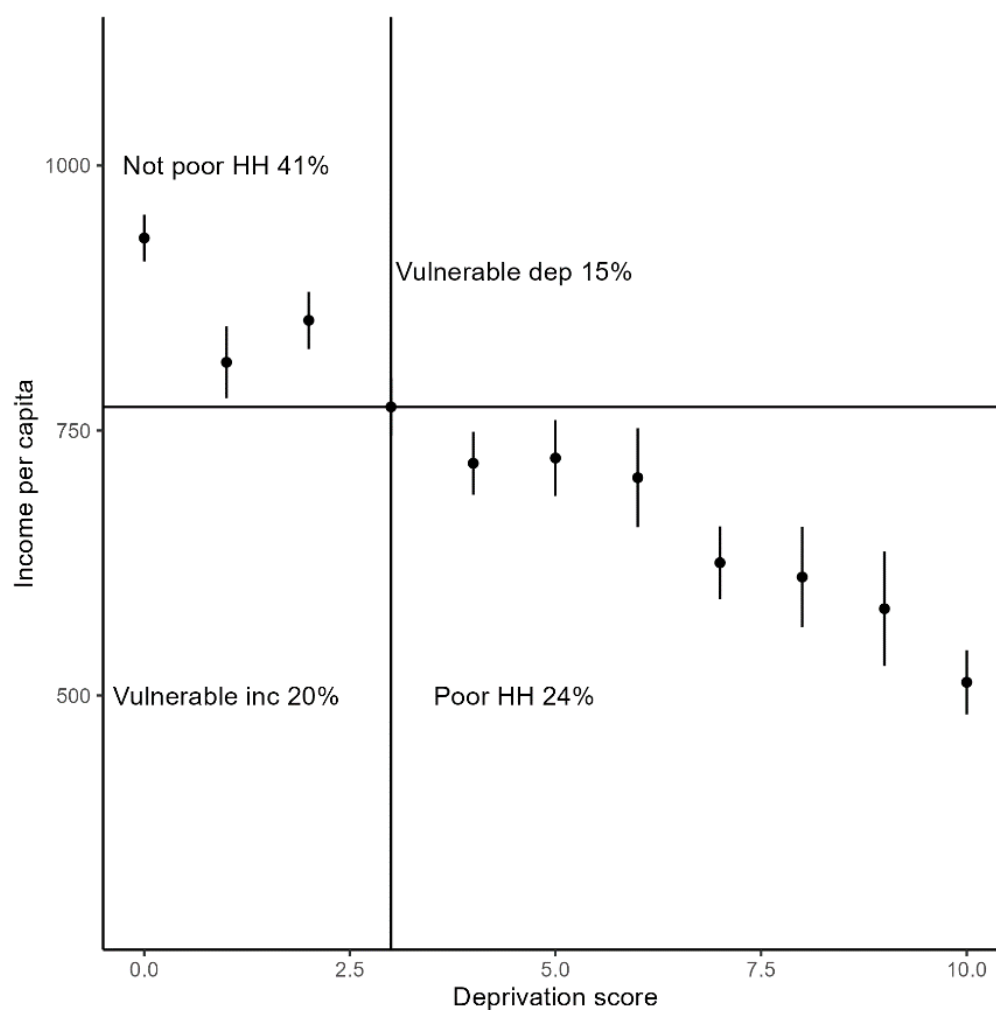
Table 1 presents the prevalence of multidimensional poverty, vulnerability to poverty and not in poverty for the total population, adults and children. The most noticeable differences between adults and children are the differences in poverty rates and in the proportion of the not poor. It seems that households with children tend to have a lower income relative to households with no children.

Table 1. Prevalence of poverty: Total, Adults and Children. 2022

Category	Total Population	Adults	Children
Poor	24	21	28
Vulnerable deprivation	15	15	15
Vulnerable Income	20	18	22
Not poor	41	46	35

The variation of the extent of multidimensional across different population groups is show in Table 2. The chances of being poor decrease for adults with higher education attainment. Similarly, older people are less likely to be poor. There is also an important gap between Tongatapu and the other islands (20% compared with 33%).

Table 2. Prevalence of poverty by different socio-demographic characteristics

Characteristic	% Poor
Disabled	23
Not Disabled	23
Primary school (Class 1 - Class 6)	30
Lower secondary school (Form 1 - Form 4	27
Higher secondary school (Form 5 - Form	21
Technical and Vocational	21
University/Tertiary	8
0 - 14	28
15 -17	28
18 - 29	21
29- 65	20
65 +	20
Tongatapu	20
Other islands	33

Figure 14 shows the poverty rate for each of the five main islands[1]. The plot shows the survey rate with full data and the survey rate dropping the missing cases. The full naïve estimate considers all cases where the missing cases are reported as not deprived in the items with missing data. This practice is usually done within the consensual approach

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[1] The HIES was designed to produce representative results at island-level. However, for the CA results, and for income, the results seem unreliable. Hence, the results at island-level need to be taken with care as more statistical research is needed to assess random and systematic biases.

as means to report the most credible lower-bound poverty estimate. The valid-cases only approach, drops from the sample those persons with missing data in more than 33% of the items. The plot shows that in most cases the survey estimate is similar but for Ongo Niua. Under the full naïve estimator poverty seems to be lower than in Tongatapu, a finding that contradicts what is widely known and agreed about the distribution of poverty in Tonga.

Figure 14. Poverty rate for each island. Full data and valid cases only.
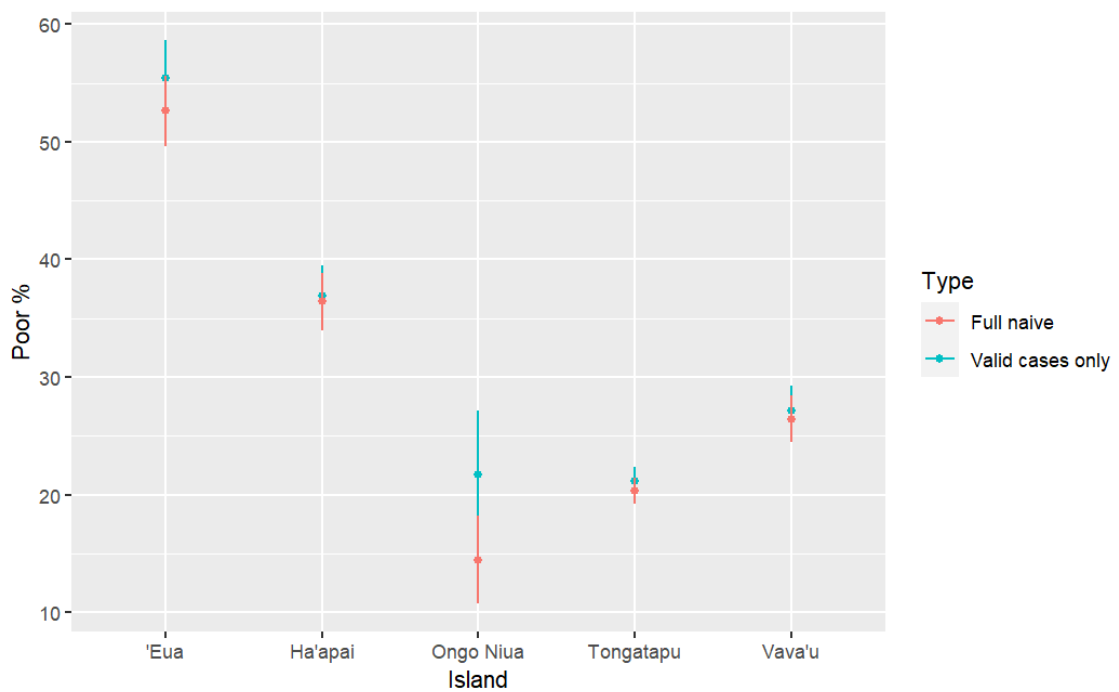
6. Policy analysis. Children education

Education is one of the key systems through which people enhance their level of resources to, in turn, transform them into better living standards. However, navigating this system is usually more challenging for the poor children than from the not poor as families have different disposable levels of investment for their children. From the point of view of social policy, the educational system is central for improving children's prospects by generating policies that help the access and quality of education.

Figure 15 compares the proportion of the available income used to buy school-related items (books, fees, uniforms, trips, etc.). In relative terms the poor spend 25% of their income in these types of items. In contrasts, the not poor only spends the 16%. This, of

course, do not mean that the not poor spend less, as their income is higher. Considering that the poverty line of the multidimensional measure is around 770 TOP, a 25% of the income of the poor comprises a considerable amount that could be used for other essential things provided there were a social assistance programme for the poor.

Figure 15. Proportion of income spent on education-related items. Children in basic education.
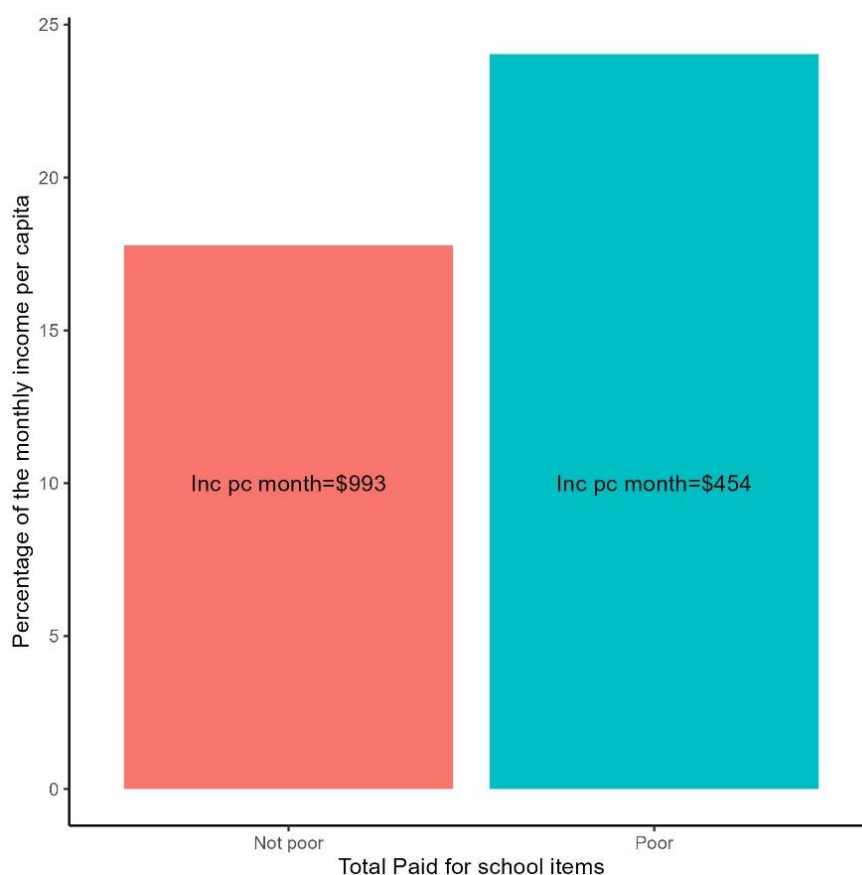
Figure 16 looks at the distribution of expenditure (as proportion of income) according to the different items included in the school items list. Almost half of the expenses are on two things: School meals and fees. This is an example of how school breakfasts or meals could substantially help the poor. Almost 7% of their income goes to cover this essential necessity.

For these aspects connect with some of the essential needs of children, an in-kind transfer could have a double effect: improving disposable income of the families but also reducing the severity of deprivation of children.

Figure 16. *Proportion of income spent in each school items.* *Children in basic education.*
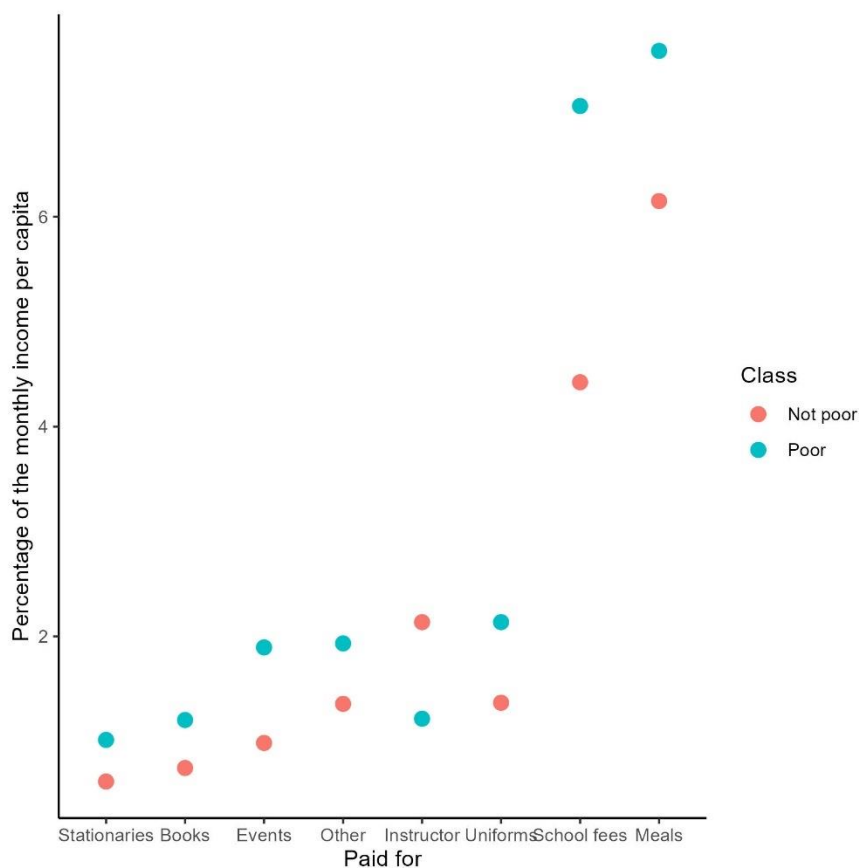
7. Policy analysis. Social transfers

Figure 17 shows the distance, in TOP, of the poor and the not poor relative to the poverty line form the multidimensional measure. The poor are on average around 320 TOP a month below the poverty line. That means, that in order to see substantive changes in poverty, it would be necessary enhance the means through which these families access their income: salaries, remittances, local inter household transfers, and social transfers.

Figure 17. *The proportion of income spent on each school item. Children in basic education.*
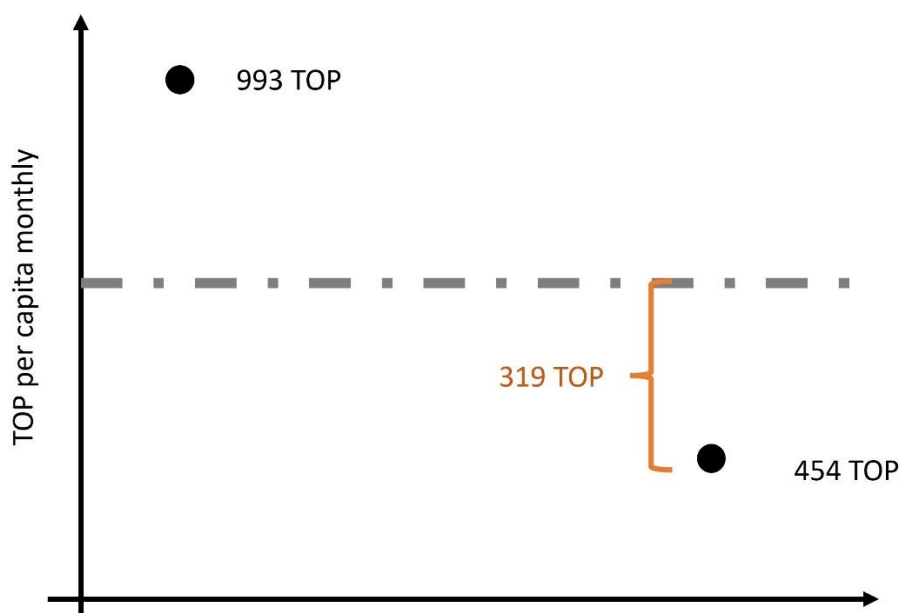
There are two main types of transfers: Universal and targeted. A universal transfer is easier to implement in that they do not require any targeting programme. These transfers also enhance citizenship for all people feel included by society. However, universal transfers are more expensive and, from some social justice perspectives, are inefficient and unfair. On the other hand, targeted transfers require identifying the population, which can be costly. However, these transfers demand less resources at the expense of concerns around more comprehensive notions of fairness. This report cannot look in-depth at these matters, but it could provide some figures for the possible costs and effects of such programmes.

Table 3. Estimated costs of effect of social assistance

	Universal	**Targeted**
Amount TOP monthly	50	200
People	All	Poor
Total cost annual TOP	60,107,400	56,635,200
% GDP	6%	5%
Poverty effect	-1%	-4%

8. Policy analysis. Food insecurity

Figure 18 shows the proportion of households that have experienced each of the eight events of food insecurity (due to lack of resources) asked in the HIES. Almost a third of the households in Tonga report having not enough to eat due to lack of resources in the reference period. Therefore, this does not mean that every day they are in this situation, this means that they experienced it at least once when the survey was undertaken. More than 20% of households report problems with the variety of food due to low resources and 15% report being unable to eat healthy. These results point at the relationship between economic constraints and the quality of the diet in the households in Tonga.

