Food and Agriculture Organization of the United Nations

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FOOD CONSUMPTION IN THE MARSHALL ISLANDS

BASED ON ANALYSIS OF THE 2019/20 HOUSEHOLD INCOME AND EXPENDITURE SURVEY

EPPSO
Economic Policy, Planning and Statistics Office

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Nathalie Troubat
Food and Agriculture Organization of the United Nations
and
Michael K. Sharp
Pacific Community

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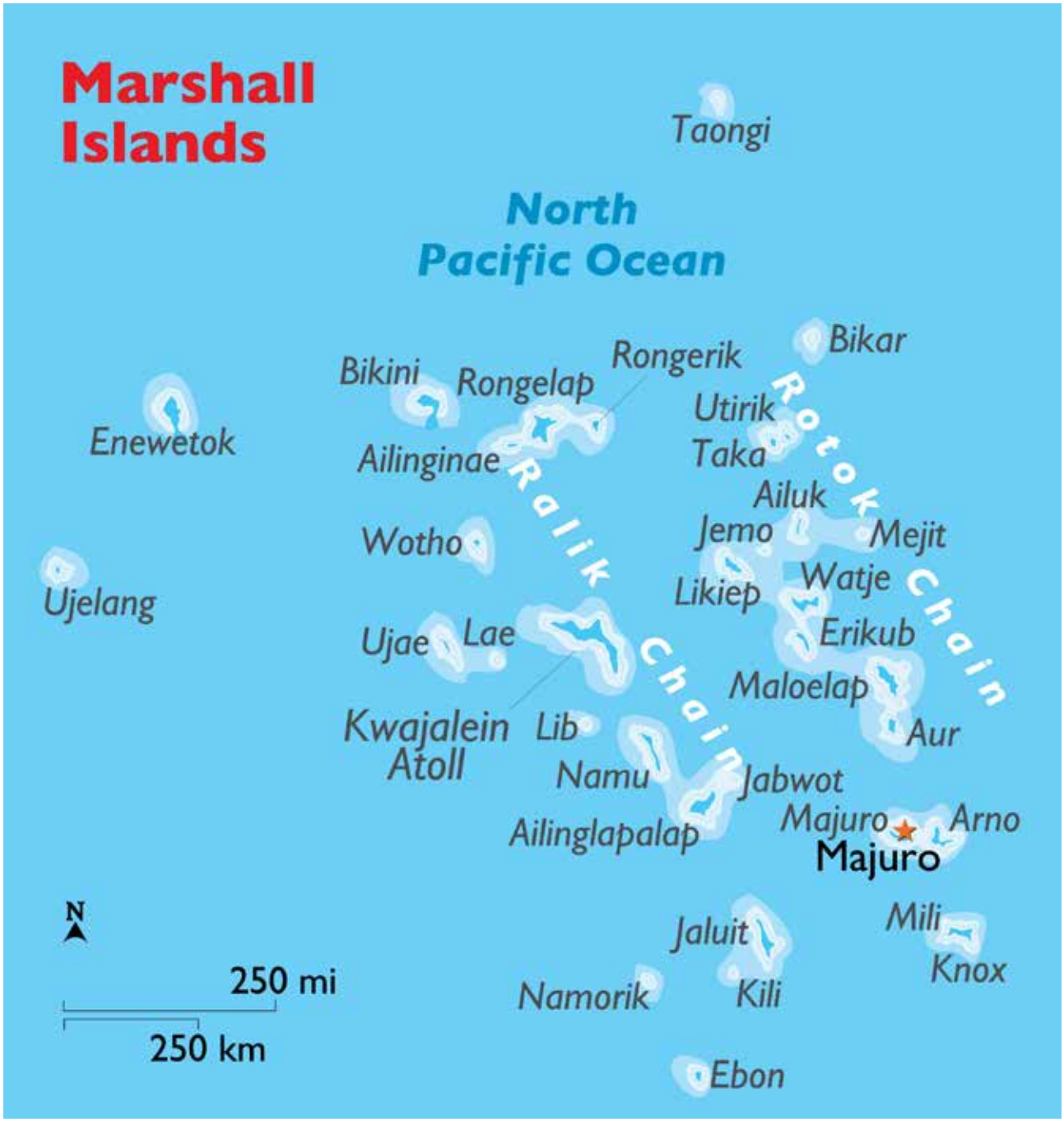
Abbreviations and acronyms

CV	coefficient of variation
DEC	dietary energy consumption
DES	Dietary Energy Supply
EPPSO	Economic Policy, Planning and Statistics Office of the Republic of the Marshall Islands
FAO	Food and Agriculture Organization of the United Nations
FAFH	food away from home
FBS	food balance sheet
FIES	Food Insecurity Experience Scale
GIFT	Global Individual Food consumption data Tool
HIES	Household Income and Expenditure Survey
MDER	minimum dietary energy requirement
NCD	non-communicable disease
PICTs	Pacific Island countries and territories
PoU	prevalence of undernourishment
SDG	Sustainable Development Goal
SPC	The Pacific Community
UNU	United Nations University
USD	US dollar
WB	The World Bank
WHO	World Health Organization

SUMMARY



SOURCE: https://www.worldatlas.com/maps/marshall-islands. Complies with UN. 2020. Map of the World [online]. un.org/geospatial/content/map-world.

The Marshall Islands is a small country in the Pacific composed of many atolls and islets. Contamination of the soil due to salination or as consequence of the US nuclear tests in the 1950s, water scarcity, limited infrastructure and difficulties in commuting from one islet/island to the other, and, among other factors, high population density are putting pressure on the agriculture sector and its capacity to ensure food for all. A high proportion of the food consumed is imported, with more and more consumers shifting from locally grown foods to ultra-processed imported foods rich in fats and sugars.

As a result, the Marshall Islands has shown limited progress towards achieving the diet-related non-communicable disease (NCD) targets.[1] With around one in two adults obese, the Marshall Islands ranks fourth in the world by prevalence of obesity.[2] Diabetes affects around one adult in five and more than one woman of reproductive age in four is affected by anaemia.[I] Access to safe and nutritious foods therefore remains a serious challenge for the Marshallese. The analysis of the food insecurity experience scale data collected in the 2019/20 Household Income and Expenditure Survey (HIES) of the Marshall Islands reveals that more than one household in three is experiencing moderate or severe levels of food insecurity, which means they are lacking money or other resources to access foods in enough quantity or of good quality. The further analysis of the food data collected in the same survey finds that for around 5 percent of Marshallese, their dietary intake is lower than their basic dietary needs to maintain a normal active and healthy life.

These results are reflected in the high level of dietary energy consumption (DEC) of 2 860 kcal/capita/day, evidencing a double burden of malnutrition with, on one hand, obesity through excess calorie consumption and, on the other hand, undernourishment through lack of access to enough calories. Income is the main factor of inequality in access to food, with the wealthiest households[II] consuming around twice as many calories as the least wealthy households.[III] But other characteristics such as the size of the household, the level of education of the head of the household, the severity of food insecurity, involvement or not of the household in fishing activities or whether the household receives remittances or not are also other important factors affecting access to dietary energy.

A Marshallese spends on average USD 5.2 daily on food, which represents around 45 percent of the overall budget. Even if food expenditures weigh more on the budget of the least wealthy households than on that of the wealthiest, food remains the major component of the overall budget of the Marshallese irrespective of their wealth status. Around two calories in three come from cash purchased food, and own production contributes only 9 percent. Foods received as gift are an important source of dietary energy, bringing on average around 250 kcal consumed per day per capita. But more than 400 kcal alone consumed on average per day per capita come from meals consumed away from home, mainly in the form of lunches.