Figure 18. Proportion of households reporting experiencing the events of the food insecurity scale (FIES).
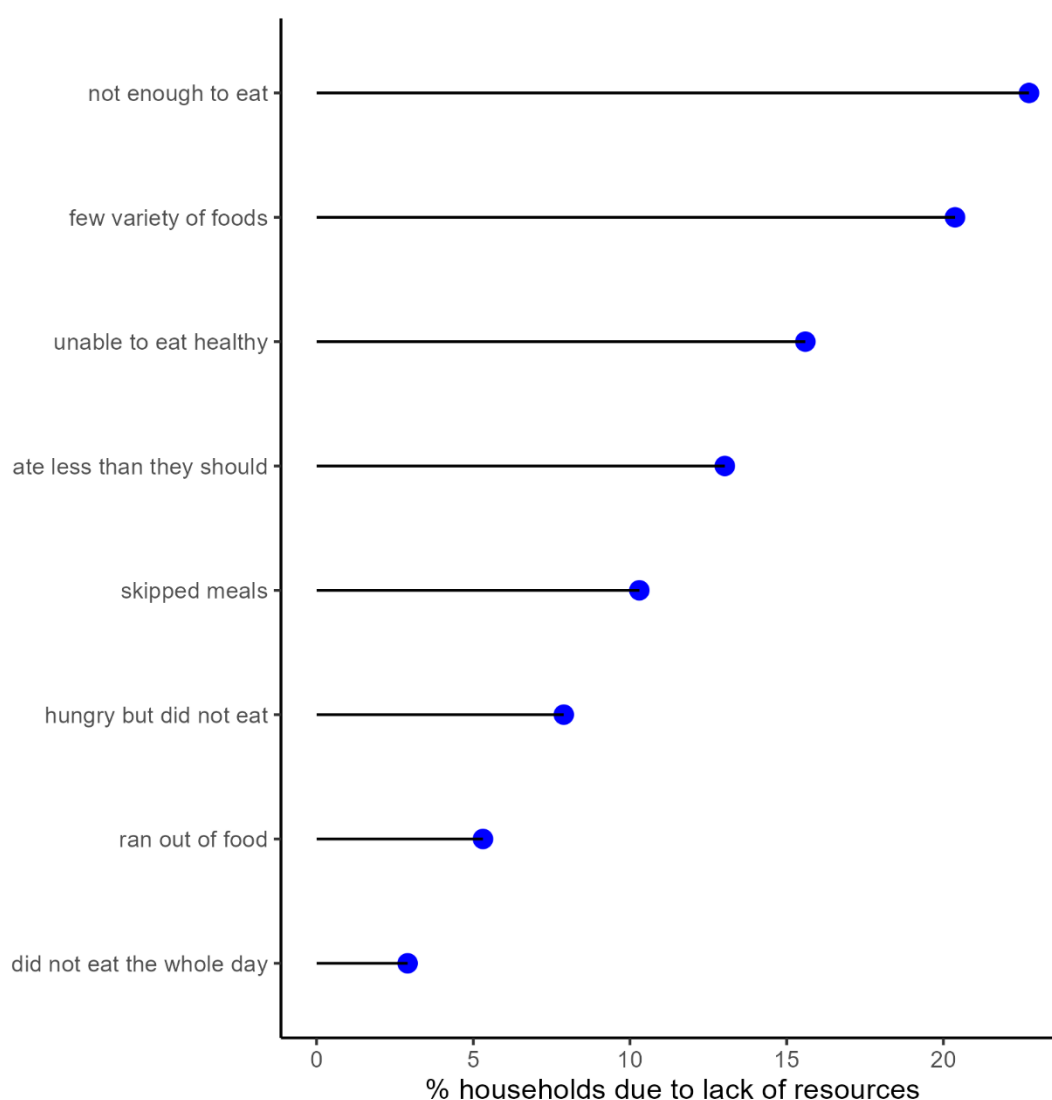
Figure 19 shows the distribution of scores of the FIES. That is, the prevalence of experiencing multiple food insecurity episodes. The results show that 30% of households in Tonga suffered from at least one event of food insecurity. However, the results also show that the severity of food insecurity is not that high as less than 10% of households report experiencing more than 3 events.

Figure 19. Distribution of the severity of food insecurity in Tonga. Household-level.
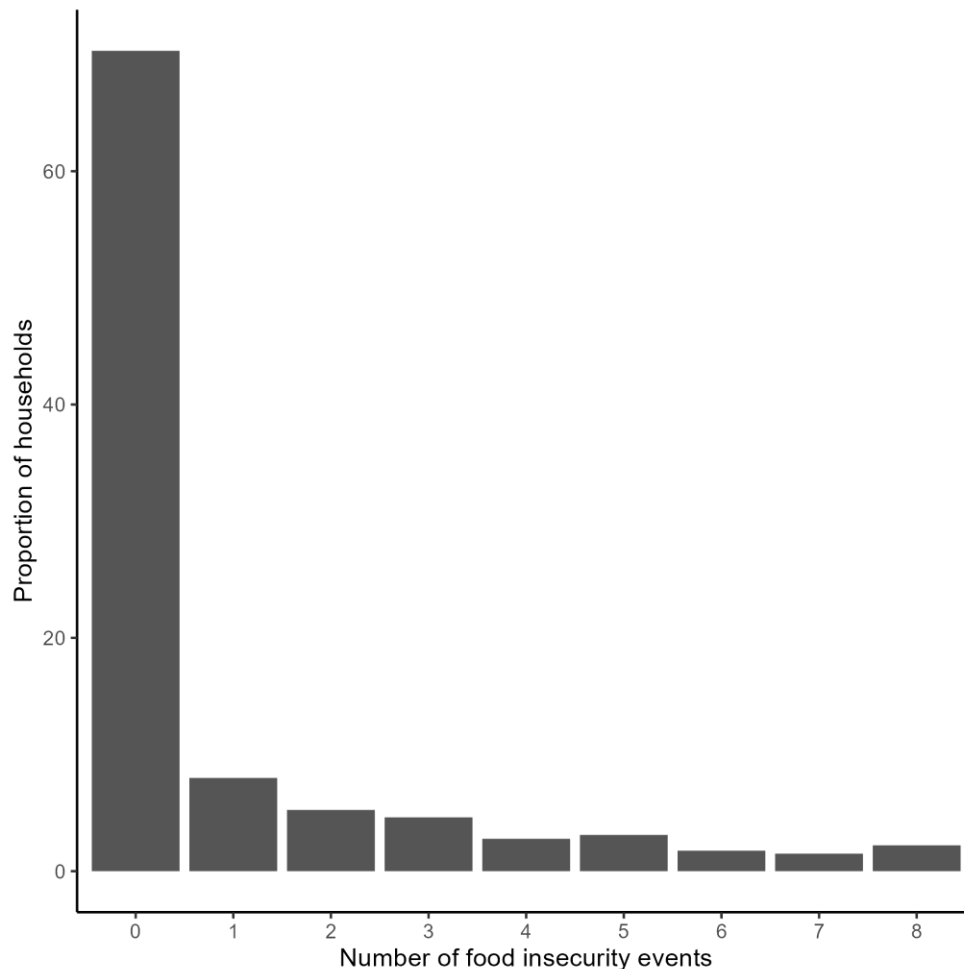
9. Statistical validation. Multidimensional poverty measure

The theory of relative deprivation, in conjunction with the consensual approach, has a clear measurement model. The overall model is based on what is known in statistics as a reflective measurement model (Gordon, 2006; Coltman *et al.*, 2008; Guio *et al.*, 2017; Nájera and Gordon, 2020). The underlying assumption is that poverty is an abstraction, theory dependent concept, and that the observable data (deprivations) are manifestations of this phenomenon, i.e. low resources is the main cause why people cannot have three

meals a day. Therefore, the manifestations reflect changes in poverty. When there is an economic crisis, poverty increases, and consequently, deprivations should also increase. If the deprivations do not respond to changes in poverty, it can hardly be argued that they are good indications of poverty.

When a reflective model exhibits perfect behaviour, it implies that its error is close to zero. In other words, error represents all the unwanted variability of an index. For example, if an index consists solely of error (100%), and there is an economic crisis, there is zero chance that the deprivations will provide any information about poverty.

The underlying measurement model relies on a series of specific statistical assumptions that, when met, ensure valid inferences about the extent and distribution of poverty. These assumptions are translated into statistical hypotheses, which are as follows:

- Overall reliability of the scores: This approximation quantifies the amount of random error present in the scores of an index. When it is close to 1, it indicates that the observed scores accurately capture higher or lower degrees of latent poverty. This is also referred to as the internal consistency of the scores. A score should effectively classify the population's poverty levels.

- Reliability of each item: The amount of variance of each item that can be attributed to the underlying phenomenon. At least 25% of the variance should be attributable to the phenomenon under consideration.

- Validity of each item: The items should correlate with measures of living standards. The likelihood of experiencing deprivation should correlate with lower living standards. In other words, if the better-off individuals are more likely to be deprived, there is evidence that a given indicator is a poor measure of poverty.

- Construct validity: The structure of the measure should make sense. If the items belong to the same set, it should be sufficient to make accurate predictions regarding the correlation structure of the data.

- Additivity: The sum of two items should result in a more disadvantaged position. Therefore, someone with a score of two deprivations should be worse off in an

observable metric like income compared to someone with one or no deprivations.

- Validity of the poverty line: It should be possible to statistically differentiate between the poor and the non-poor. The poor should clearly have lower living standards and income than the non-poor. The best distinction is the one that maximizes the differences between the two groups while minimizing the differences within each group.

9.1.1. Methods

- Overall reliability: The Omega (ω) statistic is obtained from a Confirmatory Factor Analysis (CFA). ω is referred to as the greatest lower bound in reliability estimation (Zinbarg *et al.*, 2005; McDonald, 2013). Its purpose is to quantify the extent of measurement error in an index. The ω value ranges between 0 and 1, with 1 indicating minimal measurement error. However, it is important to note that no index is entirely free from errors, and acceptable values for omega are typically $\omega \geq .8$ (Nájera Catalán, 2019). Various methods exist to estimate this statistic, with the preferred approach being the utilization of a CFA model (a reflective statistical model) to extract the parameters, followed by omega estimation for binary variables (Green and Yang, 2009). One prerequisite for obtaining reliable results is that the CFA must exhibit acceptable fit statistics (TLI $\geq .95$, RMSEA $\leq .06$) (Bentler, 1990).

- Item reliability: Item response theory and factor loadings from a CFA model. A 2-parameter item response theory (IRT) model is a statistical model commonly used to analyze the items of an instrument like the CA. This model assumes that the probability of a correct response to an item depends on two parameters: the item's severity and the respondents's level of poverty. The severity parameter represents the level of severity posed by the item, while second is the latent level of poverty parameter captures. By estimating these two parameters, the 2-parameter IRT model provides insights into both the item's discriminatory power and the respondents's level.

In a CFA model, factor loadings are coefficients that quantify the relationship between observed variables (indicators) and latent factors. The CFA is a statistical model used

in structural equation modelling (SEM) to assess the measurement properties of latent variables. Each observed variable is thought to be influenced by one or more latent factors, and factor loadings express the strength and direction of those relationships. The factor loadings represent the extent to which a particular indicator is a good representation of the underlying construct it is meant to measure. Higher factor loadings indicate stronger associations between the latent factor and the observed variable, implying that the indicator is more reliable and valid in capturing the latent construct.

- Validity: Relative risk ratios estimated from a Poisson model for each item. A Poisson model where the variable "capacity of keeping up with bills" is used as a response variable and each deprivation as predictors, adjusting by for the household size, was fitted to the data. The main outcome is the β_i of each deprivation i. This parameter simply measures how the risk of being unable to keep up with bills varies among the deprived and the not deprived. The hypothesis is that the deprived should have a higher risk of being unable to keep up with bills.

- Construct validity: Overall fit of a CFA model. The overall fit of a CFA refers to how well the model matches the observed data. It indicates the extent to which the hypothesized relationships between observed variables (indicators) and latent factors are consistent with the actual data. The evaluation of the fit of a CFA model is given by different statistics: (TLI ≥ .95, RMSEA ≤ .06).

- Additivity: Two-way ANOVA. In a two-way ANOVA, the dependent variable is measured across different combinations of levels from two independent variables. For example, if we are interested in studying the effect of two deprivations on income level. The two deprivations are the two independent variables, while the test scores are the dependent variable. This proves insights into the relationships between multiple categorical factors and a continuous outcome variable, i.e. if having two deprivations predicts lower income than the other three states (0,1,1).

- Validity of the poverty line: Bristol Optimal Method (Nájera and Gordon, 2023). The deprivation scores are used to split the population into a series of groups. For example, 0 vs 1+ deprivations, 0 & 1 vs 2+ deprivations, etc. Then each grouping is predicted using logit models using income as a key variable along

with a series of auxiliary variables. The model with the best fit corresponds to the best possible grouping given the data. This grouping is cross-validated using visual inspection to identify the value at which deprivation increases substantially given small changes in income.

9.1.2. Reliability results

Table 3 displays the estimated ω values for three deprivation indices: Total, adults and children. In all three cases the values of omega are sufficiently high to guarantee negible sizes of random errors. Together with the ω, each row also contains information of the fit of the CFA model, which in all three cases also shows acceptable fit. Overall, these results justify including all the indicators into one index.

Table 3. Overall fit of the CFA models.

model	df	cfi	tli	rmsea
Household	5	0.999	0.998	0.056
Household + Adults	104	0.977	0.973	0.084
Household + Children	135	0.978	0.975	0.070

Item-level reliability is measured with the R-square values obtained from the factor loadings (λ^2), i.e. the amount of variance captured by each item. Figure 20 shows that in the case of the adult-level indicators, in all cases the values are above the minimum recommended levels.

Figure 20: *Reliability. Adult-level items: variance explained by each indicator*
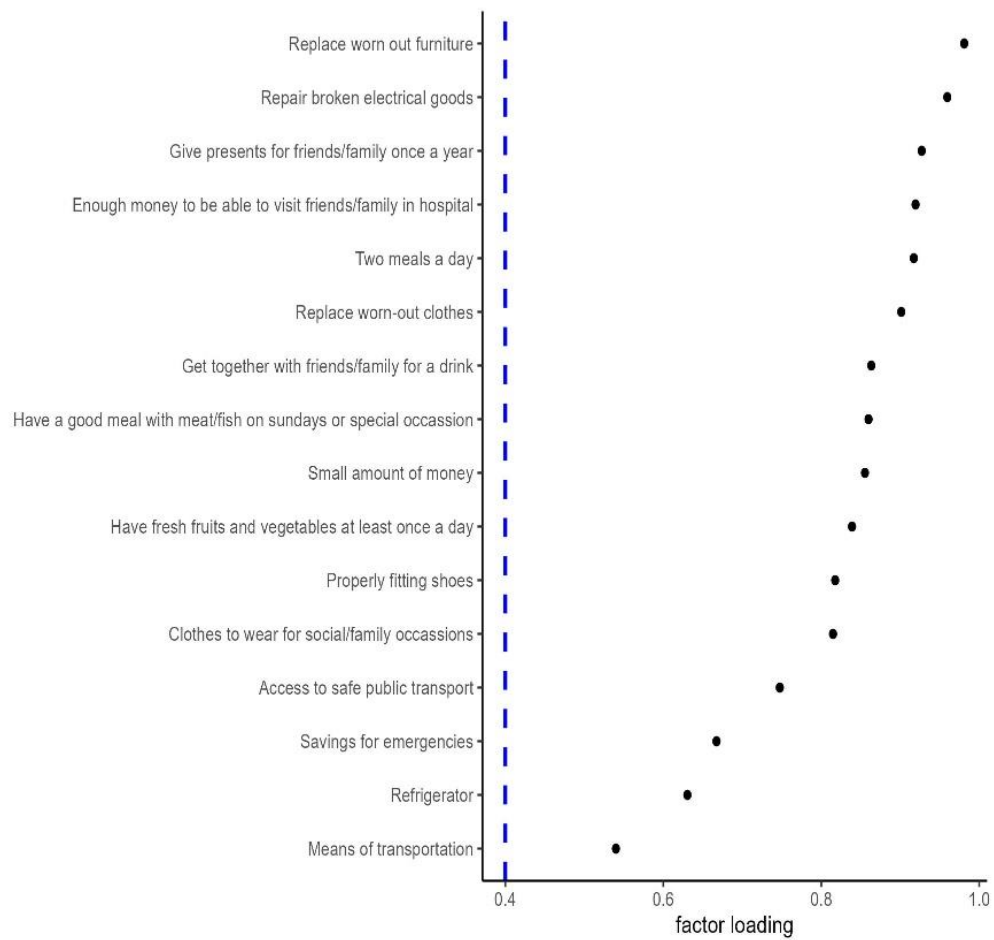
The same finding holds for the child-level items (Figure 21). In all cases, each items achieves the minimum levels of explained variances. This means that there are no items that seem to belong or respond to a different underlying phenomenon.

Figure 21: *Reliability. Child-level items: variance explained by each indicator*
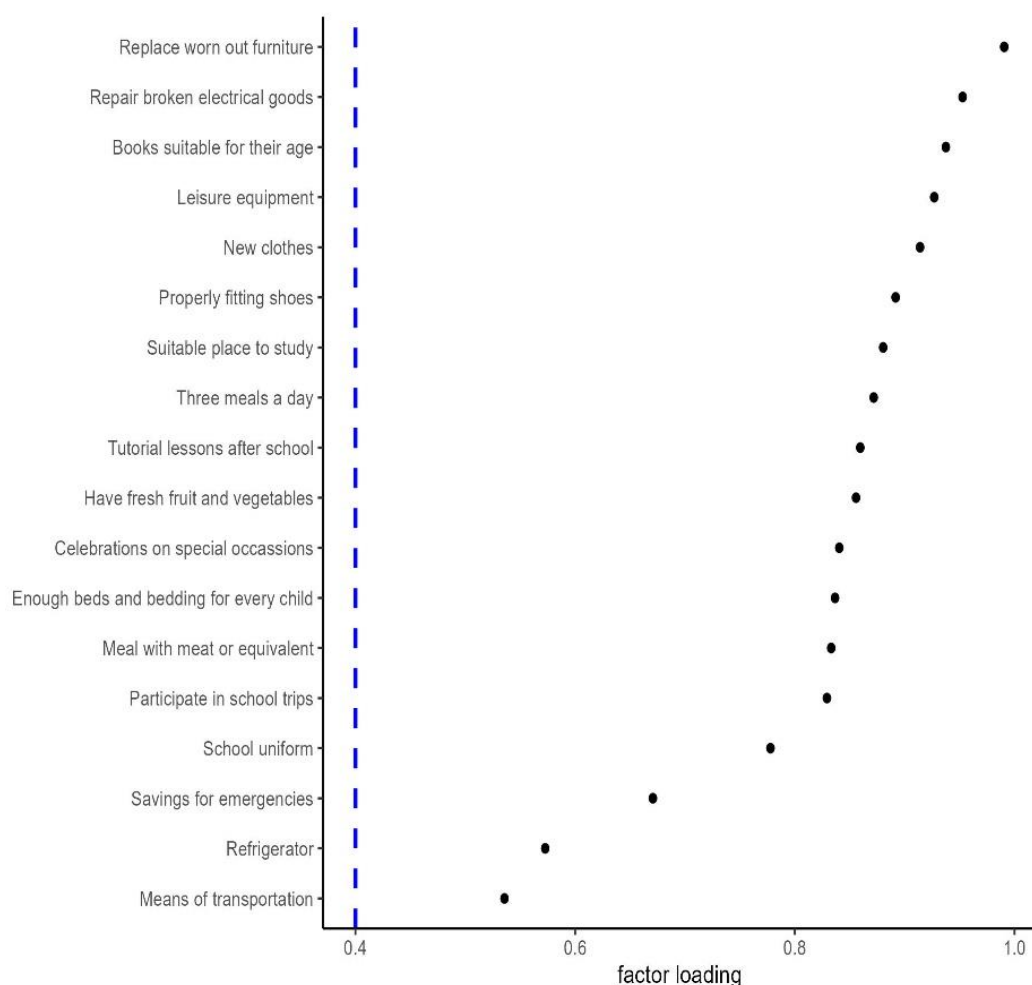
9.1.3. Validity results

Figure 22 shows the relative risk ratio of struggle to keep up with bills for each of the five household-level items. In all five cases, lacking an item leads to an increase in the risks of struggles in terms of paying bills. The risk almost doubles for those deprived of any of the five items.

Figure 22: *Criterion validity analysis. Household-level items: Changes in Risks for people considering they can't keep up with bills*
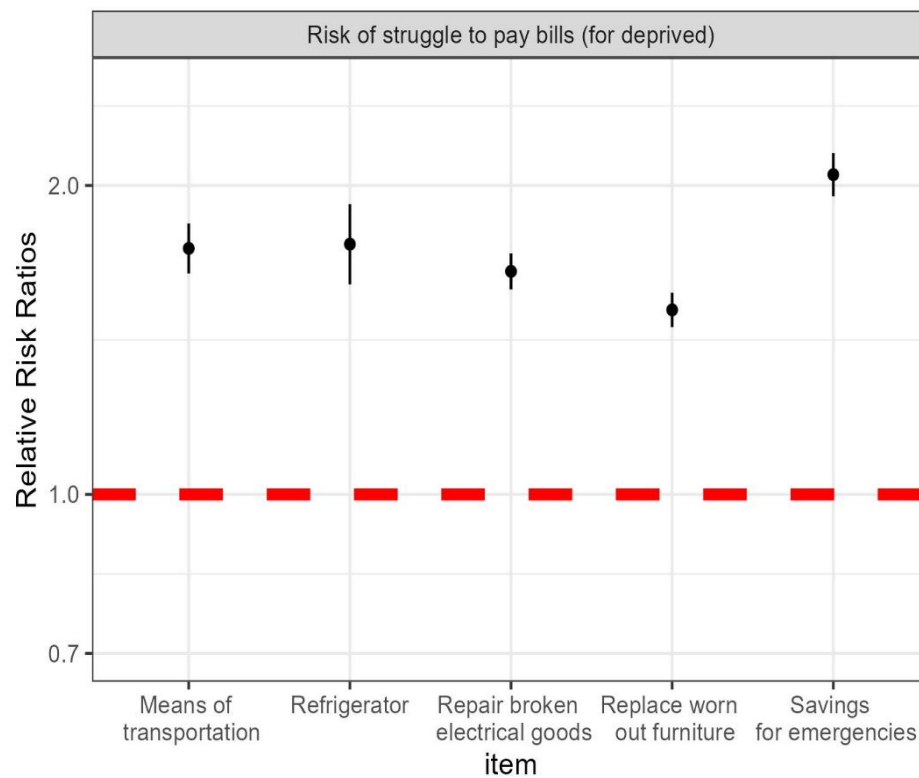
The risk of struggling to keep up with bills also increases for all adult deprivation items. The effect has some variations but there is no evidence that being deprived reduces the risk. Therefore, the deprived in socially perceived needs are very likely to be worse-off than the not deprived.

Figure 23: *Criterion validity analysis. Adult-level items: Changes in Risks for people considering they can't keep up with bills*
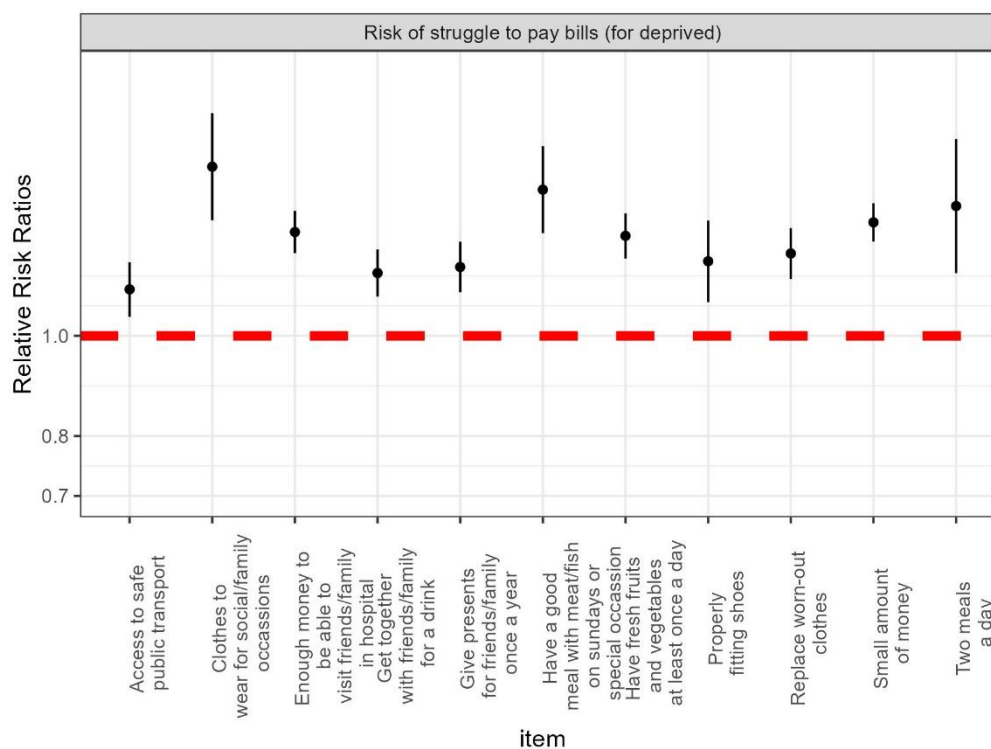
With regards the child-specific items, the risk ratios lead to the conclusion that being deprived is clearly associated with low living standards. In all cases, lacking an item is associated with higher risk of struggling with bills.

Figure 24: *Criterion validity analysis. Children-level items: Changes in Risks for people considering they can't keep up with bills*
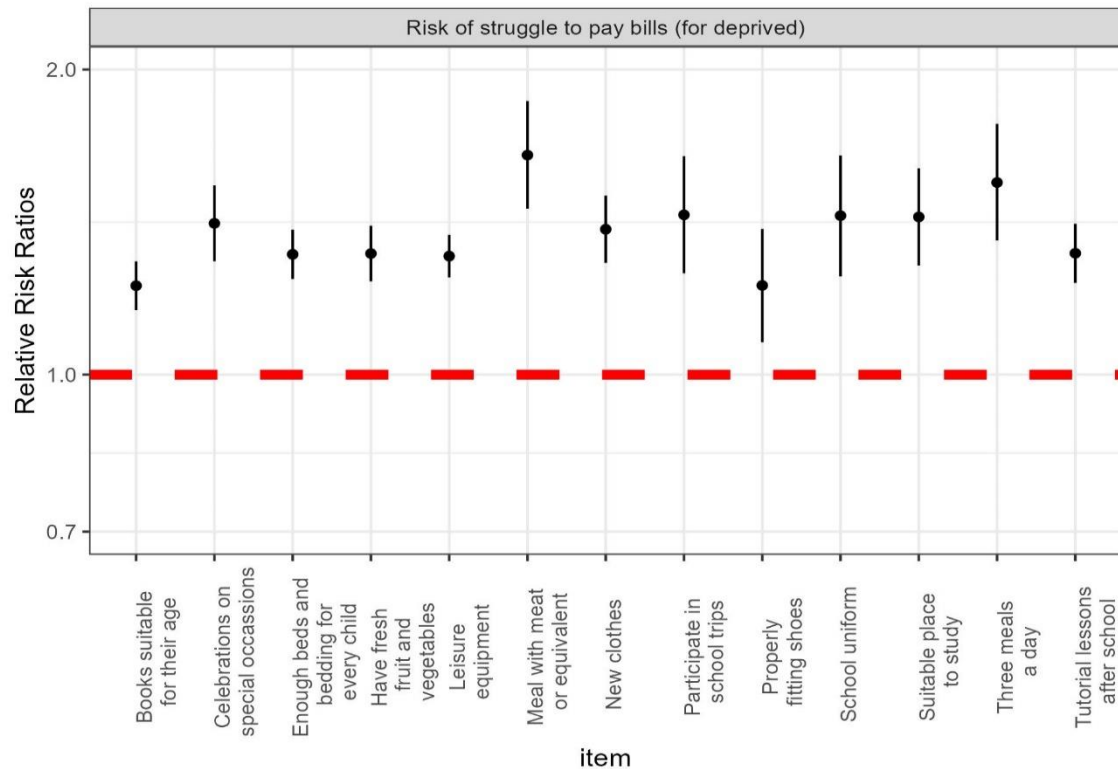
9.2. Steps for the identification of the multidimensionally poor.

1. Scrutiny of the essential needs and deprivation

   1.1 Suitable and valid: Items endorsed as essential by the majority of the population.

   1.2 Reliability: High loadings and low measurement error.

   1.3 Validity: Correlated with high/low living standards

2. Create a deprivation score for each person in the sample.

   Simple sum of deprivation. Minimum score 0 and maximum score of 29.

3. Estimate the per capita income for each person in the sample.

   Divide the annual income by 12 months and then on the total household members.

4. Find the optimal split with the BOM.

   See methods section above.

5. Classify the population accordingly.

•   Poor: People with three or more deprivations and a monthly per capita income equal or below 772 pa'tanga.

•   Not poor: People less than three deprivations and a monthly per capita income above 772 pa'tanga.

•   Vulnerable income: People less than three deprivations and a monthly per capita income below 772 pa'tanga.

•   Vulnerable deprivation: People with three or more deprivations and a monthly per capita income above 772 pa'tanga.

10. Annexes

10.1.   Missing data

Not all the people interviewed answered the consensual approach questions. There were **916** cases with missing data, which is 8% of the total sample (n=11,061 people). However, for some items the missing data is equal to **1,135**.

The denominator to estimate the prevalence rates is given by the total number of valid cases and not the total population. Using the full sample would lead to an underestimation of poverty and deprivation.

10.2.   Poverty: World Bank Poverty Line

Using the $2.19 dollar a day (2017) standard, after adjusting by PPP and CPI, the estimated rate is .52%.

11. Policy Recommendations

1. **Reducing severity and poverty:** Increasing the means for enhancing the level of available resources for a household is the best anti-poverty strategy. That is, enhancing salaries, human capital, and social expenditure toward the poor. The multidimensionally poor are, for example, around 320 TOP a month below the poverty line. A better salary and means of economic inclusion will prove beneficial for the poor. While economic policy is important, social expenditure will have to contribute to improve the monetary conditions of the poor via social transfers. Perhaps 320 TOP a month is not feasible for 24% of the population but some schemes could help. This is discussed below.

2. **Monetary transfers:** Both the cost of basic needs measurement and the multidimensional poverty measure indicate that the poor will benefit from increasing their levels of resources. A form of universal income that is economically feasible (50 TOP a month) seems expensive and with low potential effects. Although this is something that could be implemented in the future, a transfer to the poor of (200 TOP a month) would reduce multidimensional poverty by 4% and would have mid-term positive effects with regard living standard. However, it would require a commitment of 5% of the GDP.

3. **In-kind food transfers for children in school:** 14% of children do not eat protein (meat or equivalent) due to lack of resources. 30% of households report experiencing at least one event of food insecurity due to lack of resources. Both poor and non-poor households spend above 5% of their per capita income on meals for their children in school. An in-kind food programme would have a two-fold effect on the living standards of children. First, it will directly cover a form of material deprivation. Second, it will alleviate the disposable income of the household to invest it in something else.

4. **Social assistance and scholarships for children in basic education:** 25% of the household income of the poor children is spent in school

items (food, fees, uniforms, books, trips, etc.). A social programme that either provides these aspects for free or transfers money in terms of a scholarship will substantially alleviate the severity of the poverty of those households. That 25% is almost enough for the poor to put them within reach of jumping the multidimensional poverty line.

5. **Public essential infrastructure:** Tonga has made almost all essential services accessible to all. The deprivation rates of sanitation, electricity and basic education are low. Improving the conditions to safe and regular access to water would enhance substantially the living conditions of the population. Guaranteeing access to electricity will also have a greater benefit for the poorer.

6. **Attending the most prevalent deprivations:** The poor in Tonga seem to lack resources to fulfil some essential aspects like replacing worn-out furniture and clothes, having their own means of transportation, visiting their relatives in hospital, and save money for themselves. While some of these aspects are directly associated with higher income, they reflect the need to think about the industrial policy to provide goods at lower prices and access to credit. In particular, the aspect of saving money for the poor seems quite problematic. While this is a constraint due to low resources, some simple schemes could help the poor to be included by financial institutions.

7. **Labour market inclusion:** The results point at the labour market positions as a key predictor of monetary poverty. While this is something directly related to economic policy. There are several things that could be pursued: unemployment benefits, apprenticeship programmes, minimum salary policies for formal or paid workers.

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END OF PART 1

Part 2. Measurement of monetary poverty in Tonga

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Executive Summary

This section of the report analyses monetary poverty and inequality in Tonga using data from the 2021 Household Income and Expenditure Survey (HIES). The proportion of Tonga's population considered poor due to low living standard, known as the "cost of basic needs poverty headcount ratio", is estimated to be 20.6%. This equates to 20,661 people considered poor in 2021. This poverty rate is derived from comparing consumption per adult equivalent (AE)[2] with a poverty line estimated at annual amount of TOP $6,058 (approximately USD $2,618). This poverty line is calculated as the cost of basic needs for living, based on the HIES data.

Inequality among individuals in Tonga is low compared to other Upper Middle-Income Countries (UMICs), and East Asia and Pacific countries, with the Gini Index estimated at 0.271 based on per capita consumption (Table 1).

Table 1. **Key Monetary Measures of Living Standards in Tonga**	
Annual GNI per capita (2021, current local currency)	TOP $10,645
Mean (median) Annual Adult Equivalent Consumption	TOP $9,586 (TOP $8,501)
Basic Needs Poverty Line (BNPL)	TOP $6,058
Basic Needs Poverty Rate (BNPR)	20.6%
Gini Index	0.271

[3]Poverty varies by the geographic location, education level, and labour market characteristics of the household. Rural areas are more prone to poverty. The highest rates of poverty are in Ongo Niua (32.9%), Eua (32.3%) and Vava'u (25.2%); however as these regions have relatively low populations, they collectively only account for around 20% of Tonga's poor. Even though the poverty rate on the most populous island, Tongatapu, is relatively low (18.6%), around two thirds of poor live on this region.

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[2] Adult equivalency measures are used to reflect the differing consumption needs for members of the household, depending on their age. Pacific countries use an adult equivalency scale, where children aged 0–14 are considered to have one-half the consumption needs of an adult.

[3] From this point onwards, for simplicity in this section, the term poverty is used to refer to the "cost of basic needs poverty".

Households whose head of household had higher levels of education have lower poverty rates.

Three distinct groups of the poor exist in Tonga. They are mainly characterised by their geographical location, which is also correlated with activities and sources of income. The first group, in urban Tongatapu, work as employees with low wages making them the working poor. The second group lives in outer islands with poor access to formal employment and undertake rural activities (agriculture, fishing, livestock and handicraft) providing low income. The third group lives in rural Tongatapu, and cumulates the constraints of both groups: low-paid job and low cash income from own account production. All the three groups of poor share the low access to improved sources of drinking water and the poor education level. Various types of policies are required to target poor populations, including locally tailored programs to increase income sources, improve access to safe drinking water, and invest in education to ensure access to education for all. As the country is large with small population it would be wise to prioritize the areas with higher economic potential that are more likely to give quick results. Therefore, primary action should be the assessment of economic potential of each island. This assessment should include natural resources as well as human resources, and transportation issues. Education development should be seen at different levels. For primary and secondary levels development of local infrastructures would be the priority. At high education level the government should develop strategy for a better use by Tongains students of existing regional education infrastructures.

A regression model was used to identify the specific relationship of each household characteristic with poverty. All other things equal, the risk of being poor decreases as education level of household members increases. The urban/rural gap is confirmed: people living in urban Tongatapu are less likely to be poor that those living in rural areas, including rural Tongatapu. Consistent with their high poverty rate 'Eua and Ongo Niua are the two regions where the risk of being poor is highest, all other things equal. The risk of being poor increases with the household size. Aspects of household structure such as gender of household head, proportion of members by age groups and proportion of males, does not have significant impact on the risk of being poor.

1. Introduction

1.1. Country context

The Kingdom of Tonga is an archipelago consisting of four clusters of 172 coral and volcanic islands spread over an area of 360,000 square kilometres with a total land area of 650 square kilometres, located in the Central South Pacific Ocean. Tonga is organized in five administrative divisions of its islands: Tongatapu, Vava'u, Ha'apai, 'Eua, and the Ongo Niua. About 40 islands of the kingdom of Tonga are permanently inhabited. Tonga's population is approximately 100,179 (2021) people – about 74% of the total population resides on the largest island of Tongatapu where the capital Nuku'alofa is located. The latter is the only urban area and is the location of 22% of the Tongan population.

Tonga is an upper middle-income country with a GNI per capita of TOP $10,645 in 2021. The official currency used in Tonga is the Tonga Pa'anga (TOP) and the exchange rate was around TOP $2.314 for USD 1 in February 2023.

The economy of Tonga is highly dependent on climate sensitive sectors such as agriculture, fisheries and tourism and a limited resource base that is sensitive to external shocks. The agricultural sector supports the majority of the population for subsistence and for cash income, employing a third of the labour force and accounting for at least 50% of export earnings. Over 40% of total land area is also used for agricultural purposes. Tonga is vulnerable to the impacts of climate change from extreme weather events, such as tropical cyclones, rising sea level, and increase in temperature and precipitation, which exacerbate the risk of drought, flood, and coral bleaching.