To get 1 000 kcal, a Marshallese spends on average USD 2.0, but not all Marshallese enjoy the same quality of foods, and sources of energy differ among population groups. In fact, the least wealthy households spend on average USD 1.1 less to get 1 000 kcal than the wealthiest households, which points towards lower-wealth households having access to more affordable sources of energy. This trend can also be observed among households involved in fishing, livestock, handicraft or copra activities and among households experiencing moderate or severe levels of food insecurity, both of which spend on average 40 cents less to acquire 1 000 kcal than food secure households or households not involved in these activities. These households have access to more energy dense, but less nutritious or diversified foods.

The high level of dietary energy consumed on average by a Marshallese is the result of the high contribution of fats in the total diet, with 23 percent of dietary energy consumed coming from fats, which is more than 650 kcal per capita per day. The diet is also rich in proteins, contributing 16 percent of the average dietary energy consumed; 43 percent of these proteins are of animal origin. Therefore, the diet is rich in fats and animal proteins.

More than 40 percent of dietary energy comes from cereals, mainly in the form of rice, with an average consumption of 220 g/capita/day, followed by meat that contributes 9 percent of the dietary energy consumed (mainly through the consumption of around 80 g/capita/day of chicken). Fish contributes 8 percent of dietary energy consumed, with an average consumption of 180 g/capita/day of fish and fish products.

With an average daily consumption of around 150 grams per capita, fruit and vegetable consumption is very low in the Marshall Islands, and well below the World Health Organization (WHO) recommended

[I] See Global Nutrition Report portal: https://globalnutritionreport.org/resources/nutrition-profiles/oceania/micronesia/marshall-islands/

[II] Households belonging to the last tercile of total household expenditure per capita

[III] Households belonging to the first tercile of total household expenditure per capita

level of 400 grams of fruit and vegetables per capita per day for a healthy diet. Locally grown fruits like pandanus, breadfruit and banana contribute only 3 percent of the dietary energy consumed, with respective edible quantities consumed of around 40, 30 and 20 g/capita/day. Of interest is the important consumption of bottled water, which, after rice, is the second most consumed product in terms of quantity, even if water does not bring energy.

The further breakdown of the diet in terms of healthy eating patterns, shows that energy-dense foods (like cereals, tubers, roots, sugar, oil and fats), protective foods (like fruit and vegetables) and body building foods (like protein rich foods such as meat, fish and dairy products) contribute respectively 60 percent, 3 percent and 18 percent to the average dietary energy consumed. But not all energy-dense or body building foods are healthy and when these foods are further categorized in terms of food to choose, to limit or avoid, it can be found that more than 60 percent of dietary energy comes from foods to limit or avoid such as white rice, sugar, canned meat, powdered drinking juice, sugar and tomato sauce, and only 20 percent from foods to choose such as locally grown starchy foods, low-fat meat and fish, low-fat dairy products and fruit and vegetables.

The low consumption of protective foods or dairy products translates into very low adequacy of vitamins A, B1, B2 and C. Conversely, the high consumption of fish translates into high adequacy in vitamin B12 at the national level. The relatively low consumption of dairy products and calcium rich foods translates into calcium inadequacy for all population groups.

In terms of which foods are most accessible, 97 percent of households consume rice. With an average consumption of 8 g/capita/day and 10 g/capita/day, salt and soy sauce are accessed by more than 75 percent of households, bringing the overall sodium consumption well above the WHO recommended limit of no more than 5 grams of salt per person per day. Such a high level of salt consumption further puts the population at risk of heart disease. Chicken is consumed by two households in three, while reef fish, the most consumed fish product, is consumed by less than 50 percent of the households. Even if the average quantity consumed is marginal, eggs are consumed by more than one household in two. Finally, more than 40 percent of Marshallese consume tobacco, with an average quantity of one gram per day (one cigarette). Even if these products are not considered foods, their consumption represents an additional health threat.

Food insecure households consume, on average, more than 450 kcal/capita/day less than food secure households. The probability of being food insecure is higher for households living in urban areas, with low income, with a head who is less than 39 years old or is not married, or for households selling copra or involved in fishing or livestock activities. Receiving remittances or being involved in handicraft activities tend to reduce the probability for a household to be food insecure. Food insecure households spend on average 30 cents less to get 1 000 kcal than food secure households, and more than 26 products are consumed on average by food secure households compared to 20 products consumed by food insecure households.

Except for fish and tobacco, the overall quantities of food products consumed by food insecure households are lower than those consumed by food secure households. Adequacy in vitamins A, B1, B2, B12 and C is reached for food secure households while it is reached only for vitamins B12 and C for food insecure households. Consistent with the national trend, adequacy in calcium is not reached for food secure or food insecure households.

Finally, it is interesting to note the difference in food consumption patterns between the two main urban areas of Marshall Islands, Majuro and Kwajalein (Ebeye). While people living in Majuro consume on average 3 000 kcal/capita/day, people in Kwajalein consume on average 500 kcal/capita/day less. This difference in access to dietary energy can be explained by a combination of slight underreporting of quantities, higher cost of dietary energy, larger household size, and a higher proportion of the number of children less than 14 years old in Kwajalein compared to Majuro.

Note from the authors: Even if the results from the survey are consistent with the overall food security status of the country, they need to be treated and interpreted with caution. The survey was not designed to conduct an in-depth analysis of food consumption and dietary patterns. The food data presented some imperfections, such that levels or indicators need to be interpreted as reflecting survey trends rather than recorded facts. It is only through anthropometric data and individual food consumption surveys that the nutritional status of individuals can be properly informed.

INTRODUCTION

The Republic of the Marshall Islands (referred to as the Marshall Islands hereafter) is a country located in the sub-region of Micronesia in the Pacific. It is composed of five islands and many islets organized around 29 atolls (of which only 19 are inhabited). The Marshall Islands is home to around 58 413 people.[I] The capital city of the Marshall Islands, Majuro, is located on the island of Majuro. Majuro and Ebeye islands are the two urban centres, concentrating more than 70 percent of the population. Ebeye Island in the atoll of Kwajalein is the most densely populated area in Marshall Islands, with an equivalent population density of 41 667 inhabitants per square kilometre. The population in the Marshall Islands is young, with a median age of 23.8 years.[II, 3]

The Marshall Islands is considered an upper middle-income country[4] and it is usually compared with Samoa and Philippines in terms of the Human Development Index, ranking 117th out of 189 countries and territories.[5] United States government assistance is the main support of the economy to compensate for the use of some of the atolls to conduct nuclear tests in the late 1940s and 50s. Despite the financial assistance from the US, 30 percent of the population in the island's two cities are living below the basic-needs poverty line[6] as a consequence of the scarce natural resources, high unemployment rates and wealth inequality.

In addition to its people experiencing poverty, the Marshall Islands is vulnerable to recurrent drought, sea-level rise, flooding, and the associated intrusion of saltwater into crucial freshwater supplies. These environmental constraints affect agricultural production, which is generally on a small scale. Agricultural products include coconuts, tomatoes, melons, taro, breadfruit, fruits, pigs and chickens. Industry is based on the production of copra and craft items, tuna processing and tourism. The most important commercial crop is copra, followed by coconut, breadfruit, pandanus, banana, taro and arrowroot. Livestock production consists primarily of pigs and chickens. Small-scale industry is limited to handicrafts, fish processing, and copra. Majuro is the world's busiest tuna trans-shipment port in the world.[7]

The lack of water, rising sea levels and the inability to produce food from four atolls contaminated with radioactive material has led to the importation of most of the food consumed in Marshall Islands, mostly in the form of ultra-processed foods that are rich in fats and sugar, making many Marshallese dependent on unhealthy food. Unhealthy diet, lack of exercise and consumption of tobacco (22.8 percent of adults older than 15 years of age were using tobacco daily in 2015)[8] are leading to major health problems such as diabetes and other forms of NCD associated with the high prevalence of obesity (53 percent of adults are obese). In addition to NCDs, child malnutrition is also a source of concern in the Marshall Islands with 11.5 percent of children less than 5 years old being underweight and 35.3 percent suffering from stunting.[9] All these indicators tend to indicate lack of access to foods in enough quantity and quality for most of the Marshallese. If this trend persists, Target 1 of Sustainable Development Goal (SDG) 2 aiming to end hunger and ensure sustainable access by all people to safe, nutritious and sufficient food will not be reached by 2030. Action is needed and to support the government and inform policies, it is essential to access good and timely data.