Figure 1[4]. Tonga in the Pacific

Figure 2[5]. Tonga islands
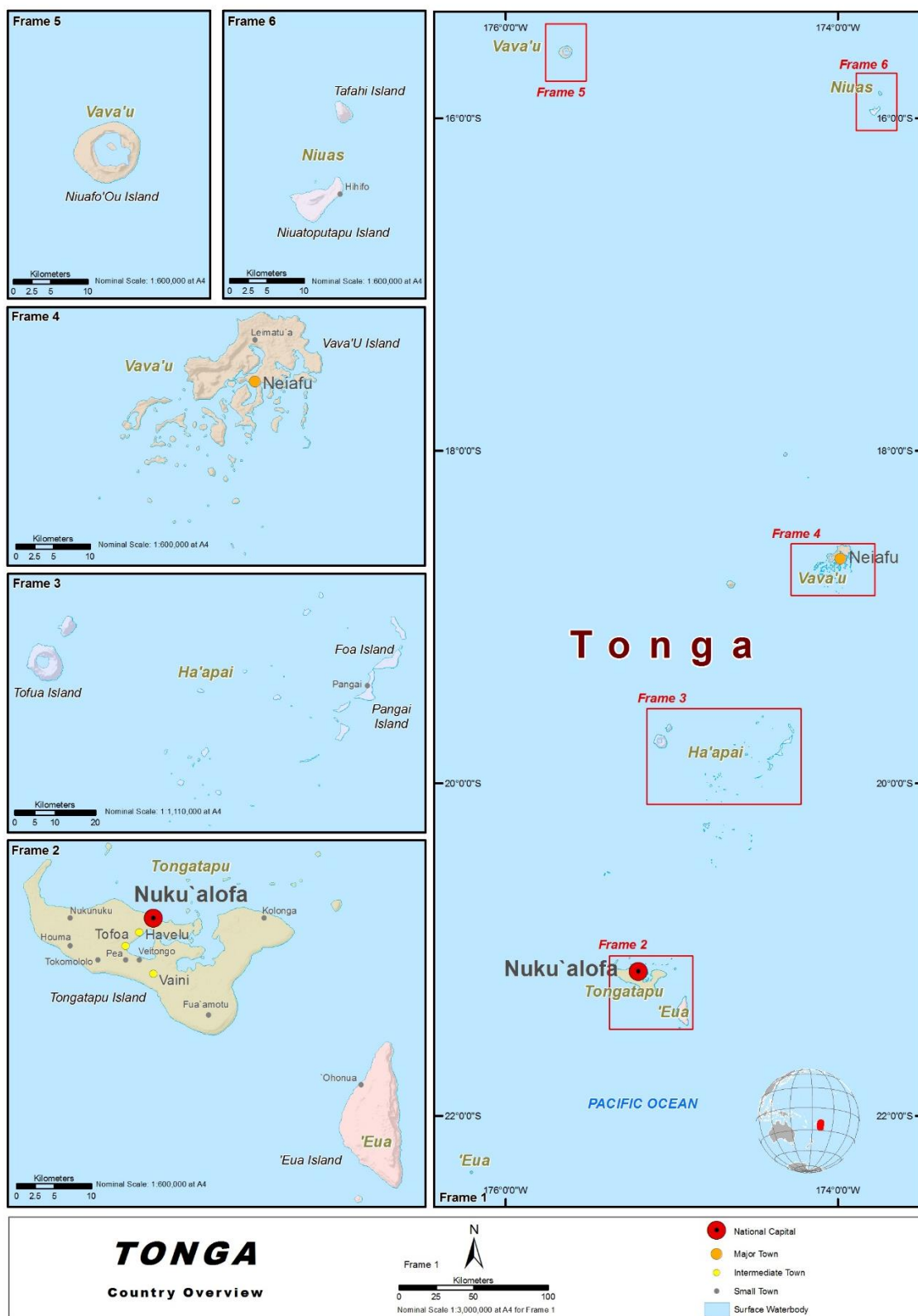
1.2. The 2021 HIES

The latest HIES was conducted in 2021 from 19 January to 23 November and had a total sample size of 2,130 households (11,061 individuals). The survey was designed to produce data that provides representative income, expenditure, and consumption aggregates for each division of Tonga (Tongatapu, Vava'u, Ha'apai, 'Eua, and the Ongo Niua). This HIES is the fourth conducted in Tonga, with the previous surveys occurring in 2000, 2009 and 2015.

1.3. Structure of the section

The first section presents the results of analysis of the 2021 HIES on key dimensions related to poverty and household welfare. Section 2 presents the headline numbers on monetary poverty and inequality, as well as non-monetary dimensions of poverty. Section 3 is a "profile of the poor", which compares poverty rates across several socio-demographic groups and compares the performance of poor and non-poor households across key non-monetary outcomes. Section 4 examines the income composition of households in Tonga to investigate the sources of household welfare and possible causes of different poverty rates by group. Section 5 concludes the analysis by synthesizing the findings of previous sections to construct typologies of the poor to better inform stakeholders of the key decisions that would most affect poverty and inequality in Tonga.

2. Monetary poverty and inequality snapshot

2.1. Monetary poverty – "cost of basic needs" method

This chapter reports a snapshot of poverty and household welfare in Tonga for 2021. One in five people in Tonga is living in poverty. The poverty rate in Tonga for 2021, based on the national "cost of basic needs" poverty line (see Box 1) was 20.6%. This measure is based on an annual per adult equivalent poverty line of TOP $6,058 (USD

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[5]https://www.mapsland.com/oceania/tonga/large-detailed-map-of-tonga-with-relief-cities-villages-and-other-marks

$8.69 2017 PPP a day)[6]. There are major geographic differences in the extent of poverty across Tonga. Almost one-third of people in the Eua live in poverty, while around one-fourth of the Vava'u and Ongo Niua and one-fifth of the Ha'apai and Tongatapu populations are poor (Figure 3). Within Tongatapu, there is a large difference between rural and urban areas: poverty rate is 13.3% in urban areas against 21.1% in rural areas. Most (53%) of Tonga's poor people live in Tongatapu rural areas (11,036 of a total of 20,661).

The "poverty gap" measure captures the depth of poverty in addition to the incidence of poverty. Poverty gap is highly correlated and increases with the poverty rate; it shows the same pattern of regional differences. Tongatapu area exhibits the lowest poverty gap while the biggest are in Eua and Ongo Niua.

Table 2. **Poverty rate by region**

	Poverty rate (%)	**Confident interval**	
		Lower bound	*Upper bound*
Tonga	**20.62**	*19.33*	*21.92*
Tongatapu	**18.61**	*17.18*	*20.46*
Urban Tongatapu	13.35	*11.43*	*15.27*
Rural Tongatapu	21.13	*18.96*	*23.30*
Rural Vava'u	25.22	*22.56*	*27.88*
Rural Ha'apai	21.38	*18.51*	*24.24*
Rural 'Eua	32.34	*28.72*	*35.96*
Rural Ongo Niua	32.92	*25.38*	*40.47*

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[6] in 2021 the PPP in US$ 2017 for private consumption was 1.71 and the CPI was 1.11. The poverty line in USD dollars PPP value is derived by dividing the value in TOP by PPP, then by CPI.

Figure 3. Basic needs poverty rate and gap by region

Figure 3. Basic needs poverty rate and gap by region
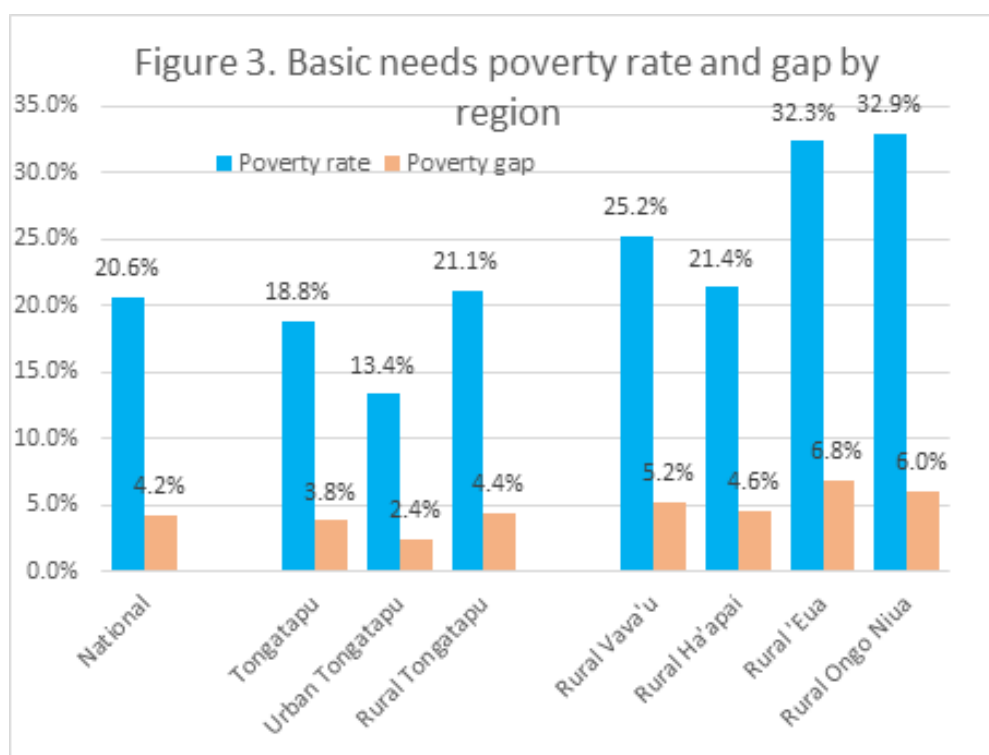
Box 1. Cost of Basic Needs Poverty Line

A "cost of basic needs" poverty line is a way of measuring poverty by calculating the threshold of consumption required to meet the minimum food and non-food needs. The main steps of the "cost of basic needs" method are:

1. Estimate the minimum required consumption to meet food needs ("food poverty line" / FPL).

2. Estimate the minimum required consumption to meet non-food needs ("non-food poverty line" / NFPL).

3. Add the FPL and NFPL to produce the "basic needs poverty line" (BNPL).

4. Calculate the total value of goods and services consumed by each household, based on HIES data.

5. Compare the value of household consumption (the consumption aggregate) to the BNPL; individuals in households with consumption below the BNPL are considered poor.

> Detailed notes about methodological decisions in calculating the consumption
> aggregates and poverty lines are presented in the Annexes.

2.2. Food poverty

Tongan people are hardly affected by food poverty: 1.0% of the population falls under the food poverty line which is TOP 2,783 (USD $3.99 2017 PPP a day). This figure ranges from 0.6% in Eua to 1.8% in Ongo Niua (Figure 4). The food poverty rate was estimated based on consumption per adult equivalent and on the food poverty line, which is defined as the cost of a food basket providing 2,100 kcal per day per capita[7].

Figure 4. Food poverty by region

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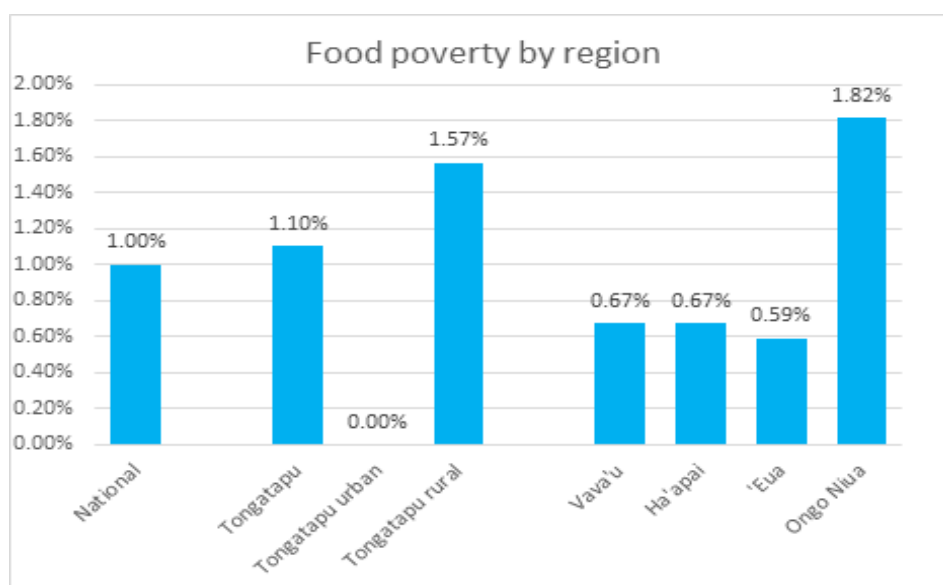
[7] This threshold is used when the living standard is measured as the ratio of the food consumption by the household size. However, when the living standard is defined as the ratio of the food consumption to the number of adults equivalent the threshold should be adjusted to take into account the scale change. To be consistent with the living standard rescaling the threshold is multiplied by an adjustment coefficient that is equal to (Average household size)/(Average adult equivalency). The threshold of kcal intake per adult equivalent is therefore 2,600 kcal.

2.3. Consumption inequality

Inequality in Tonga is similar to that of Kiribati, but quite low compared to other countries in East Asia and the Pacific. The Gini Index, a measure of inequality that scales from 0 (perfectly equal distribution of consumption across the population) to 1 (one person in the population holds all the consumption), was estimated at 0.271for Tonga in 2021 based on consumption per capita. This level of inequality compares favourably to other PICs as well as other UMICs in East Asia and the Pacific (Figure 5).

Figure 5. Gini Index (based on consumption per capita)
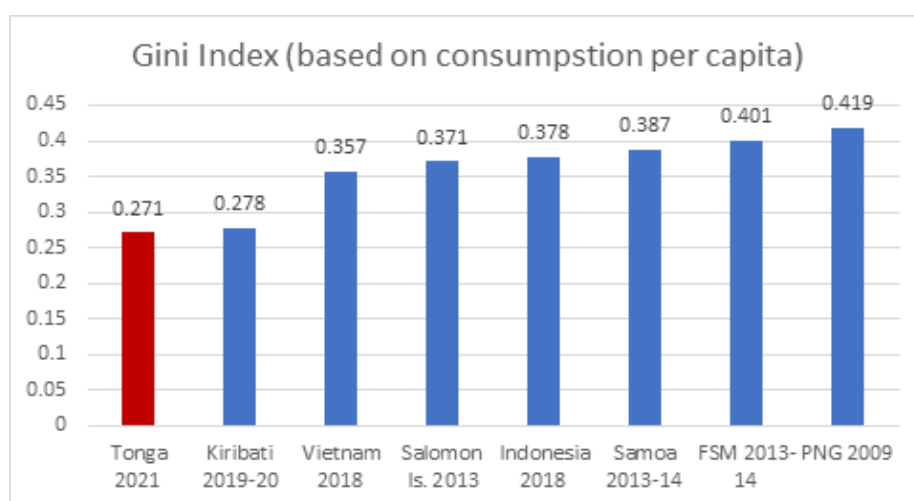
Inequality within a region is higher in regions that are poor, shown by higher estimated Gini indexes (Table 2). Ongo Niua which is one of the two poorest regions of Tonga exhibits a Gini index of 0.314 while the index ranges from 0.258 in Ha'apai (the less poor outer island) to 0.272 for the other regions. Within Tongatapu inequality is slightly higher in the rural and poorest area than is in the urban area (0.272 against 0.264). Other inequality measures confirm these results. Some of these measures are the shares of consumption held by different parts of the distribution. the ratio of the share of the wealthiest population to the share of the poorest ones. Ongo Niua, one of the poorest among the rural regions, exhibits the highest ratio of the top 10% to bottom 10% consumption (6.79) while the ratio ranges from 5.15 to 5.33 for the other regions. Despite this observation the relationship between poverty and inequality is mitigated. In fact, the poverty rate is significantly lower in urban Tongatapu than in outer islands;

however the value of inequality indexes are similar to those of the former regions (except Ongo Niua).

Table 3.**Gini coefficient by region**

	Gini coefficient	Confident interval	
		Lower bound	*Upper bound*
Tonga	**0.271**	*0.263*	*0.279*
Tongatapu	**0.270**	*0.260*	*0.281*
Urban Tongatapu	0.263	*0.250*	*0.276*
Rural Tongatapu	0.272	*0.259*	*0.286*
	-		
Rural Vava'u	0.267	*0.252*	*0.283*
Rural Ha'apai	0.258	*0.240*	*0.275*
Rural 'Eua	0.264	*0.244*	*0.284*
Rural Ongo Niua	0.314	*0.279*	*0.349*

Table 4**. Inequality indices by region**

	share of top 10% for consumption per capita	share of bottom 10% for consumption per capita	share of bottom 30% for consumption per capita	share of bottom 40% for consumption per capita	ratio of top 10% to bottom 10% of consumption per capita	ratio of top 10% to bottom 30% of consumption per capita	ratio of top 10% to bottom 40% of consumption per capita
National	**22.0%**	**4.0%**	**15.8%**	**23.3%**	**5.47%**	**1.39%**	**0.95%**
Tongatapu	21.9%	4.0%	15.8%	23.2%	5.44%	1.38%	0.94%
Urban Tongatapu	21.7%	4.2%	16.3%	23.7%	5.18%	1.33%	0.92%
Rural Tongatapu	21.8%	4.1%	15.8%	23.1%	5.33%	1.37%	0.94%
Rural Vava'u	22.1%	4.1%	16.1%	23.5%	5.34%	1.37%	0.94%
Rural Ha'apai	21.1%	4.0%	16.1%	23.9%	5.25%	1.31%	0.88%
Rural 'Eua	22.0%	4.3%	16.8%	23.8%	5.15%	1.31%	0.92%
Rural Ongo Niua	22.0%	3.2%	14.0%	20.1%	6.79%	1.57%	1.09%

2.4. Deprivation of monitoring of basic infrastructure and education

Analysis on non-monetary deprivation is important to complement the monetary dimension of poverty and to present the full breadth of challenges faced by households. Though household consumption is an important welfare metric, it does not provide a complete picture of household well-being. There are several ways to present non-monetary deprivations, and several dimensions to choose from. The second main section this report is dedicated to multidimensional poverty using the so called consensual approach. The current section deals with another approach used by the World Bank. This approach focuses on indicators related to the monitoring of deprivations in infrastructure (consisting of drinking water, sanitation, and electricity) and education (consisting of educational attendance and educational attainment). The poorest households by monetary measures in Tonga also tend to be the most likely to be deprived in terms of non-monetary dimensions (Table 3). For all dimensions, the bottom 40% of consumption per capita exhibits the higher proportion of deprived people.

Table 5. Non-monetary deprivation		
Type of deprivation	National	Bottom 40% of consumption per capita
Population deprived of safely managed water	25.7%	31.3%
Population deprived of safely managed sanitation	17.0%	23.8%
Population without access to electricity grid	7.1%	10.4%
Population in households where at least on child 7-14 is out of school	1.5%	2.2%
Population in households where no adult (aged 15+) completed primary education	0.1%	0.0%

3. Poverty profile

3.1. Geographic distribution

In 2021, three quarters of the more than hundred thousand Tongans (74.2%) lived in Tongatapu (Table 4.). The only urban area of the country is located in Tongatapu and accounts for 22.1% of the national population. Rural Tongatapu, which represents 52% of the national population, is the most populous rural area of Tonga, followed by Vava'u (14.0%) while the less populous region (Ongo Niua) represents 1.1% of the total.

Table 6. **Population spread of Tonga**

	Population	Proportion
Tonga	**100,179**	**100.0%**
Urban	22,098	22.1%
Rural	78,081	77.9%
Tongatapu	**74,323**	**74.2%**
Urban Tongatapu	22,098	22.1%
Rural Tongatapu	52,225	52.1%
Rural Vava'u	14,059	14.0%
Rural Ha'apai	6,315	6.3%
Rural 'Eua	4,422	4.4%
Rural Ongo Niua	1,060	1.1%

Despite both Tongatapu urban and Tongatapu rural being the least poor with respect to the proportion of the total population, it is in fact where the majority of the poor reside (Table 5). This is because the large share of the total population of Tonga live in Tongatapu (Table 5). That is, the proportion of the poor living in Tongatapu is quite low compared to its share in the population. Conversely, 'Eua which accounts for 4.4% of the population and 6.9% of the poor.

Table 7. **Distribution of poor population by region**

	Global poverty		Food poverty	
	Distribution of the global poor	Number of global poor	Distribution of the food poor	Number of food poor
Tonga	**100.0%**	**20,661**	**100.0%**	**1,001**
Tongatapu	**67.7%**	**13,986**	**81.8%**	**819**
Urban Tongatapu	14.3%	2,950	0.0%	-
Rural Tongatapu	53.4%	11,036	81.8%	819
Vava'u	17.2%	3,546	9.4%	94
Ha'apai	6.5%	1,350	4.2%	43
'Eua	6.9%	1,430	2.6%	26
Ongo Niua	1.7%	349	1.9%	19

3.2. Age groups

Tonga has a relatively young population with a child dependency ratio (proportion of children to working-age adults) of 0.61 (Table 8). The country's population distribution (Figure 6) is pyramid-shaped, as around half of Tonga's population in 2021 are under the age of 20. Less than 3% of its population is aged 71+. The dependency ratio in Tonga is 0.74 with major contribution of children as the child dependency ratio is 0.61 while the elderly dependency ratio is only 0.13.

Table 8**. Dependency ratio**

child dependency ratio	0.61
elderly dependency ratio	0.13
total dependency ratio	0.74

Figure 6. Tonga population distribution (from HIES)
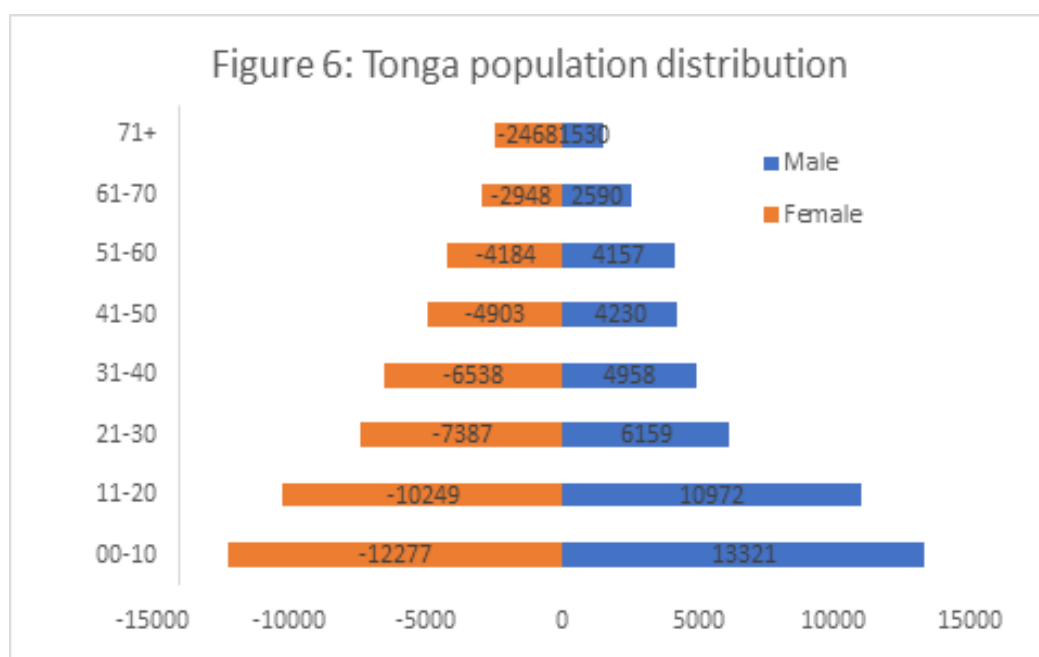
Young people are more frequently affected by poverty. The highest poverty rates are found among the youngest age groups (0 to 20 years old) with a rate of around 23%, while it is less than 20% for older people. Therefore, the largest number of poor is among children under 20 years who account for 47% of the population and 53% of the poor8 (Figure 7).

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[8] The groups 0-10 and 11-20 are respectively 28.6% and 24.7% of gf he poor.

Figure 7. Poverty rate and distribution of the poor, by age group
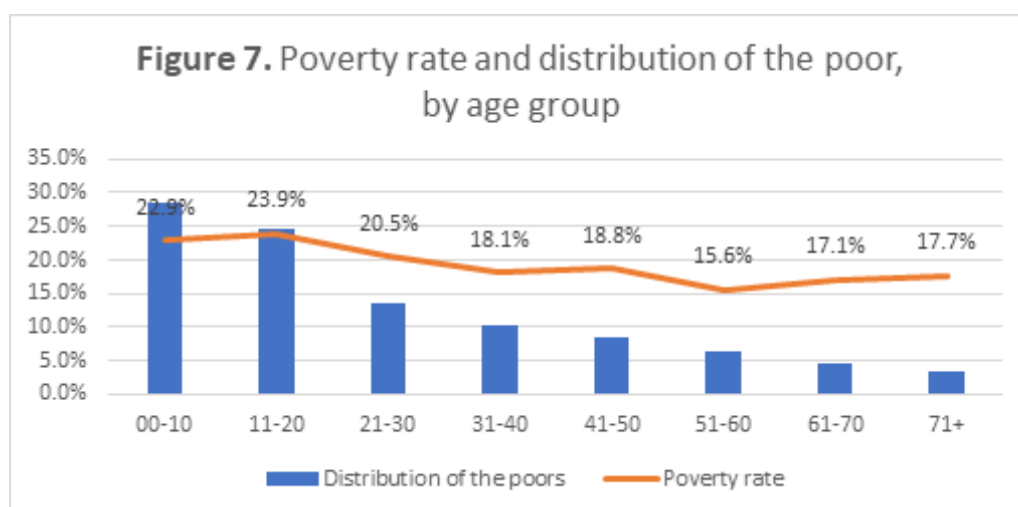
3.3. Gender

At national level, poverty rate is lower for people living in female-headed households (18.3% against 21.4% for those living in male-headed households) (Figure 8). This result mirrors the situation in Tongatapu where 80% of household members that are headed by females live (72% for those headed by male). In Tongatapu, the poverty rate is 14.5% for female-headed households while it is five percent points higher for male-headed households. The reverse result is observed in outer islands (except Ongo Niua) with a higher poverty rate for female headed households. One fifth of the Tongans live in households headed by female (22%). The highest proportion is found in urban Tongatapu (27.8%) while Eua exhibits the lowest proportion (15.4%).

Figure 8. Poverty rate by sex of household head and location

Figure 8: Poverty rate by sex of household head and location
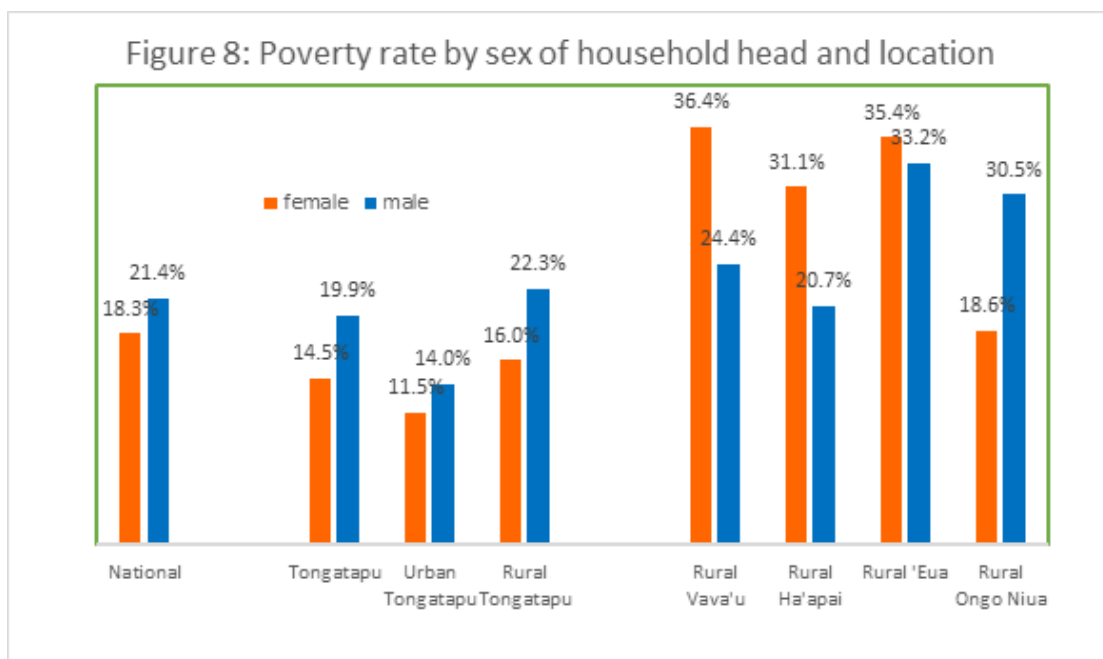
3.4. Education

Over 40% of households in Tonga are headed by people who never attended higher secondary school (Figure 9). However, these households usually have other members with higher levels of education as only 11% of households do not have any members that attended secondary school. Only 12% of households are headed by people who have attended university or tertiary education, but 31% of households have at least one member with university or tertiary education. Across the population aged 25+, only 11% have completed post-secondary education.

Figure 9. Highest level of education in household vs highest education of head of household

Figure 9. Highest level of education in household vs highest education of head of household
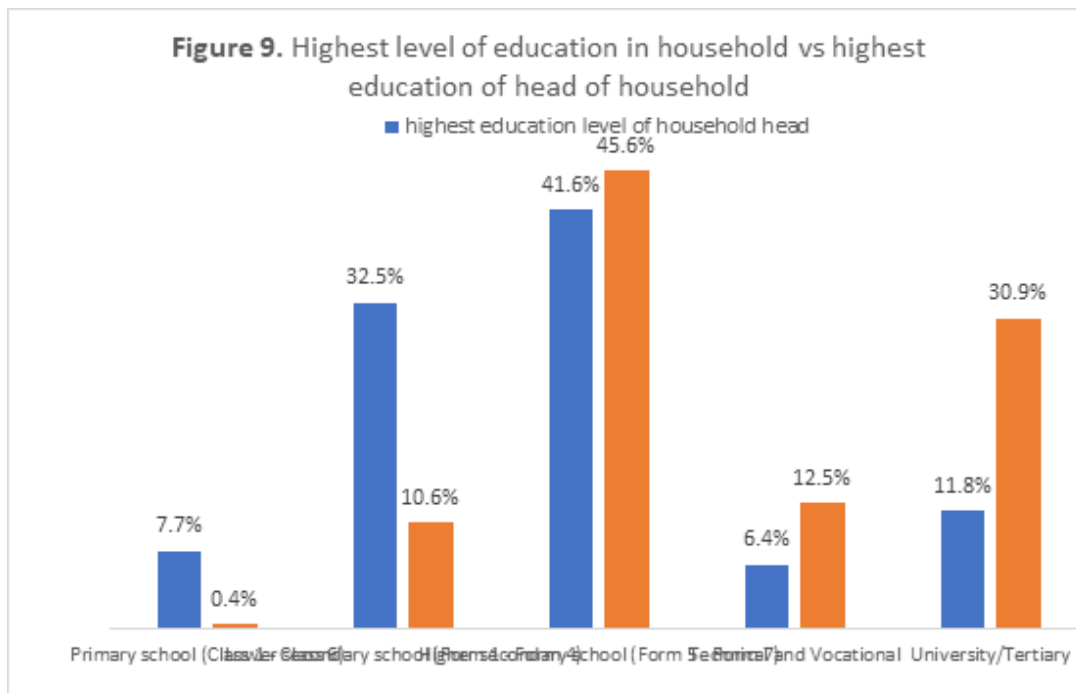
Poverty rates correlate more strongly with the education of the household head than other household members. Poverty rates decline as the education level of the household head increases. However, the relationship between poverty and the highest level of education completed by any adult (aged 25+ years) is weaker than the relationship of poverty to education of the household head (Figure 10). On the highest education completed by the household head, poverty rate varies from 32.5% for primary school to 7.9% for university and tertiary education, which represents a difference of 24 percentage points. Regarding the highest education completed by any other adult member of the household, the :poverty rate varies from 29.6% to 11.3% respectively representing a 19 percentage points difference. This result suggests that the household head's education level matters more than the presence of other household adult members with higher education when it comes to poverty correlation.

Figure 10. Poverty rate by education completion of head of household and highest educated adult (aged 25+)

Figure 10. Poverty rate by highest education completion of head of household and adult (aged 25+)
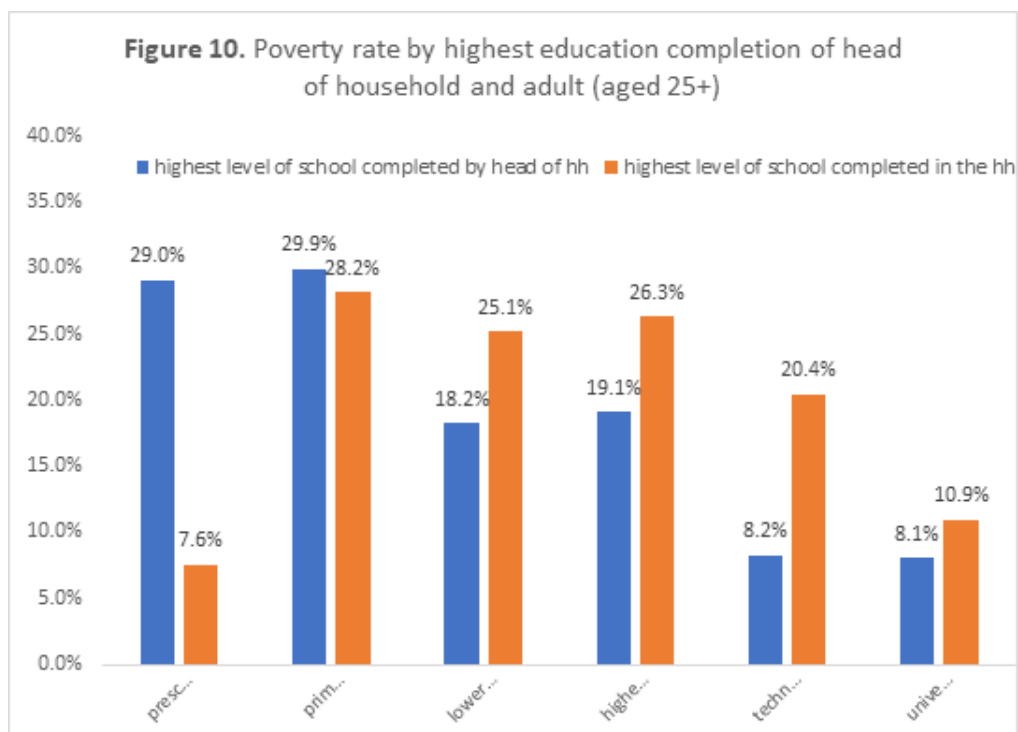
Poverty rates among adults decline greatly for those having at least completed lower secondary school. When looking at adults aged 25+ years, poverty rates decline greatly with higher levels of education (Figure 11). This effect can be observed in Tongatapu as well as in outer islands.

Figure 11. Poverty rate for adults (aged 25+) by education completion

Figure 11, Poverty rate for adults (aged 25+) by education completion
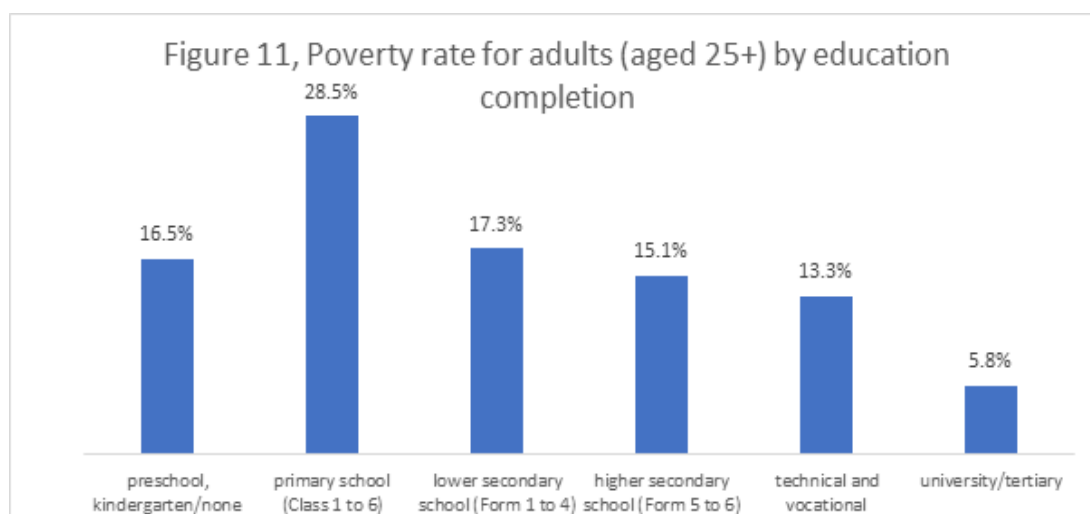
attendance in education for primary school-aged children is very high with a 98% school attendance rate for children aged 6–11 nationally and remains consistent geographically, as well as throughout the consumption distribution (Figure 12 and 13). Apart for Ongo Niua where it falls to 93%, the attendance rate of 6-11 remains close to 100%. The attendance rate of children aged 12-18 is lower than those of 6-11 as it is close to 90%. Surprisingly, the highest rate is found in Ongo Niua (94%) which exhibits the lowest attendance rate for the 6-11. For the 11-18 age group, the lowest attendance rates are observed in Vava'u and Ha'apai regions, suggesting that children leave school earlier in these regions.