I 2018 UN estimate.

II Monaco being the first country with the oldest population and a median age of 55 years and Niger the 222nd country with the youngest population and a median age of 14.8 years.

In 2019/20 the Economic Policy, Planning and Statistics Office of the Republic of the Marshall Islands (EPPSO) conducted a large national household income and expenditure survey (2019/20 HIES) to provide information on the socioeconomic status of the Marshallese. This survey collects, among other data, information on food consumed by the household during the previous seven days and on their level of food insecurity through the introduction of the Food Insecurity Experience Scale (FIES) module. The analysis of this information provides a good basis to inform policies on nutrition and/or food security.

This report presents the main trends derived from the analysis of the food data collected in the 2019/20 HIES. The first section of this report briefly presents the two SDG Target 2.1 indicators and is followed by a lengthy discussion on the main features of the food consumption in the Marshall Islands in terms of DEC, food expenditure, cost of food and main sources of acquisition of the food consumed. The third section focuses further on composition of the diet in terms of products consumed. The fourth section presents the consumption of essential nutrients and finally the last section draws the profile of food insecure households and their related food consumption pattern.

The analysis was conducted using ADePT-FSM software[I] developed jointly by the World Bank and the Food and Agriculture Organization of the United Nations (FAO) to derive food consumption indicators at national level and for representative groups of populations. ADePT-FSM produces more than 50 output tables[II] with disaggregation level going up to the tenth percentile of expenditure. As not all indicators or disaggregation levels are relevant, only the most meaningful trends and groups of population are analysed. Because of their size, most of the tables produced by ADePT-FSM and analysed in this report are joined as a companion document to this report (https://microdata.pacificdata.org/index.php/catalog/761/related-materials).

It is important to note that the survey started in July 2019 and stopped in May 2020 when the world was confronted by the COVID-19 global pandemic. At the time of the survey, the Marshall Islands was dealing with severe outbreaks of dengue fever and influenza-like illness, and to avoid adding pressure to the health system with even a single-case of COVID-19 entering the country, all travel to the Marshall Islands was suspended. To further prepare, prevent, and respond to the coronavirus pandemic, the Marshall Islands has received assistance from the United States,[10] but despite this assistance, it is believed that travel restrictions will further exacerbate inequality, poverty and food insecurity. However, apart from setting a pre-COVID-19 baseline, the impact of the epidemic on food security and the food system cannot be assessed through the data collected in the 2019/20 HIES.

[I] ADePT-FSM is a free downloadable software developed by World Bank and FAO to analyze food data collected in HIES and derive indicators of food consumption by population groups. The software can be downloaded at: http://www.fao.org/food-agriculture-statistics/statistical-domains/food-security-and-nutrition/methodology/en/

[II] For more information on output tables see "Analyzing food security using household survey data", FAO/WB. 2014 (https://openknowledge.worldbank.org/handle/10986/18091) and "Optimizing the use of ADePT-FSM for nutrient analysis" – ADePT-FSM V3. FAO. 2018. (http://www.fao.org/3/cb2465en/cb2465en.pdf)

CHAPTER 1
SDG Target 2.1 and the Marshall Islands

SDG Target 2.1 "by 2030 end hunger and ensure access by all people, in particular the poor and people in vulnerable situations including infants, to safe, nutritious and sufficient food all year round". This target is measured by two indicators: the prevalence of undernourishment (SDG 2.1.1) and the prevalence of moderate or severe food insecurity based on the FIES (SDG 2.1.2). These two indicators have been adopted by the Marshall Islands to report on progress made in ending hunger and food insecurity. In collecting both FIES and food consumption data, the 2019/20 HIES provides a timely opportunity for the Marshall Islands to report on these two indicators during the 2021 Voluntary National Review, of which the Marshall Islands will be part.

1.1 SDG 2.1.1 – Prevalence of undernourishment

The prevalence of undernourishment (PoU), or percentage of the population whose dietary energy intake is lower than the amount of energy it needs to be in good health and have an active life, has been regularly monitored by FAO and reported yearly in the state of food security and nutrition in the world.[11] The PoU has been used to monitor and report on global hunger back to 2000 with the Millennium Development Goals and has been endorsed in September 2015 as SDG 2.1.1. In order to provide a comparable estimate over time and across countries for global monitoring, the PoU is based on the Dietary Energy Supply (DES) compiled by FAO in the Food Balance Sheets. Since the Marshall Islands does not produce a Food Balance Sheet, the PoU is not part of the data for which progress towards reducing hunger is monitored by FAO.

However, from the food data collected in the 2019/20 HIES, it is possible to derive all the parameters needed to estimate the PoU, which is the average amount of energy consumed in the Marshall Islands together with the indicator of dispersion of the DEC within the population and the dietary energy needed by a Marshallese to be in good health and perform a level of activity socially acceptable (see Methodological Annex 1.1).

Based on the food consumption and demographic data collected in the 2019/20 HIES, it was found that around one Marshallese in twenty is undernourished, with a margin of error in the prevalence of around 2.5 percentage points. This means that for more than 2 000 Marshallese, their everyday dietary energy intake is not enough to meet their basic dietary energy needs. These people are suffering from hunger.

The size of the sample is not enough to allow for a reliable estimate at a lower level of disaggregation.

1.2 SDG 2.1.2 – The prevalence of moderate or severe food insecurity based on the FIES

The FIES is composed of eight dichotomous questions asking respondents to report on their experience in accessing enough and/or nutritious food with respect to their resources. The scale has been adopted to monitor progress towards SDG 2.1 through the SDG 2.1.2 indicator of the prevalence of moderate or severe food insecurity based on the FIES. Food insecurity as measured by this indicator refers to limited *access to food*, at the level of individuals or households, due to lack of money or other resources. The FIES was introduced for the first time in the Marshall Islands through a survey experiment conducted in 2018. The analysis of the data found that overall, the scale performed well in the Marshall Islands, but the low size of the sample on which the experiment was conducted prevented conclusions on the robustness of the statistical validity test. Taking from these positive results, the scale was then introduced in the 2019/20 HIES. However, the SDG 2.1.2 indicator on the prevalence of moderate or severe food insecurity is not provided for the Marshall Islands because it was not representative of the national population due to the exclusion of 86 households from Kwajalein.[I] However, from the analysis of the raw score (number of affirmative answers) of the remaining households and after demonstrating that the raw score is an ordinal measure of the severity of food insecurity, it is still possible to draw the profile of the food insecure and their related pattern of food consumption. Such analysis is presented later in this report.

[I] These households were dropped from the analysis because the same response pattern was observed for all the households belonging to the same enumeration area. As it was not possible to determine if these were reflecting true respondent patterns or field data issue, it was prefered to drop these cases.

CHAPTER 2
BASIC FEATURES OF THE FOOD CONSUMPTION BY POPULATION GROUPS

The ADePT-FSM software was developed to allow for in-depth analysis of the food data collected in the HIES at national level, and for groups of population or groups of products or individual products. ADePT-FSM can provide estimates up to the tenth percentile for each population group, and therefore, allowing for robust estimates, it is recommended to have population groups relatively balanced in terms of size with at least 250 households per group. In the case of the 2019/20 HIES, valid estimates on food consumption were obtained for 870 households,[I] which means that not all population groups can be considered for the analysis. The categories below were therefore selected based on their relevancy in the context of food security analysis and the possibility of being disaggregated at a level allowing for reliable estimates (see Annex 2 for basic information on the size of each group).