Figure 12. attendance in school per locality, by age group

Figure 12. Enrollment in school per locality, by age group
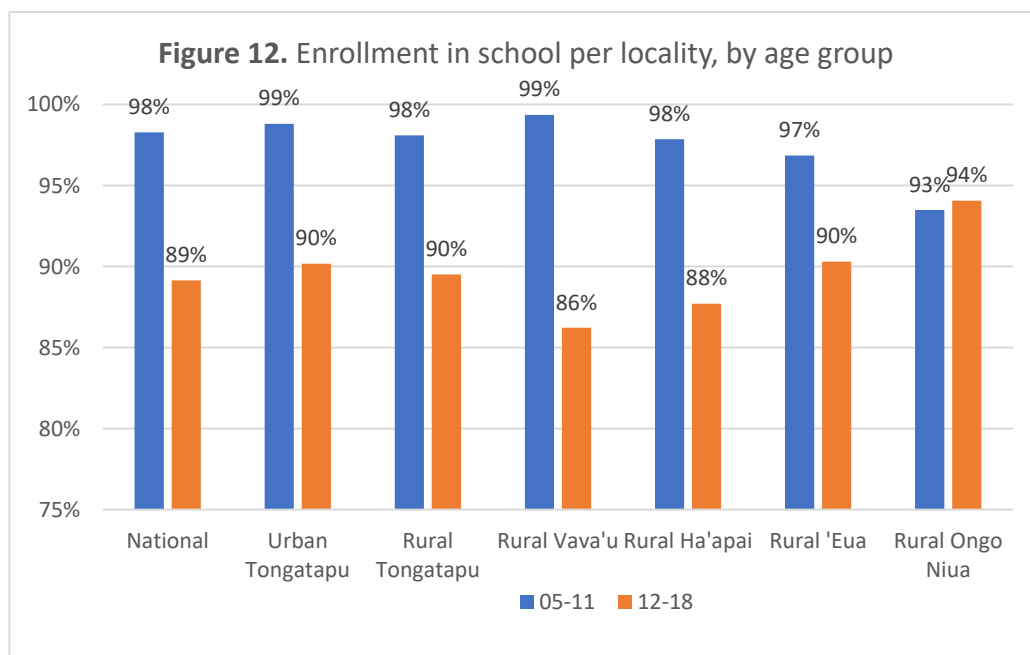
Figure 13. Attendance rate by age group per consumption decile

Figure 13. Enrollment rate by age group per consumption decile
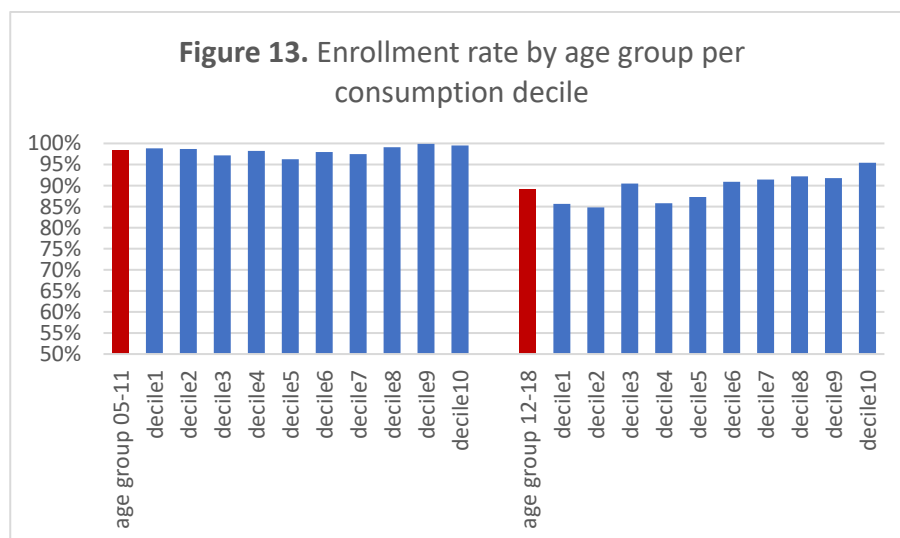
The large gap between the attendance of the 5-11 and 12-18 suggests that children start to drop out of the education system between 12-18. The phenomenon is more significant for poor households for whom the attendance rate decreases from 99% for the 5-11 to 86% for the 11-18. These proportions are respectively 98% and 90% for the non-poor (figure 14). This result is consistent with the residence area. In urban area the attendance rate for the poor population drops from 96% for the 5-11 to 86% for the 11-18. It is worth noting that the attendance rate of the 5-11 among poor children is slightly lower in urban area than in rural area (96% against 99% respectively), which may reflect the harder living conditions of the poorer population in urban area, or need to get a job or enter into own account production as an alternative to going to school.

Figure 14. Attendance in school by poverty status, age group and residence

Figure 14, Enrollment in school by poverty status, age group and residence
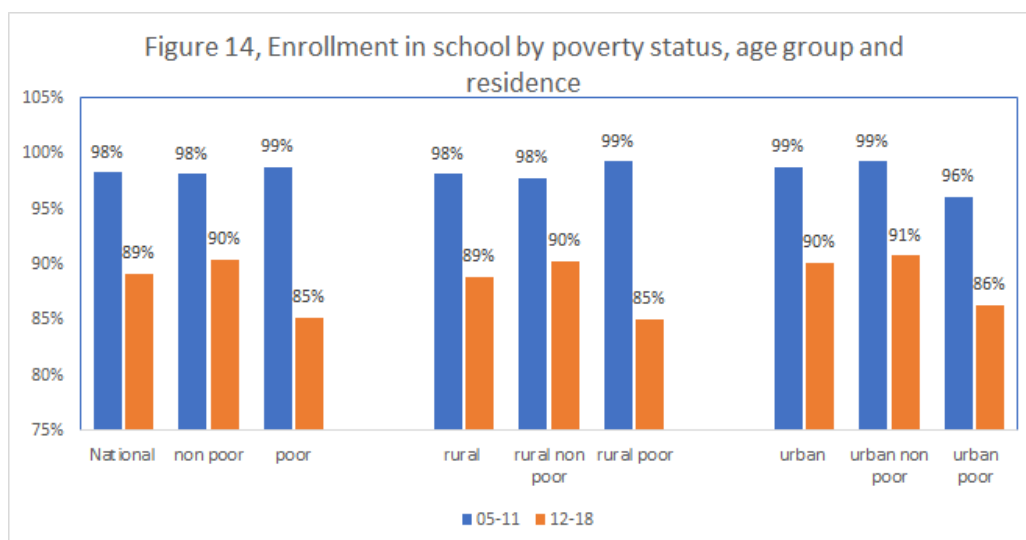
The attendance pyramid in Figure 15 shows that girls and boys do equally attend school up to 13 years old. From 14 years the attendance rate is higher for girls. For example, at 18 years old, 70.5% of girls continue to attend school, among which 58.3% are at secondary school and 12.2% at tertiary school. Only 56.2% of boys attended at this age. At 23 years old the proportion of girls attending school has strongly decreased (20.9%) but is still higher than those of boys (10.3%).

Figure 15. School attendance pyramid per education level by age and sex
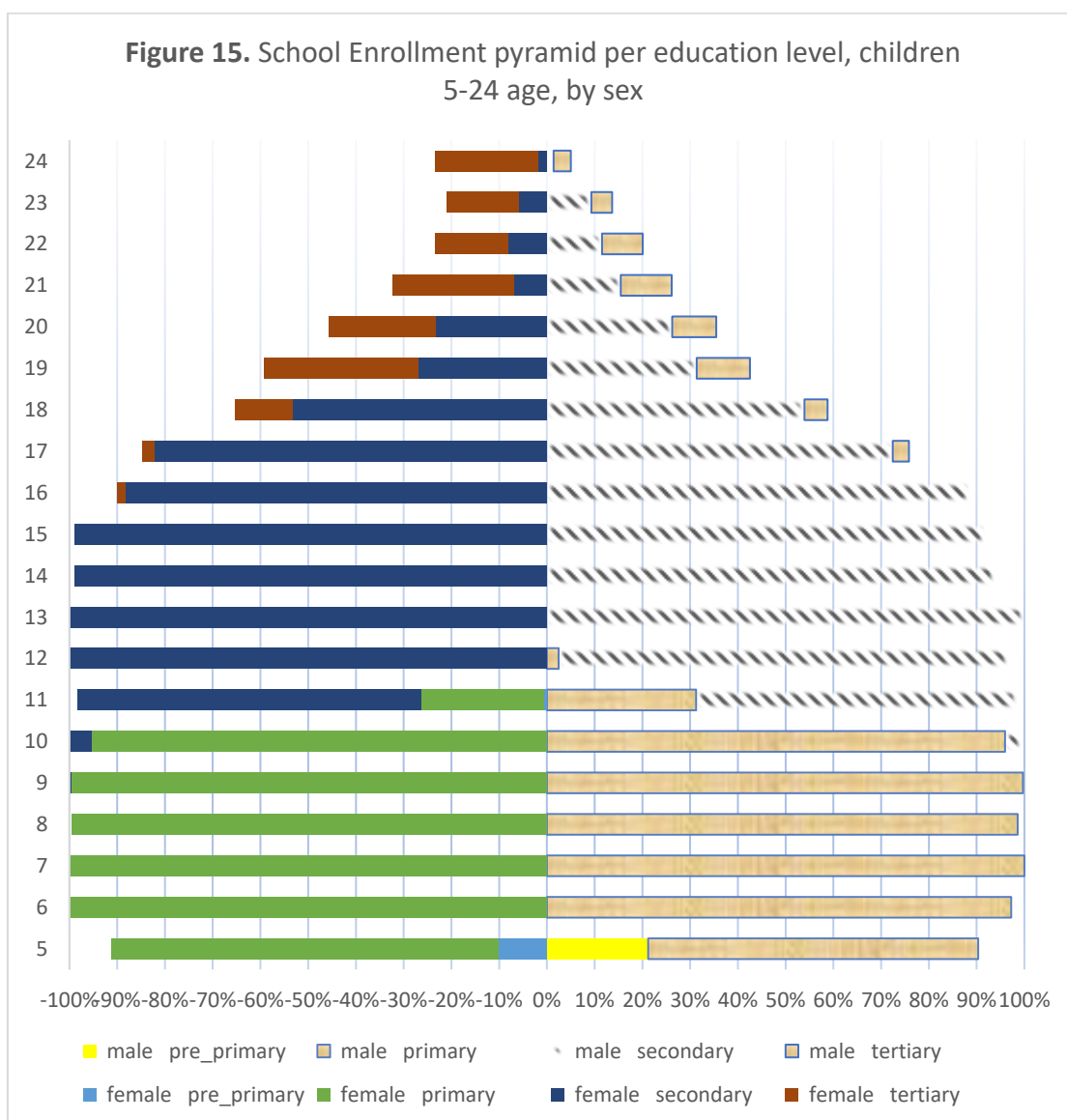
3.5. Employment

Around 48% of adults aged 15–64 participate in the labour force in Tonga (Table 9). Overall, women are less likely to be active labour force participants with only 41.2% of women against 57.4% of men stating they are currently working. The rate of unemployment (people not working but who are looking for jobs) is very low and similar among men and women (3.8%).

Table 9. **Labour force statistics of adult aged 15-64 years old**

	All	Male	Female
Labour force participation rate (employed + unemployed / total 15-64)			
Unemployment rate (unemployed/ employed + unemployed)	48.7%	57.4%	41.2%
Employment (employed / total 15-64)	3.8%	3.8%	3.8%
Labour force participation rate (employed + unemployed / total 15-64)	46.9%	55.2%	39.7%

Most working adults aged 15–64 are employees, with the next largest group being self-employed. This dominant position of employee is highly pronounced for male among which 58.3% are employees while only 21.5% work in own business activity (Table 10). These proportions are respectively 46.7% and 38.6% for female. Working as an employee is more prevalent in urban Tongatapu (71.1%) than elsewhere in Tonga: 53.1% for rural Tongatapu and 39% for outer islands (Table 11). Workers in outer islands are equally distributed between employees and self-employed.

Table 10. **Status of employment of adult aged 15-64 years old (% of employed population)**

Employment status of individual	National	Male	Female
own business activity	29.2%	21.5%	38.6%
business operated by hh/family member	4.2%	3.6%	4.9%
Employee	53.1%	58.3%	46.7%
Apprentice	0.5%	0.6%	0.5%
other status	13.0%	16.0%	9.4%

Table 11. **Status of employment of adult aged 15-64 years old working, by location**

	National	Urban Tongatapu	Rural Tongatapu	Rural Outer Islands
Own business activity	29.2%	19.6%	28.9%	37.1%
Business operated by hh/family member	4.2%	4.5%	3.8%	4.6%
Employee	53.1%	71.1%	53.1%	39.0%
Apprentice	0.5%	1.2%	0.5%	0.1%
Other status	13.0%	3.6%	13.7%	19.2%

There are substantial differences in poverty rates for adults (aged 15-64 years old) by employment status. The smallest groups named apprentice and workers in business operated by a household or family member are also the less poor (Figure 16). Self-employed individuals in their own business are more likely to be poor than employees (21.9% against 15.6%). Even though this result is consistent for men and women the gap is more significative for the latter.

Figure 16. Poverty rate by employment status and sex, employed pop. Aged 15-64
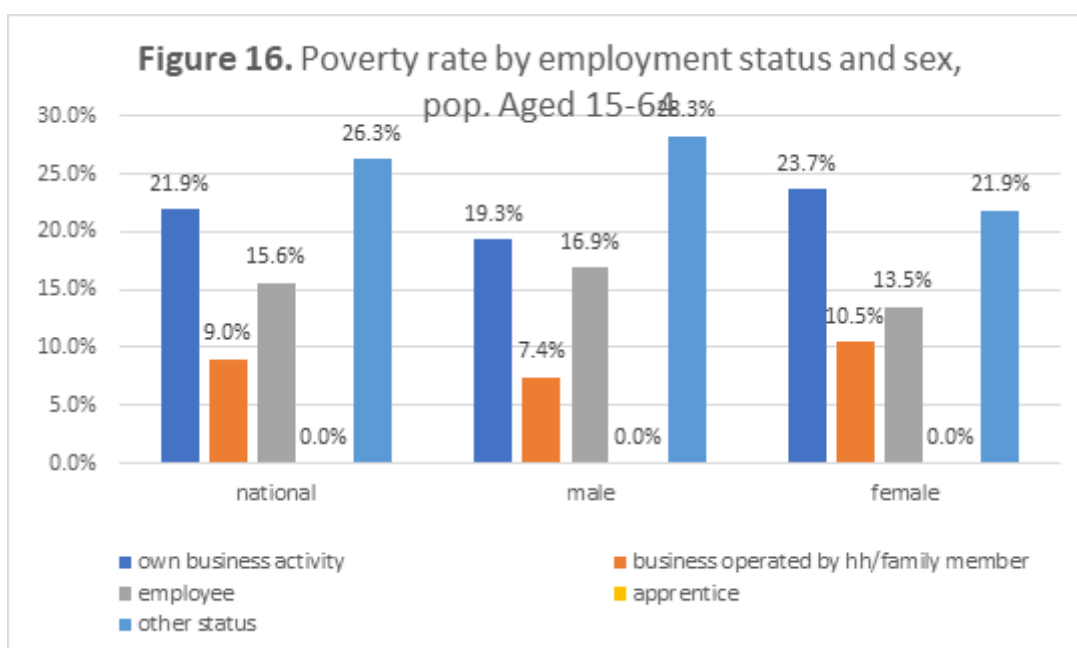
At the population level, poverty would appear to be significantly influenced by the employment status of the household head. When employment status of household heads are compared, self-employed in own business shows a higher poverty rate while those working in business operated by family members are less poor (Figure 17).

Figure 17. Poverty rate by employment status of household head
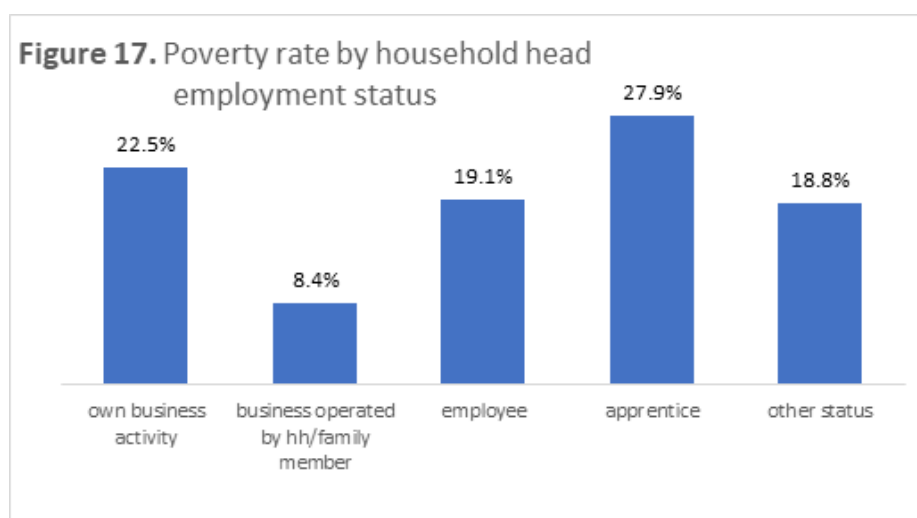
3.6. Access to basic services

Improved drinking-water sources are defined as those that are likely to be protected from outside contamination, and from faecal matter in particular[9]. Pipe and tap that are the very obvious improved sources of drinking water are accessible to only 2.2% of the households. However, rainwater tanks that are also classified as improved drinking sources are accessible to 85% of the population. Finally, only 13.7% of the households lack access to improved source as they mainly use bottled water that is classified as a non improved source. Surprisingly the lack of access to improved sources of drinking water is higher in Tongatapu than in outer islands, and even higher in Urban Tongatapu than in rural Tongatapu.

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[9]   https://www.who.int/data/nutrition/nlis/info/improved-sanitation-facilities-and-drinking-water-sources

This result is not consistent with the expectations on the differences between urban and rural area. Access to improved source of drinking water is usually higher in urban area. It is likely that bottled water are used in a more safely way in Tonga than does in other countries. In fact, the households using bottled water as main source of drinking water are less poor than those using rainwater tanks. Unfortunately the survey did not collect details on the access conditions to water sources. For example, if the collection time was known, the rainwater tank would be classified as improved source if that time was not more than 30 minutes for a roundtrip, including queuing; and otherwise classified as non improved source.