- Geographic characteristics
  - Marshall Islands
  - Urban/rural
  - Majuro/Kwajalein/rural
- Demographic characteristics of the household or the head of the household
  - Gender of the head of the household: Male or female
  - Age of the head of the household: Less than 39 years old, 40 to 49 years old, 50 to 59 years old, 60 years old and above
  - Number of dependent children in the household who are less than 14 years old: No child, one child, two children, three children and more than four children
  - Marital status of the head of the household: Married or not married (widowed/divorced/separated/never married)
- Health and sanitation
  - Access to a safe source of drinking water: Yes or no[II]
- Socioeconomic characteristics of the household or head of the household
  - Tercile of household by per capita total expenditure
  - Education level of the head of the household: Pre- and primary school, lower secondary school, higher/post/tertiary education[III]
  - Household member was engaged in fishing, hunting or seafood collection during the last 7 days: Yes or no
  - Household member was engaged in handicraft or home processed food activities in the last 30 days: Yes or no
  - The household is involved in livestock activities: Yes or no[IV]

[I] From the original sample of 873 households, two households presenting an average amount of dietary energy lower than 500 kcal/capita/day and one household presenting an average amount of dietary energy higher than 12 000 kcal/capita/day were dropped from the analysis.

[II] This group is created using information on the main water source used for drinking. A dichotomous variable was created taking the value of "Yes" when the source for drinking water is a public piped or protected well and "No" when the source for drinking water is an unprotected well, ground water or a rainwater tank.

[III] This population group is created using the information on the highest level of schooling attended.

[IV] The question analyzed refers to livestock (pigs, chicken, ducks or other livestock) or aquaculture stocks (prawn, clam, moi, tilapia, oyster or pearl, coral, other) possessed by any of the household members.

- The household is selling copra: Yes or no
- The household receives remittances from another household: Yes or no
- Level of severity of food insecurity based on the FIES:[I] Food secure or mildly food insecure and moderately or severely food insecure.

In addition to the above population groups, indicators are also provided for each of the 167 food products collected in the survey and for each of the 17 food groups of the FAO/WHO Global Individual Food consumption data Tool[II] (GIFT) classification. To these 17 food groups, the group of "Tobacco and kava" was added to further look at the consumption pattern of these products, even if they are not considered as food (see Annex 2.2, the list of the 18 groups and their composition).

Further to this grouping, products were also classified following the Pacific guidelines for healthy living, developed by SPC's experts in nutrition.[12] In page 5 of the guidelines, authors propose a categorization of food products by energetic foods, body building foods and protective foods, and they further disaggregate these groups by distinguishing between foods to choose, to limit or to avoid.

Household Income and Expenditure Surveys are designed to collect information at the level of the household and therefore only the total amount of food consumed by the household is reported, from which it is not possible to infer intra-household food allocation. For this reason all the indicators are expressed in per capita per day and do not consider the age and sex of the individuals. Further, due to measurement error around the food consumption estimate associated with survey design and processing (see Annex 3), the analysis is performed for representative groups of people and not on single households or individuals. The units of measurement are kcal, grams, USD and percentage.

Finally, as already mentioned, it is only through individual intake surveys that it is possible to infer the food consumption of individuals. Food data collected in the 2019/20 HIES for the Marshall Islands do not substitute for such surveys and they are – at best – an approximation of the amount of food that is available to the household to be consumed over a certain reference period. Therefore, results presented below reflect only a pattern and whenever the term consumption is used it does not refer to actual intake.

2.1 Dietary energy consumption

The analysis of the food data collected in the 2019/20 HIES shows that on average a Marshallese consumes 2 860 kcal per day (ADePT table 1.3). This average amount of DEC is not equally distributed among the population, as reflected by the relatively high dispersion ratio and coefficient of variation (CV) of the DEC distribution.[III] These statistics reveal the coexistence of overweight/obesity (people consuming an amount of dietary energy higher than that needed to be in good health) and undernourished people (people having access to less dietary energy than that needed to be in good health and perform a certain level of physical activity that is socially acceptable).

A deeper look at the distribution of the household average DEC confirms that in the Marshall Islands not all population groups have access to the same amount of dietary energy. The most important differences in the average DEC are mainly observed between the least and most wealthy households and between households whose head possesses a higher level of education and those who possess a lower level of education. Households that receive remittances also tend to present a lower amount of dietary energy consumed than households who do not receive remittances. The same is observed also for food insecure households, who consume on average 400 kcal/capita/day less than food secure households.

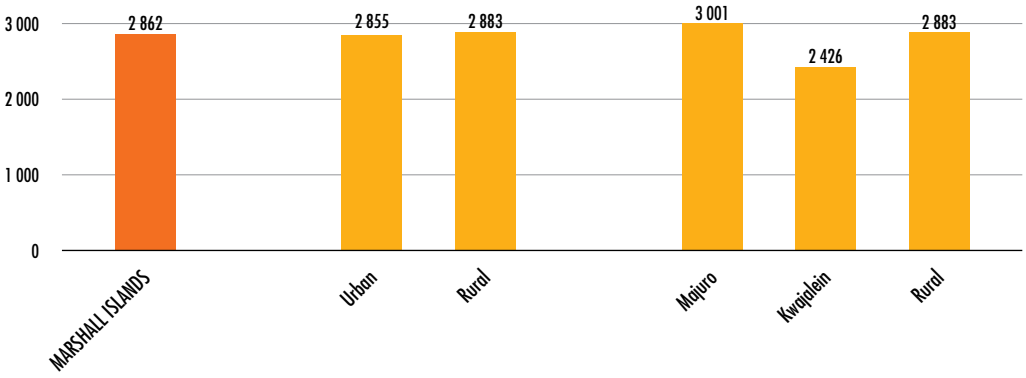
I This categorization is performed using the affirmative questions to the FIES module. Before associating a level of food insecurity to the number of affirmative questions (raw score), it is important to assess the statistical validity of the scale. After having demonstrated that the scale performs well in the Marshall Islands and after equating the Marshall Islands scale to the global scale (treating the item related to the question "did you spend the whole day without eating" as unique in the Marshall Islands), we looked at the value of the raw scores for which the probability of being moderately or severely food insecure is higher than 50 percent, which corresponds to a raw score higher than or equal to 4. Based on this finding, two classes were created: 1 for "Food secure or mildly food insecure", 2 for "Moderately or severely food insecure".

II The food products were grouped according to FAO nutrition experts who developed the GIFT platform http://www.fao.org/gift-individual-food-consumption/data-and-indicator/en/ adapted from FoodEx2 classification. FoodEx2 is a comprehensive food classification and description system aiming to cover the need to describe food in data collections across different food safety domains https://efsa.onlinelibrary.wiley.com/doi/pdf/10.2903/sp.efsa.2015.EN-804.

III The dispersion ratio (ratio of the average dietary energy consumed by the highest income group to the average DEC of the lowest income group) or the CV of the DEC are good indicators of the inequality in access to dietary energy. In the Marshall Islands the dispersion ratio of the DEC is higher than 2 and the CV of the DEC (without correcting for excess variability) is close to 50 percent.

FIGURE 1
Geographical differences in the average DEC

Average dietary energy consumption (kcal/capita/day)



SOURCE: Marshall Islands 2019/20 HIES.

Households with no access to a safe source of drinking water consume around 300 kcal/capita/day less than households with access to a safe source of drinking water. There does not seem to be a significant difference in the average DEC between households involved in livestock activities and those not involved in these activities. In contrast, lower levels of consumption are observed among households involved in handicraft activities or households selling copra than among households not involved in these activities. These former households also present the lowest level of income, and these activities can be seen as a coping strategy to increase income and reduce level of vulnerability.

The average DEC seems to be lower in urban areas than in rural areas but this difference can be attributed to a slight underreporting of food consumption in Kwajalein atoll and a slight overreporting of food consumption in some rural areas.[I] But an important difference in the average DEC between the two main urban centres can be observed, with the average DEC in Kwajalein being around 550 kcal/capita/day less than in Majuro. This difference is further explained in Box 1.

The age, gender or marital status of the head of the household do not seem to significantly affect the amount of dietary energy consumed. As expected, the composition of the household also matters but in such cases the difference is better evaluated when the DEC is expressed in adult male equivalent[II] rather than when it is expressed on a per capita basis. The difference between the average consumption of a Marshallese belonging to a household without a child and that of a Marshallese belonging to a household with at least four children is more than 1 400 kcal extra when expressed on a per capita basis but it reduces to 900 kcal when expressed in adult male equivalent.

[I] The highest values of DEC observed in rural areas are associated with high consumption of coconut, sugar or flour. In rural areas, 75 percent of households are involved in handicraft or home processed foods activities and 91 percent are involved in copra activities. It is believed that some of these households might have reported some coconut they have used to exchange for food or some of the flour or sugar used to produce doughnuts or pancakes to be further sold or exchanged.

[II] The DEC expressed in adult male equivalent refers to the total dietary energy consumed divided by the size of the household in adult male equivalent. To obtain this denominator, the normative average dietary energy requirement of each household member is estimated and divided by the average normative requirements of a male adult. These ratios are then summed up for each household to obtain the size of the household in adult male equivalent. The higher the number of children in a household, the lower the denominator and the higher the value of the DEC expressed in adult male equivalent compared to the DEC expressed in per capita.

BOX 1

Focus on Kwajalein

Kwajalein atoll is composed of many islands and islets. The island of Kwajalein is a US Department of Defense missile research and testing site and home to around 1 800 Americans (not part of this sample). Ebeye Island is the most populous and polluted island of Kwajalein atoll and by far the most impoverished city and atoll in the Marshall Islands.

The survey finds that in Ebeye the average DEC is 500 kcal/capita/day lower than in Majuro, the capital city.

It is believed that the DEC reported in Ebeye is too low and that it might have suffered from underreporting due to the dengue fever outbreak that disrupted field work.[I]

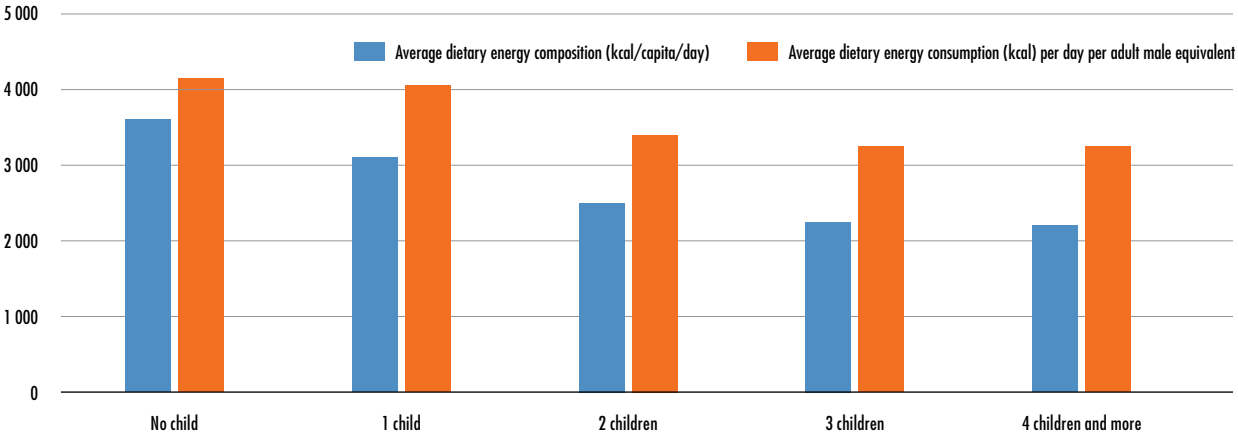
However, it is also believed that we should expect a lower average DEC in Ebeye compared to Majuro for the reasons described below:

- A household in Ebeye is composed on average of 4 people compared to 3.5 people in Majuro.[II]
- Dietary energy requirements are expected to be lower in Ebeye than in Majuro as a household in Ebeye is composed of more children than a household in Majuro.[III]
- Households in Ebeye are subject to higher price of basic foods.[IV]

FIGURE 2

Differences in the DEC expressed in per capita and adult male equivalent by household composition

Differences in the average DEC in per capita or adult male equivalent (kcal/day) by household composition



SOURCE: Marshall Islands 2019/20 HIES.

As seen in Figure 3, income (proxied by total consumption expenditure) is the main factor of inequality in access to dietary energy and many household characteristics are strongly linked to income; hence, to assess which characteristics affect the average DEC after controlling for income, a simple linear regression was performed linking the logarithm of the DEC distribution to the logarithm of the total expenditures and all the regional, demographic and socioeconomic characteristics of the households.[V]

The regression confirms all the results discussed above. The average DEC is significantly lower in Kwajalein than in Majuro and there is no significant difference between the average DEC observed in Majuro and that in rural areas. Except for households whose head is older than 60 years of age, the gender, the age and marital status of the head of the household do not significantly affect the DEC. The higher the level of education of the head of the household, the higher the DEC, but the level of

I Data were collected in Ebeye from July 2019 to December 2019 and a big drop in the average DEC can be observed for the months of August, September, October and December, which also coincided with the dengue fever outbreak in Ebeye.

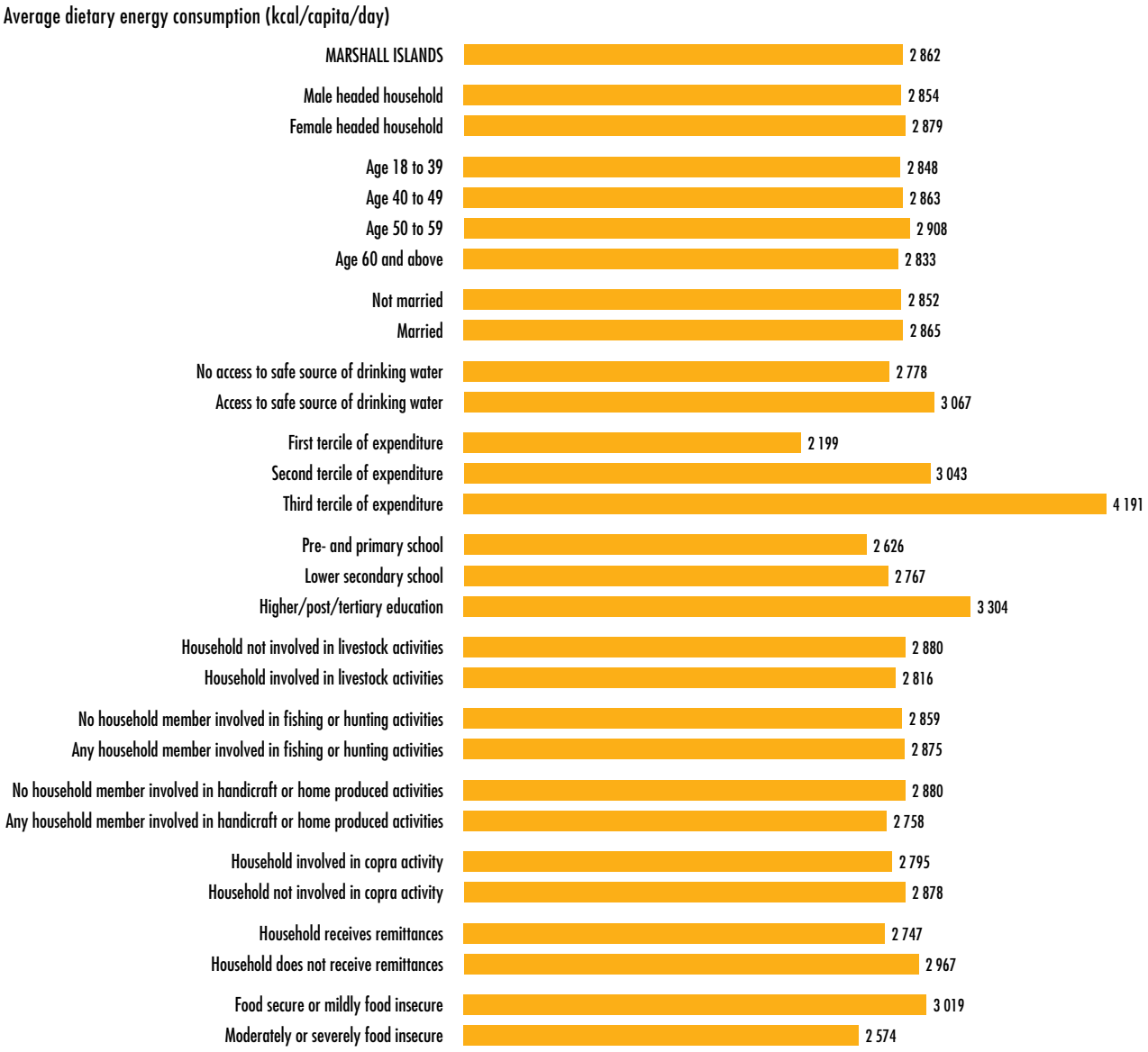
II The difference in the mean is significant at 1 percent level.