From local experiences it appears that bottled water in Tonga means people taking large water filter type plastic bottles to water supply points which are safe for drinking. Therefore, bottled water is classified as improved source of water beside pipe and tap. Conversely rainwater tanks are classified as a non improved source since we do not have information to separate among improved and non improved. Based on this restricted definition 15.9% of households have access to improved source of water in Tonga. This means four households in five do not have access to improved sources of drinking water (pipe, tap or bottled water), with substantial differences between regions. They mostly use tanks to collect rainwater. Tongatapu exhibits a significative gap with the outer islands. In urban and rural Tongatapu water from pipe or tap devices or bottled water are used for respectively 26.2% and 17.3% of the households. This proportion falls to 5% or lower for the outer islands.

Household's source of drinking water is correlated with poverty. Table 12 reports that households drinking water from a rainwater tank have a poverty rate of 27.4% when the tank is shared and 21.2% for own tanks. In contrast, for households that have access to improved source of drinking water, the poverty rate is around 4.5% for pipe and tap and 6.4% for bottled water.

83

Table 12. **Access to basic services**

Main source of drinking water per locality

	National	Urban Tongatapu	Rural Tongatapu	Rural Vava'u	Rural Ha'apai	Rural 'Eua	Rural Ongo Niua
pipe or tap	2.2%	2.8%	1.9%	10%	3.1%	5.0%	1.4%
bottled water	13.7%	23.4%	15.4%	4.4%	1.1%	0.6%	
rainwater tank own	58.7%	44.0%	54.3%	75.5%	84.5%	75.0%	98.1%
rainwater tank shared	25.5%	29.8%	28.5%	19.0%	11.3%	19.3%	0.6%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Main source of power energy per locality

	National	Urban Tongatapu	Rural Tongatapu	Rural Vava'u	Rural Ha'apai	Rural 'Eua	Rural Ongo Niua
electricity grid	91.5%	95.0%	95.7%	90.6%	65.2%	94.9%	
solar panel	3.2%	0.5%	0.4%	6.5%	15.1%	0.5%	66.7%
generator (private/shared)	1.4%		0.2%		18.0%		14.5%
neighbor connection	2.0%	3.2%	1.9%	1.8%	0.2%	0.5%	18.8%
other energy source	1.9%	1.3%	1.9%	1.0%	1.5%	4.0%	
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Type of toilet per locality

	National	Urban Tongatapu	Rural Tongatapu	Rural Vava'u	Rural Ha'apai	Rural 'Eua	Rural Ongo Niua
flush toilet	88.0%	95.3%	91.5%	79.9%	62.4%	82.5%	65.8%
not flush toilet	12.0%	4.7%	8.5%	20.1%	37.6%	17.5%	34.2%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Figure 18. Poverty rate by access to basic services

Figure 18. Poverty rate by access to basic services

Connection to electricity grid is very common in Tonga as nine households in ten are connected (Table 12). Apart from the island of Ongo Niua that does not have electricity grid system, at least 65% of households are connected in the regions. For the latter region the main source of power energy is solar panel (66.7%). Households who do not have direct access to solar panel use generators that is either private or shared (14%) or connect to their neighbors (18.8%). Poverty is correlated with source of power energy. The lowest poverty rate is found for households that are connected to neighbors source; this is likely because most of those households are located in Tongatapu. Among the other sources of power energy, poverty rate is far lower for households connected to electricity grid (19.9% against 33% to 41%).

Access to flush toilet is very common in Tonga as 88% of households have. However, an important gap remains between Tongatapu and outer islands (table 12). Almost all households have access to a flush toilet in Tongatapu (95% in urban and 91% in rural) while in outer islands access rates vary from 62.2% in Ha'apai to 82.5% in Eua. Poverty rate is twice as high among households with no access to flush toilets.

Health facilities are reasonably accessible to most people as the average time to reach the nearest facility is nearly 12 minutes. People living in Tongatapu still have significant advantage compared to those in outer islands. The average time to reach the nearest health facility is less than 10 minutes in both urban and rural Tongatapu while it reaches 16 minutes or more in outer islands (Table 13).

Table 13. **Average time to reach the nearest health facility**

	Average time (minutes)
Tonga	**11.6**
Urban Tongatapu	8.4
Rural Tongatapu	9.7
Rural Vava'u	17.2
Rural Ha'apai	16.5
Rural 'Eua	21.8
Rural Ongo Niua	25.5

3.7. Spending patterns

There is no clear pattern with respect to the proportion of food and non-food consumption across the consumption distribution. Based on Engel's Law, people would be expected to spend an increasing share of consumption on non-food items as their total consumption increases. However, this is not the case in Tonga, where the share of food consumption remains around 49% in each decile (Table 14).

Table 14. **Annual food vs non-food consumption by decile per adult equivalently**

	average annual total consumption per AE (TOP)	average annual food consumption per AE (TOP)	average annual non consumption per AE (TOP)	share of food consumption
national	**9,859**	**4,843**	**5,016**	**49.1%**
decile 01	4,220	1,934	2,286	45.8%
decile 02	5,617	2,663	2,953	47.4%
decile 03	6,646	3,213	3,433	48.3%
decile 04	7,612	3,679	3,933	48.3%
decile 05	8,414	4,167	4,247	49.5%
decile 06	9,299	4,497	4,802	48.4%
decile 07	10,406	5,226	5,180	50.2%
decile 08	11,956	5,951	6,005	49.8%
decile 09	14,100	7,055	7,045	50.0%
decile 10	20,365	10,070	10,295	49.4%

Vegetable and fruits, meat and food away from home are the major components of food consumption for Tonga people as each of them count for around 20% of the total consumption. Far behind are the starchy staples (11.9%), followed by seafood (8.3%). The distribution of food categories changes across deciles. As expected, the share of starchy staples decreases across deciles in line with Bennett's Law stating that, as people get wealthier they start to eat relatively fewer calorie dense starchy staple foods and relatively more nutrient-dense foods such as meats, fruits, and vegetables. This law is somehow followed in the case of Tonga. The share of starchy staples, which includes rice and tubers, decreases smoothly from 14% for the poorest consumption decile to 10% for the wealthiest decile (Figure 19). However, the share of vegetables and fruit which are expected to increase do also decrease as households get wealthier and those of meats are stable. Finally, the decrease in the shares of starchy staples, vegetables and fruits is compensated by an important increase of take away food from around 1% for the poorest decile to 6% for the wealthiest decile, and in some level the increase in beverages, snacks and condiments.

Figure 19. Food budget share by consumption decile per Adult Equivalent
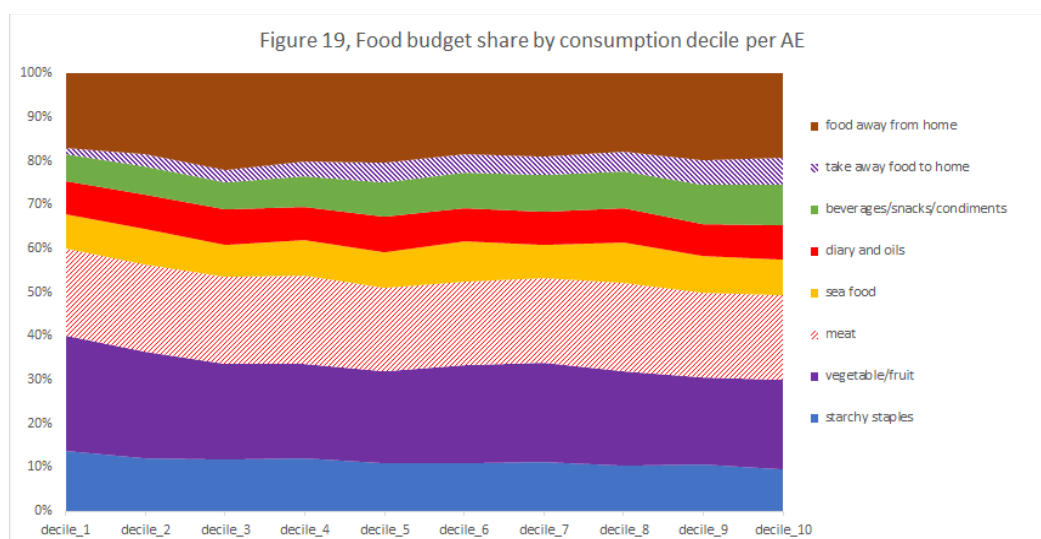
4. Income sources and remittances

4.1. Income source

In Tonga, around 60% of household income come from work, meaning cash from employer or business (33.8%), sale from rural activities such as agriculture, fishing, livestock, handicraft (22.1%) and subsistence from the latter activities (4.8%). Interpersonal solidarities (gifts and remittances) represent important source of income (30%) as the shares of cash gifts received or remittances and gifts in kind are respectively 15.3% and 14.5%.

Income sources vary considerably across localities. Income from employment comprises a much higher share of income in Tongatapu (42.9% and 34.4% respectively in urban and rural areas) while it varies from 24% to 28% in outer islands (Figure 20). For the latter, income comes mainly from rural activities (agriculture, fishing, livestock and handicraft) which provide with cash money as well as means of subsistence. Cumulatively, cash and subsistence from these activities account for 38% to 45% of income in outer islands.

There are also notable differences in the share of income from interpersonal solidarities. In Ongo Niua, remittances account for 5.7% while they exceed 13% in Tongatapu and Vava'u. Despite a small share of remittances, Ongo Niua exhibits the highest share of gifts in kind (22.6%), far before the other localities where the share ranges from 13% to 17.6%.

Figure 20. Share of income source, by locality

Figure 20. Share of income source, by locality
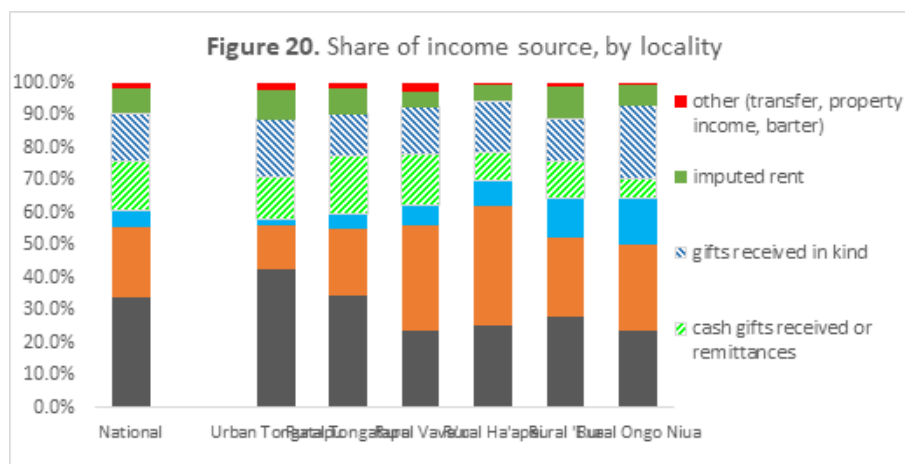
Income sources change somewhat as households move higher up the consumption distribution. Households in the poorest consumption deciles generate 60% to 70% of their income from work activities including cash and subsistence while interpersonal solidarity accounts for around 20% of income and the imputed rent for 7% (Figure 21). It is worth noting that the share of the imputed rent is stable across deciles. For the wealthiest deciles work activities remain the main source of income, but with a lower share of around 50% of the income while interpersonal solidarities provide with 30% to 40% of income. Across deciles, income from interpersonal solidarity is equally distributed between gifts received in kind and cash gifts received or remittances.

Figure 21. Income breakdown by consumption per AE

Figure 21. Income breakdown by consumption per AE
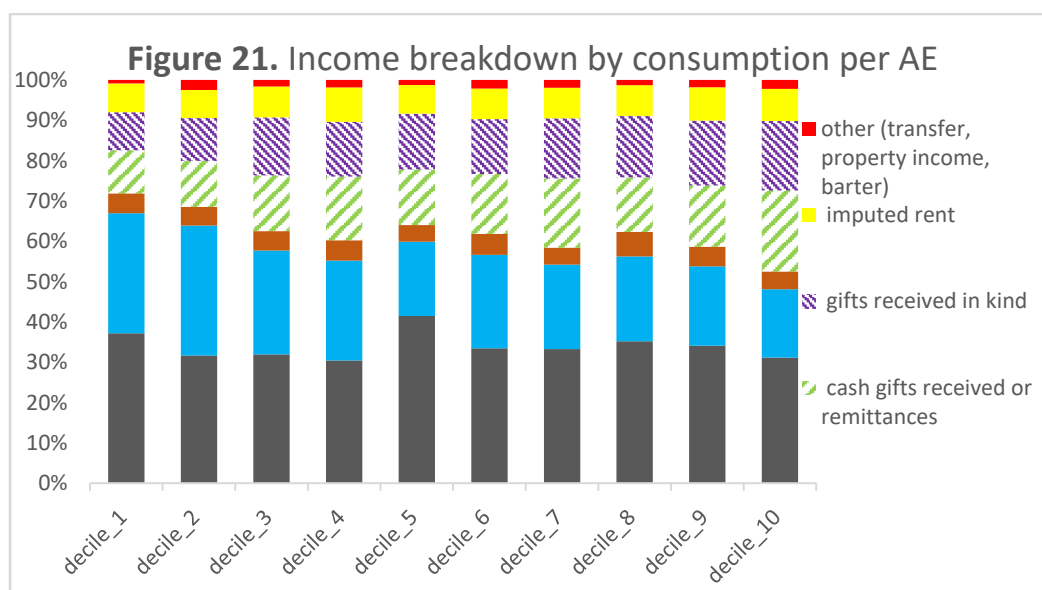
4.2. Remittances

Remittances are a widespread source of income for households in Tonga, with about 90% of households receiving remittances. There are differences among localities, but the proportion of households receiving remittances remains high across all regions. The rates vary from 63% in Ongo Niua to 94% in Vava'u. There are also differences in the amount of remittances across locations (Figure 22). One out of two households receives more than TOP 7,000 in Vava'u while this amount is only TOP 1800 in Ongo Niua. With the exception of Vava'u, the median amount of remittances is higher in Tongatapu than it is in outer islands.

Figure 22. Households remittances and median annual

Figure 22. Households remittances and median annual
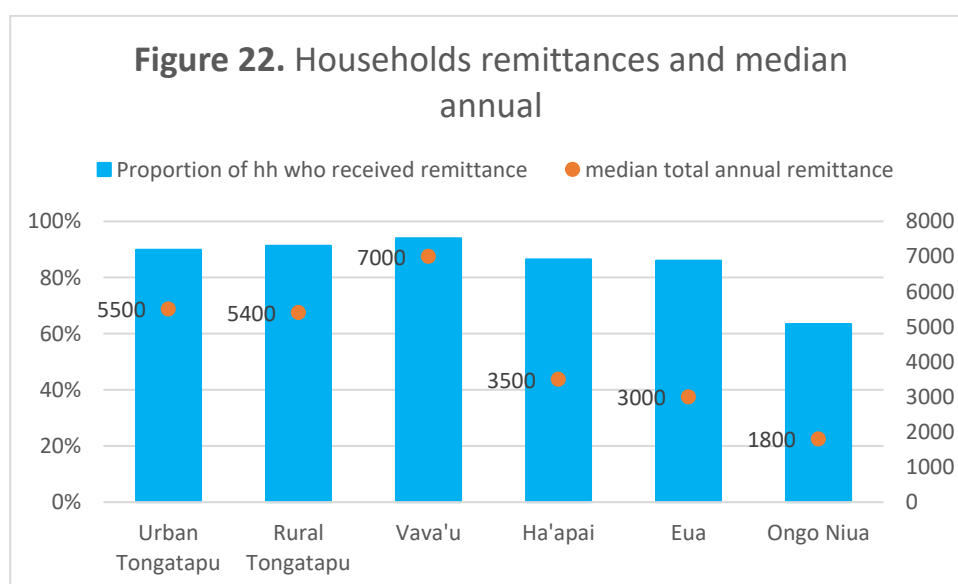
5. Typologies of the poor

Based on the previous analysis, three distinct groups of the poor emerge in Tonga. The first group, making up 14% of the poor, are in urban Tongatapu. Access to some basic services is common among this group: connection to electrical grid (89.9%) and possession of flush toilet (75.1%) (Table 15). However, access to improved sources of drinking water (pipe/tap, bottled water) is very limited as they are the main source of water for only 8.3% of the households. Around half of heads of poor households work as employees and one in ten completed secondary school. On average, there are three

working aged adults earning an income in the household. Almost half of household income is from employment and only one-fifth is from selling farming or handicraft products. Remittances account for only 8% of income. Across all of these measures, poor households in urban Tongatapu have good access to services, higher levels of human capital, and greater opportunities for formal employment than elsewhere in Tonga. As such it is unsurprising that the depth of poverty in urban Tongatapu (measured in terms of the poverty gap) is substantially lower than in other regions.

Table 15. **Characteristics of poor households**

poor_RAV_ub_ade	Poor	Poor	Poor	Poor
Poor	Urban Tongatapu	Rural Tongatapu	Rural Outer Island	National
Electricity grid connection	89.9%	91.7%	73.4%	84.7%
Has flush toilet	75.3%	82.1%	65.3%	75.1%
improved drinking water source (pipe/tap, bottle)	8.3%	4.8%	2.7%	4.4%
head of household completed secondary school	10.1%	4.8%	4.3%	5.3%
head of household works as employee	45.3%	27.4%	25.9%	29.0%
Average number of household members earning income	3.0	2.3	2.1	2.3
Share of income from employer or business	47.8%	36.3%	25.9%	34.2%
Share of income from cash sale of agriculture, fishing, livestock, handicraft	20.4%	29.0%	38.0%	31.0%
Share of income from gifts received or remittances	8.5%	12.4%	10.2%	11.1%

The second group, making up around 52% of the poor, live in rural Tongatapu. Only one in four household heads work as an employee in rural Tongatapu, almost all household heads did not complete secondary school. On average, there are 2.3 working-aged-adults earning an income in the household. Around 36% of the income are from

employment, 30% from the sales of agricultural, fishing, livestock and handicraft products. Poor households in this region do have better access to electrical grid and a flush toilet, but less than 5% of the households do have access to improved sources of drinking water (Table 15).

The third group, making up around 33% of the poor, live in rural outer islands which only account for 26% of total population. They seem to be the most deprived. Only one in four household heads work as an employee, almost all heads of household did not complete secondary school. On average, there are 2.1 working aged adults earning an income in the household. Only a quarter of income are from employment while 38% are from the sales of agricultural, fishing, livestock and handicraft products. Poor households in this region have the lowest access to grid electricity and a flush toilet, but almost all households do not have access to improved sources of drinking water (Table 15).