III The difference in the mean number of children less than 14 years old that belong to the household in Ebeye or Majuro is significant at 1 percent level.

IV The market survey that was conducted concurrently with the HIES finds that, on average, imported foods are more expensive in Ebeye than in Majuro.

V The regression is performed using the sampling weights, as we could see that weights affect the average DEC of some population groups.

FIGURE 3
Geographical differences in the average dietary energy consumption by demographic and socioeconomic characteristics of the household



SOURCE: Marshall Islands 2019/20 HIES.

education does not seem to significantly affect the DEC after controlling for income, and the same result is observed between households involved or not in handicraft, copra or livestock activities. Remittances represent an important source of income for many Marshallese and 45 percent of households receive remittances (and more than one household in three in Kwajalein atoll). A reduction or cutting back of this additional income would translate into increase difficult access to food in enough quantity and quality for many households. After controlling for income, access to a safe source of drinking water is not alone a factor of inequality in accessing DEC. Food insecure households or households receiving remittances also present a statistically significant lower DEC (*p*-values respectively of 0.02 and 0.08) (see Annex 4 for the results of the regression).

Remittances represent an important source of income for many Marshallese and 45 percent of households receive remittances (and more than one household in three in Kwajalein atoll). A reduction or cutting back of this additional income would translate into increase difficult access to food in enough quanity and quality for many households.

2.2 Main sources of dietary energy consumption

Of the dietary energy consumed on average by a Marshallese, 85 percent is consumed in the house and the remainder is consumed outside the house mainly in the form of lunch, dinner, snacks or breakfast (respectively 57 percent, 13 percent, 12 percent and 10 percent of the calories consumed away from home). Of the total amount of dietary energy consumed, 67 percent of the dietary energy consumed is purchased and consumed in the house. Households depend strongly on in-kind foods, since own production and food received for free or through exchange contribute together 18 percent of the amount of dietary energy consumed (ADePT table 1.5), even if the contribution of own production remains a relatively marginal source of dietary energy.

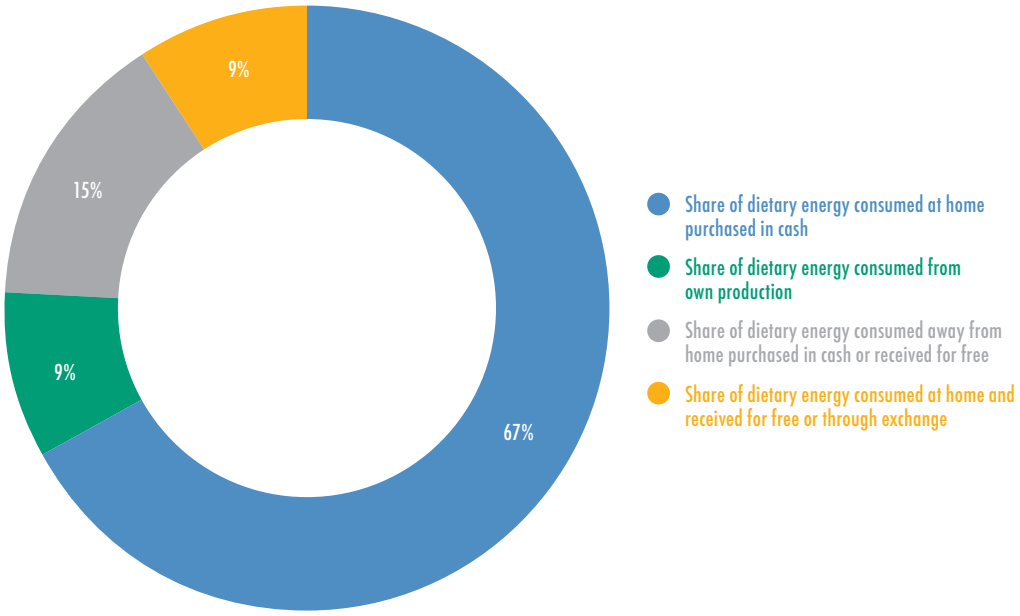
These trends differ slightly by geographic, demographic or socioeconomic characteristics of the households. Around 75 percent of the dietary energy consumed in the house in urban households is purchased in cash, 17 percent is consumed away from home while around one calorie in two consumed in rural areas comes from own produced foods or is received for free or through exchange.

Differences within urban areas can also be observed, since 24 percent of the dietary energy consumed in Kwajalein (28 percent of the total amount spent on food) is consumed away from home compared to 15 percent in Majuro (22 percent of the total amount spent on food). Meals consumed away from home (mainly in the form of lunch and breakfast) therefore represent an important component of the diet of people living in Ebeye. These lunches may be consumed by people working in the US base in Kwajalein, as most of the Marshallese working in the US base are daily workers coming from Ebeye.

Households involved in fishing, livestock, handicraft or copra activities depend more on their own production, or on food received for free, than households not involved in these activities, since less than 50 percent of the dietary energy they consume comes from cash purchases. Contribution of own production to the dietary energy consumed by the wealthiest households is marginal, while 13 percent of dietary energy consumed by the least wealthy households comes from their own production. Conversely, one calorie in five consumed by wealthy households is consumed away from home. Interestingly is the higher contribution of food consumed away from home to the average dietary energy consumed by female headed households compared to male headed households (respectively 18 percent and 14 percent), and female headed households also tend to depend less on cash purchases and more on food received for free than male headed households (10 percent compared to 8 percent). Finally, the larger the household, the higher the contribution of own production and food received for free to the average DEC consumed.

FIGURE 4
Contribution of the main sources of acquisition to the average dietary energy consumed (percentage)

Distribution of the average dietary energy consumption by major sources of acquisition (percentage)

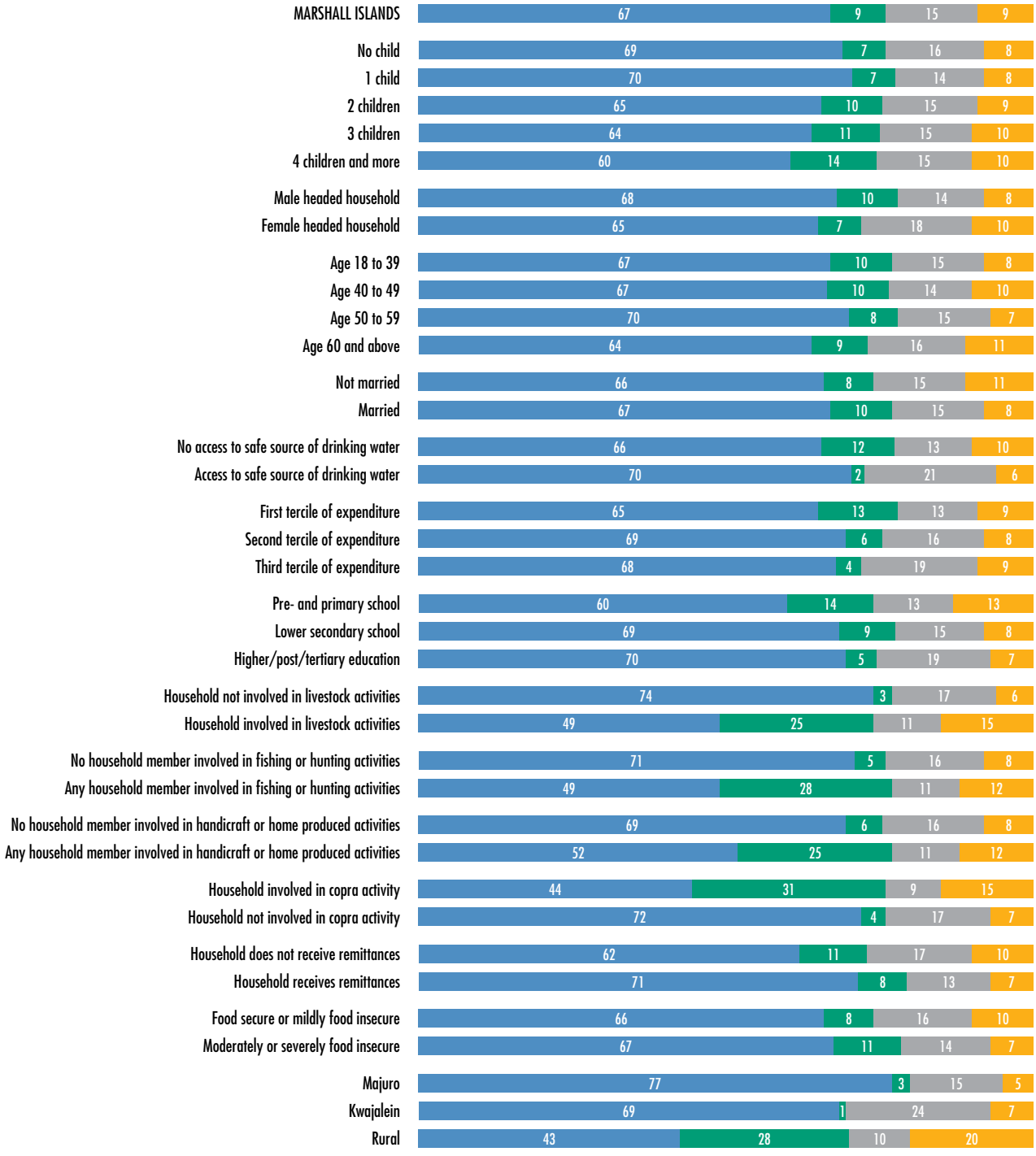


SOURCE: Marshall Islands 2019/20 HIES.

FIGURE 5

Contribution of main sources of acquisition of the dietary energy by household characteristics

Contribution to the average DEC of the major sources of acquisition by population groups (percentage)

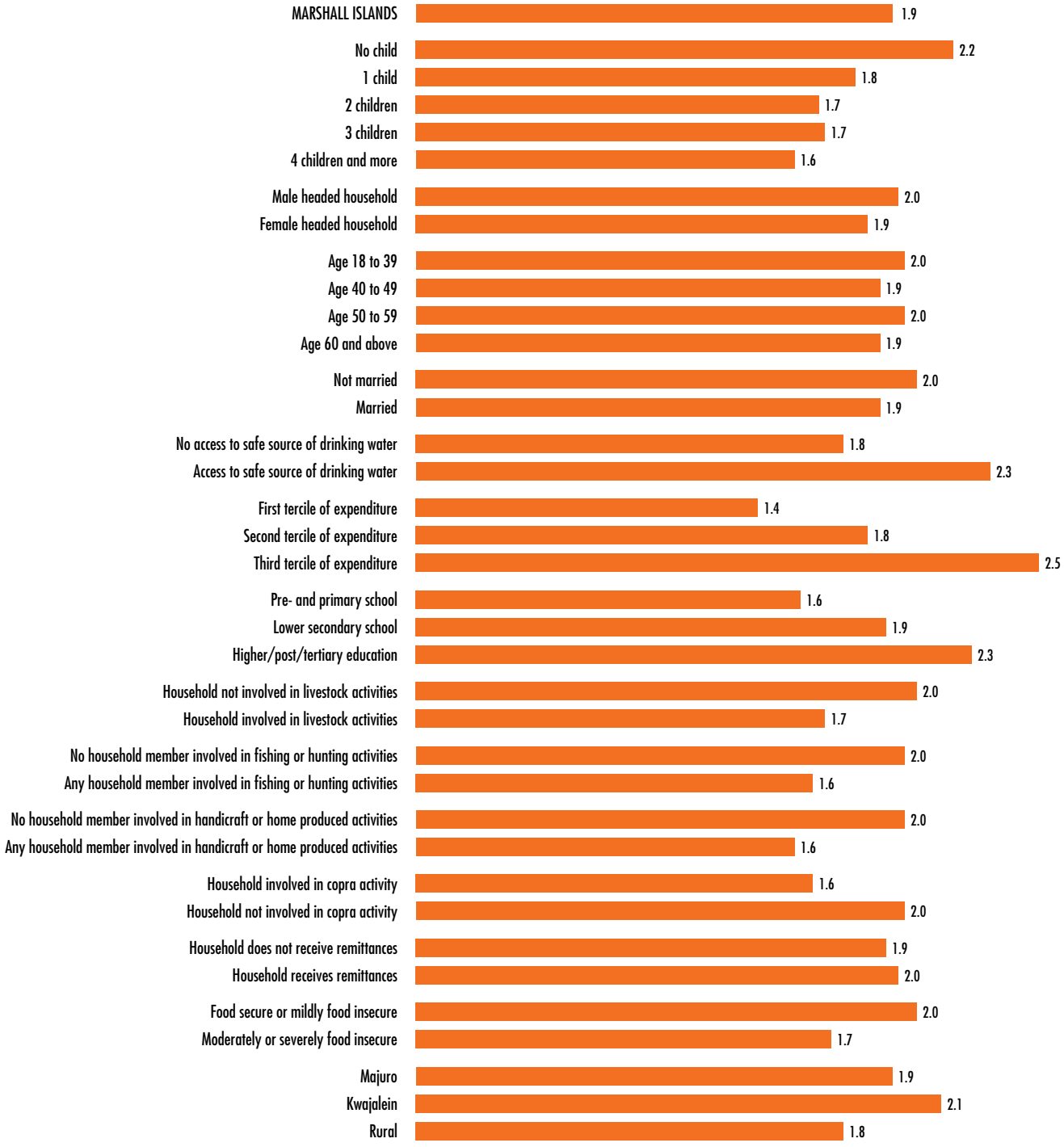


SOURCE: Marshall Islands 2019/20 HIES.

FIGURE 6

National disparities in the cost of 1 000 kcal

Average dietary energy unit value (USD/1 000 kcal)



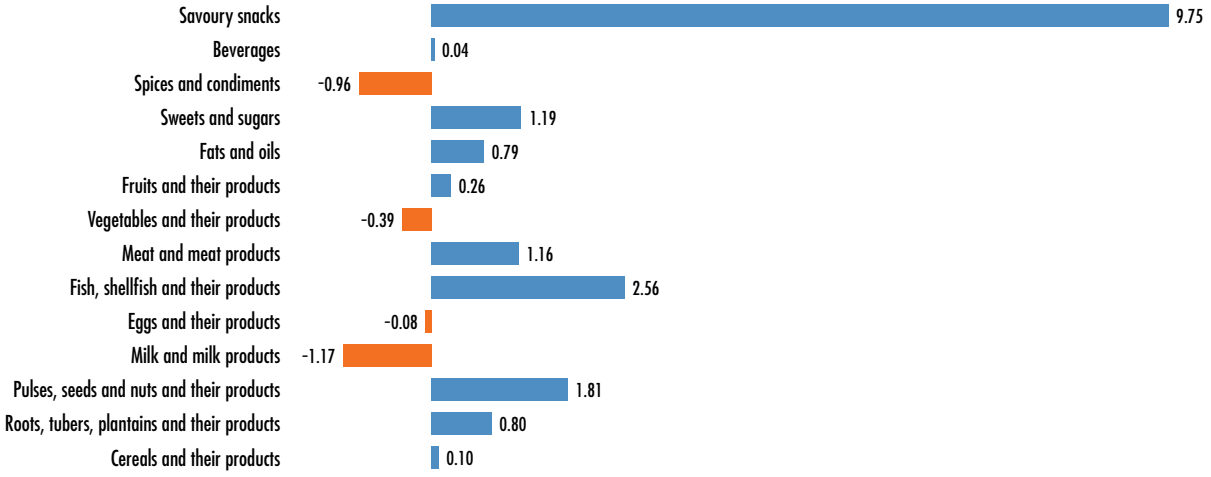
SOURCE: Marshall Islands 2019/20 HIES.