Beyond differences in locations, the three groups of poor exhibit differences in their income sources, share the high restricted access to improved drinking water and poor education of household heads. Therefore, policies should be tailored for each group in order to impact its income sources while a national strategy is needed to address issues 1) of drinking water via development of infrastructures and 2) of education by ensuring that poorer school aged children complete secondary school, which would significantly improve human capital.

In urban Tongatapu, the high proportion of employees among heads of households and the high number of adults earning income reflect a phenomenon of poor workers. That may reveal that 1) employers in a scarce employment market pay low salaries as employees do not have other opportunities, or 2) private business is not making enough profit to offer better pay to employees. The government should assess the factors of poor paid employs and adopt a salary policy accordingly, which could be either incitation to employers to pay better salaries or a support to improve the productivity of private sector, etc.

In the rural outer islands, poor households generate their income mainly from sales of agricultures, fishing, livestock and handicraft products. These products may not provide with them enough financial resources due to low productivity or to difficulties to access the main local market in Tongatapu or abroad market. An assessment of these

constraints would guide the government in defining policies for poor households in outer islands. This should target either transportation prices and conditions or training of rural people in a more productive practices in agriculture and other rural activities.

Rural Tongatapu, which is the location to one poor out of two, exhibits characteristics that are found for poor in urban Tongatapu as well as in outer islands. Household income is the mix of employer and business sources and of sales of agriculture and fishing products. A mix of policies adopted for the two other groups would be recommended for rural Tongatapu, with appropriated adaptations.

6. Annexes

6.1. Methodology note

6.1.1. Introduction

The analytical methods applied to the Tonga 2021 Household Income and Expenditure Survey (HIES) data are in line with the latest international and regional guidance from the Pacific Statistics Methods Board (PSMB), on construction of a consumption aggregate and poverty measurement. This methodology note details the key analytical choices made by Tonga Statistics Department (TSD) and the Pacific Community (SPC) that impact poverty measurement. In practice the food consumption aggregate is calculated using the large set of data collected at household level for the last seven days consumption. In few cases expenditures on food items are used as the calculation of the food consumption aggregate. As it is difficult to collect data on the consumption of non food goods and services, expenditures are collected in the HIES and used to approximate the non food consumption aggregate.

6.1.2. Background to monetary poverty measurement

Measuring poverty in monetary terms is best achieved with detailed household level consumption data, typically from a HIES or similar survey. The estimation of poverty requires three major steps:

1) Constructing a single dimensional, measurable welfare indicator that can be used to rank the population according to well-being (the "welfare aggregate"). Each household has its own consumption aggregate that is constructed based on a

range of food and non-food items consumed. It is typical to exclude some categories of consumption for which there is data, such as lumpy/once-off expenditures (e.g., purchase of expensive durables). In contrast, some consumption such as accommodation (e.g., imputed rent), may not be directly measurable but must be accounted for. The consumption distribution graphs the consumption aggregates of all households.

2) Constructing an appropriate threshold of welfare that can be used to classify individuals as poor or non-poor (the "poverty line").

    a. A food poverty line needs to be selected based on a local food basket (identified using the consumption patterns of a reference group of the population) and a minimum caloric intake for the country. There may be only one food basket and poverty line for a country (national poverty line), or there may be subnational poverty lines (e.g., for areas such as provinces).

    b. A non-food component needs to be constructed to calculate a basic needs poverty line (which includes both food and non-food consumption). The basic needs line (or national monetary poverty line) would be inclusive of and always higher than the food poverty line. This poverty line should be contextually appropriate and allows policymakers to understand relative poverty within the country. In contrast, while the international poverty line allows countries to understand their relative level of poverty compared to the rest of the world, it is not based on local patterns of consumption or local needs.

3) Combining the welfare indicator with the poverty line to describe the poverty status of the population (the "poverty rate"). The poverty line crosses the consumption distribution and all those living below the poverty line are considered poor. The poverty rate is always relative to the line used, with the national poverty line often being different to the international poverty line.

6.1.3. Sample used for poverty measurement

Consumption data was collected for the majority of the HIES sample with recall-based consumption questions (2,130 households), while a diary-based consumption module was used for a small part of the sample. The official poverty is measured based on only the first group of the sample households.

6.1.4. Consumption aggregates

Consumption aggregate construction for the 2021 HIES was based on the latest recommendations of the PSMB. This section outlines 1) the construction of the food consumption component of the aggregate, 2) the non-food component, and 3) spatial deflation applied for the purpose of poverty measurement.

Figure A23. Components of consumption by decile
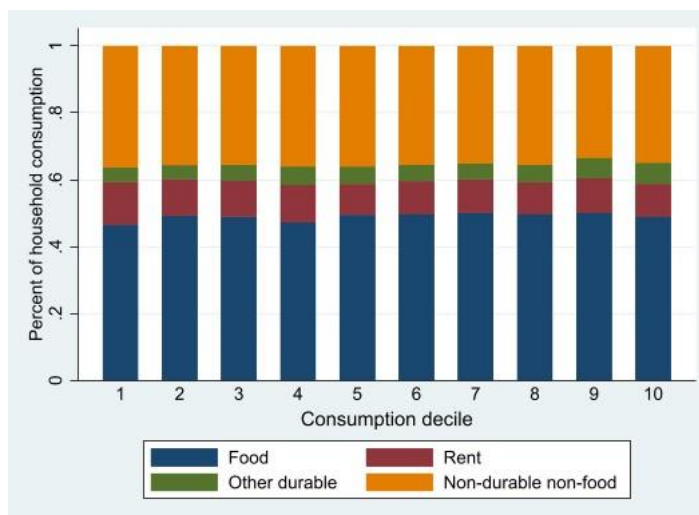
6.1.4.1. Food consumption

The HIES survey collects information on food consumed in-house as well as food away from house (FAFH). The total monetary value of food consumption was not directly recorded in the survey, only the total quantity consumed over the last 7 days for each food type was collected as well as some details on the sources of the corresponding consumption: cash purchase (quantity and spending), home produced (quantity and estimated cost), exchange of items (quantity and estimated cost) and received as gifts (quantity and estimated cost). The monetary value of food consumption was obtained by summing the reported values from different sources. When a reported value was not consistent a new value was estimated by first converting reported quantities into standard units, and then multiplying these by a price estimated from the survey or derived from market survey depending on availability and consistency. Only food consumed by the household was included, whether purchased in cash transactions, home-produced, exchanged, or received as a gift. The consumption aggregate does not

include food purchased or produced by the household but given away as a gift to another household, in order to prevent double counting of expenditures between households.

6.1.4.2. Non-food consumption

a. Non-durables

Like food consumption, the consumption of non-food non-durable items was calculated as the annualized value of reported transactions for individual and household expenditures in the questionnaire, with varying time periods reported for different types of consumption. For example, health expenses were asked to be recalled for the past 12 months, while expenses on clothing for each household member were asked to be recalled for the past 3 months. Following the PSMB guideline, non-food gifts and transfers to other households, as well as churches, are not included in consumption aggregates to avoid double counting.

b. Durables

Durables are defined as items that are infrequently purchased by the household and have a lifetime that spans multiple years, such as motor vehicles or major household appliances (e.g., televisions, computers, and refrigerators). The PSMB guidance recommends the calculation of "annualized use values" for durable items owned by the households, regardless of whether the items were purchased in the past year. In order to obtain the use value of each individual durable, an estimated current value of the durable needs to be multiplied by an estimated depreciation rate applicable to that type of durable.

c. Semi-durables

Semi-durables are sub-category of durable items that have utility for multiple years, but not as long as durables. Semi-durables tend to be purchased more frequently and are not as expensive as durables. There is no strict guidance on semi-durables in the PSMB recommendations. TSD and SPC opted to include semi-durables in the consumption aggregate for Tonga. The exception being semi-durables such as fishing nets which were counted as intermediate expenditure.

d. Imputed rent

The "imputed rent" component of the consumption aggregates was computed for owner-occupied and occupied for free housing using a predictive "hedonic" model. This is based on a range of variables including tenure, physical dwelling characteristics (number of rooms, building materials for walls, floor, roofing, water connection, flush toilet, electricity grid connection, fuel for cooking and fuel for lighting) and location characteristics (island, urban/rural). The model was based on rental expectations from the non-renting households in the sample. The main reason is that only 61 households were renting (3% of the sample, mainly in the urban area), what is too small for an imputation model in isolation. An OLS model with a dependent variable of actual rents and rental expectations, controls for household characteristics, and a dummy variable for renter/non-renter status showed that the latter is highly statistically significant meaning that actual rents and rental expectations should not be combined.

The final predictive model was a generalized linear model (GLM) which is a flexible generalization of ordinary least regression that allows for response variables that have other than a normal distribution. The final model used rental expectations data adjusted for outliers (the outlier correction involved replacing observations that were 3 standard deviations away from the mean by strata, with the median by strata). While there is no R-squared for the GLM model, the OLS equivalent of that model using the same variables has an adjusted R-squared score of 0.48. That means close to half of the variation in rental expectations can be explained by the dwelling characteristics variables included in the model. That is not high but not far off imputed rent models used in other countries. For consistency across renter and non-renter households, the imputed rent from the model was used for all households, and actual rents were not used in the consumption aggregate.

Deductions were made from the imputed rent for maintenance costs (outlier corrected for 2 standard deviations). Renovations and expansion of the dwelling were categories under "maintenance costs" in the survey but could be more accurately described as lumpy expenditure for long term investment in dwelling structures, and so are best excluded from the net rent calculation, as well as being excluded from the consumption aggregate.

Table A16. **Net imputed rent by island**

	N	Mean	S.D.	Min.	Max
Tongatapu	1,092	5,106	2,031	947	18,357
Vava'u	384	3,298	1,294	693	7,734
Ha'apai	296	3,268	1,904	661	11,385
'Eua	244	3,463	1,347	744	8,152
Ongo Niua	114	2,191	1,307	751	5,065
Tonga	2,130	4,633	2,066	661	18,357

6.1.4.3. Spatial and temporal deflation

In order to account for regional and seasonal differences in costs of living and enable direct comparisons of household welfare across regions, a "deflator" was applied to the nominal consumption aggregate. The spatial-temporal deflator is calculated by comparing regional and seasonal differences in the prices of food goods (assuming that these differences are consistent between food and non-food goods), weighted by the importance of those goods to the consumption basket of the reference group. The spatial disaggregation used was based on island groups (Tongatapu, Vava'u, Ha'apai, 'Eua, and Ongo Niua) and dividing Tongatapu into two different groups (urban and rural). Temporal deflation was based on the survey year semesters in 2021.

The reference population used for the consumption basket is individuals in the 11th to 35th percentiles of consumption per capita, In order to capture the "real" reference population rather than the nominal one, the deflators were estimated using an iterative approach, where households are re-ranked after deflators are applied, and the deflation is repeated (on the nominal aggregate) using the consumption shares of the "new" 11th to 35th percentile. This iterative process is repeated until the households in the reference population stabilize. In the case of Tonga only two iterations were required to stabilize the reference population. Tornqvist deflators were used in order to better account for outlier prices and consumption shares. The spatially deflated aggregates are rescaled in order to keep the same values for national averages and totals.

Table A17. **Deflators of food consumption prices by location and semester**

Province and urban rural status	Survey period (semesters of 2021)	Laspeyres	Paasche	Fisher	Tornqvist
Urban Tongatapu	1	1.181	0.995	1.080	1.069
Urban Tongatapu	2	0.967	1.068	0.988	1.087
Rural Tongatapu	1	1.036	0.998	1.004	0.989
Rural Tongatapu	2	0.836	0.947	0.899	0.947
Rural Vava'u	1	1.153	1.103	1.131	1.034
Rural Vava'u	2	1.054	1.109	1.101	1.024
Rural Ha'apai	1	0.952	0.914	0.918	0.895
Rural Ha'apai	2	0.986	0.988	0.990	0.944
Rural 'Eua	1	0.850	0.888	0.875	0.885
Rural 'Eua	2	0.689	0.943	0.833	0.958
Rural Ongo Niua	1	0.470	0.958	0.772	0.940
Rural Ongo Niua	2	0.577	1.222	0.934	1.042

6.1.5. Poverty line methodology

A new Basic Needs Poverty line (BNPL) was constructed for the 2021 HIES data. This new BNPL will be used for future rounds of poverty analysis, with the application of appropriate inflation adjustments. This section outlines 1) the use of adult equivalency scales, 2) issues with the construction of food poverty line, 3) issues in non-food poverty line selection and 4) sensitivity analysis.

6.1.5.1. Adult equivalency scales

In order to compare welfare measures, which are often recorded at the household level, it is necessary to account for differences in household composition. Two alternative ways to do this are: 1) per capita measures, which divide the household-level welfare aggregate by the number of household members, and 2) adult equivalent measures, which assign different weights to the household members depending on their age or sex. In the Pacific, countries that apply adult equivalent measures typically utilize a simple

scale, where household members aged 0-14 (children) are given a weight of 0.5, with all the other household members given a weight of 1, with no differentiation by sex.

6.1.5.2. Issues in food poverty line construction

A single national food poverty line is constructed by computing the amount of monetary expenditure required to consume a daily calorie target using the real consumption patterns of a reference population. An expanded basket of 60 goods was used which covers 90 percent of food expenditure. The calorie target was set at 2,100 calories per adult per day. This is in line with the recommendation of the PSMB, as well as solid evidence on the level of activity of the poor and vulnerable, 2,100 calories per day can be considered the default. The cost per calorie of food items was computed using nutritional values from the Pacific Nutrient Database (PNDB) for each food item calculated based on the price/unit value assumed in the consumption aggregate.10 In order to make the food line consistent with the use of adult equivalency scale for welfare aggregate calculation the threshold for required calorie was rescaled from 2,100 to 2,593 calories using a multiplier coefficient equal to average(hhsize)/average(AE).

The reference population chosen is households in the 11th to 35th percentile based on real (deflated) per adult equivalent consumption.

6.1.5.3. Issues in non-food poverty line construction

The non-food poverty line is computed as a multiplier of the food poverty line. For comparison both a regression method and the non-parametric Ravallion lower-bound and Ravallion upper-bound lines were used to calculate the multiplier based on the food vs non-food consumption patterns of the population as they move up and down from the food poverty line. Unlike other Pacific countries, the Ravallion upper-bound method was chosen for Tonga, as the Ravallion lower-bound poverty line could not be computed as few households in the reference group having total consumption per adult equivalent near the food poverty line.

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[10] https://sdd.spc.int/digital_library/pacific-nutrient-database-pndb

6.1.5.4. Sensitivity analysis: comparing reference populations and BNPLs

For sensitivity analysis, several reference populations were checked with each of the two non-food poverty line methods (regression and Ravallion upper bound). Table A18 reports the poverty lines by method and reference population, followed by Table A19 which reports the poverty rates with each combination of reference population and NFPL (Non Food Poverty Line) method.

Table A18. **Food poverty line and Basic Needs poverty lines by ref. population and method**

ref_hh_basket	Food poverty line	Regression	Ravallion Upper bound
percentile 06-30	2825	5015	6060
percentile 06-35	2848	4914	6140
percentile 06-40	2905	4707	6226
percentile 11-30	2891	4384	6186
percentile 11-35	2881	4743	6256
percentile 11-40	2950	4286	6474

Table A19. **Food poverty rate and Basic Needs poverty rates by ref. population and method**

ref_hh_basket	Food poor	Regression	Ravallion Upper bound
percentile 06-30	0.95%	9.0%	18.9%
percentile 06-35	1.03%	7.7%	19.5%
percentile 06-40	1.03%	5.8%	20.4%
percentile 11-30	1.03%	4.5%	20.0%
percentile 11-35	1.03%	6.1%	20.7%
percentile 11-40	1.12%	4.3%	22.9%

6.1.6. Estimation of the correlates of consumption and poverty

Descriptive statistics show that people with some characteristics were more frequently poor. Some of these characteristics are correlated such as education and locality. For example, educated people and those living in urban area exhibit low proportion of poor while urban inhabitant is more educated. An econometric regression model (logistic model) was used to identify the specific relationship of each household characteristic with poverty. All other things equal the risk of being poor decreases as education level of household members increase (table A20). The urban/rural gap is confirmed: people living in urban Tongatapu are less likely to be poor that those living in rural Tongatapu and in any other rural area located in outer islands. Correlatively to their higher poverty rate, Eua and Ongo Niua are the two region where people are more likely to be poor, all other things equal. The risk of being poor increases with the household size. The household structure like gender of household head, proportion of members by age groups and proportion of males, does not have significant impact on the risk of being poor.

Using the same characteristics a generalized linear regression model was applied on the consumption per adult equivalent. For most of the household characteristics results are consistent with those of the logistic model applied on poverty. Consumption increases as household members are educated, is higher in rural Tongatapu than outer islands, except Ha'apai where the risk of poverty is also comparable to those of rural Tongatapu. It is worth noting that living in urban Tongatapu does not have significant impact on the consumption.

Table A20. **Regressions to estimate the correlates of consumption per adult equivalent and poverty**

	Model 1 (log of Consumption per adult equivalent)	Model 2 (Poor)
Vava'u	-0.107 ***	0.51 ***
Rural Ha'apai	-0.04 ns	0.232 ns
Rural 'Eua	-0.216 ***	0.895 ***
Rural Ongo Niua	-0.243 ***	1.402 ***
Urban Tongatapu	0.013 ns	-0.444 **
Rural Tongatapu		
household size	-0.091 ***	0.338 ***
head of household male	-0.012 ns	-0.038 ns
head of household female		
proportion of adults 15-30 years old	-0.176 ***	0.54 ns
proportion of adults 30-64 years old	0,013 ns	-0.05 ns
proportion of adults 65 years old /more	0.019 ns	0.144 ns
proportion of males in the household	0.117 ***	0.253 ns
number of household members working in family business	0.159 ***	-0.858 ***
number of household members working as employee	0.065 ***	-0.219 *
number of household members working as apprentice or other	-0.058 ***	0.098 ns
number of household members working in own business	0.025 ns	-0.062 ns
number of household members earning an income	-0.027 *	0.027 ns
maximum education - university and tertiary	0.327 ***	-1.645 ***
maximum education - technical and vocational	0.247 ***	-0.949 ***
maximum education - high secondary school (form 5 and 6)	0.127 ***	-0.759 ***
maximum education - primary and low secondary		
Constant	9.511 ***	-2.947 ***
Number of observations		2,130

Note: ***=significative at 1%, **=significative at 5%, ***=significative at 10%, ns=not significative