2.3 Cost of the dietary energy

To acquire the 2 860 kcal per day, a Marshallese spends around USD 5.2, which means that it costs a little less than USD 2.0 to obtain 1 000 kcal (ADePT table 1.3). Important disparities in the cost of calories can be observed within the population and not all households enjoy the same quality or variety of foods. The richer the household, the higher the amount spent to get 1 000 kcal. In fact, households belonging to the highest tercile of expenditure spends USD 1.1 more to get 1 000 kcal compared to households belonging to the first tercile of expenditure. Households with no child or with high education level also tend to acquire less energetic but more expensive foods. Interestingly, but as expected, households with no access to safe drinking water also tend to access more affordable sources of dietary energy than households with access to a safe source of drinking water. Food secure households spend on average 20 percent more than food insecure households to access 1 000 kcal. This finding is consistent with the 33 percent of households who are experiencing moderate or severe levels of food insecurity. What this means is that most food insecure households do not have access to safe and nutritious foods and they need to compromise on the quality and diversity of the foods they are accessing. In Majuro and Kwajalein, the food consumption patterns are very similar and the difference in the average cost of 1 000 kcal is mainly due to the fact that foods are on average more expensive in Kwajalein than in Majuro.

Expenditure on food accounts for around 45 percent of total household consumption expenditure (ADePT table 1.7). Food expenditures weigh more on the overall budget of rural households than that of urban households, with respective contributions of 58 percent and 41 percent. Households belonging to the first tercile of expenditure devote 48 percent of their total expenditures to food while the wealthiest households devote 41 percent. Interesting to note also is the most important contribution of food expenditures to the total expenditures of all households involved in fishing, livestock, handicraft or copra activities. This trend is also very consistent with the fact that there is a significant association between the total expenditure of the households and their involvement or not in these activities. The average total expenditures of the households involved in fishing, handicraft, livestock or copra activities are 30 to 40 percent lower than those of households not involved in these activities.

FIGURE 7
Differences in the average cost of 1 kg of products between Kwajalein and Majuro



SOURCE: Marshall Islands 2019/20 HIES.

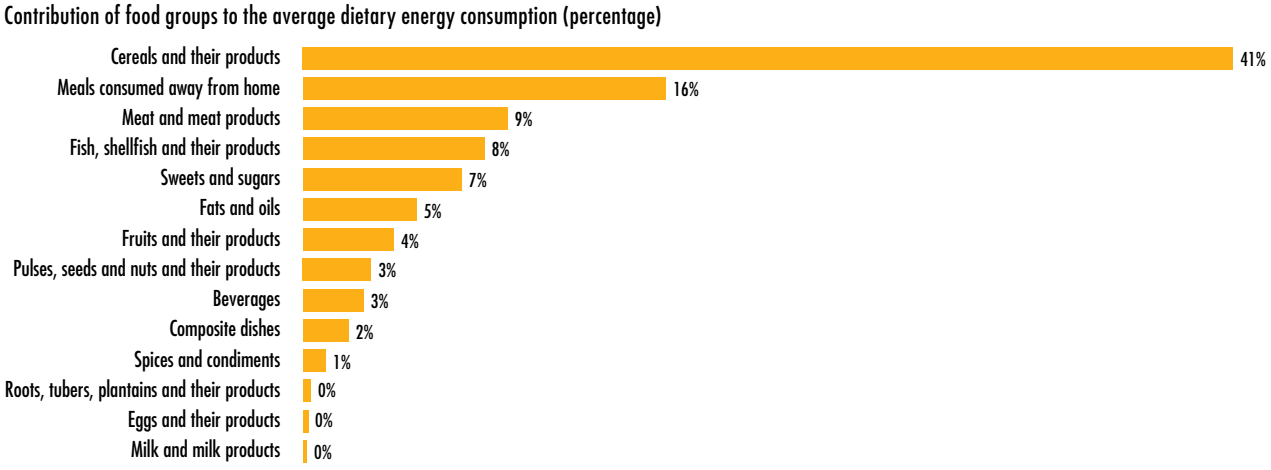
CHAPTER 3
COMPOSITION OF THE DIET OF A MARSHALLESE

3.1 Contribution of main food groups

To provide a broad overview of the main kinds of foods consumed, products were categorized according to food groups defined on the basis of their nutritional relevance following the classifications used in the FAO/WHO Global Individual Food consumption data Tool (GIFT). In the case of the Marshall Islands, out of the 19 food groups of the GIFT classification, 17 were covered by the food recall section of the 2019/20 HIES,[I] and the group of "tobacco/kava" was added because of the negative impact on health of excessive consumption of these products (see the mapping of the food products into GIFT groups in Annex 2.2). Around 158 food products were collected in the 7-day food recall section of the questionnaire, to which 7 "products" referring to meals consumed away from home[II] were added, as well as "smoking and smokeless tobacco" and "kava", giving a total of 167 products analysed in this report. With more than 20 food products, the groups of "beverages" and that of "fruits and their products" are the most diversified, followed by the groups of "sweets and sugars", "vegetables and their products" and "fish, shellfish and their products" which comprised 14 to 18 products. The groups of "eggs" and "savoury snacks" are the least diversified, being represented by only one food product.

But not all households consume all the products reported in a group. Out of the 167 products reported, only 25 are consumed by at least one household in three. Only one type of vegetable, three types of fruits and three types of fish or fish products are consumed by at least one household in three. Conversely, the groups of meat and cereals that are less diversified are also those for which at least four products are consumed by 33 percent of the households. Less than one household in three consumes milk products, roots or tubers, but around 60 percent of the households consume eggs. Of note also is the importance of meals consumed away from home, since more than 33 percent of households have a lunch, a snack, a hot drink, a non-alcoholic drink or a bottle of water away from home.

FIGURE 8
Average dietary energy consumption by food groups



SOURCE: Marshall Islands 2019/20 HIES.

I None of the food products belonging to the groups of "insects, grubs and their products" and "food for particular nutritional uses" were collected in the food recall section of the questionnaire.

II Breakfast, lunch, dinner, snacks, hot drinks, non-alcoholic beverages and bottled water.

TABLE 1
Number of products reported by food group

Food group	Number of food products	Number of products accessed by at least one third of the households
Cereals and their products	9	4
Roots, tubers, plantains and their products	6	0
Pulses, seeds and nuts and their products	6	0
Milk and milk products	4	0
Eggs and their products	1	1
Fish, shellfish and their products	14	3
Meat and meat products	10	4
Vegetables and their products	17	1
Fruits and their products	21	3
Fats and oils	5	1
Sweets and sugars	18	1
Spices and condiments	9	3
Beverages	24	2
Food not classified (meals consumed away from home)*	8	5
Food additives	3	0
Composite dishes	9	0
Savoury snacks	1	0
Tobacco/kava**	2	1
Total	**167**	**29**

* In addition to meals consumed away from home, this group also contains one product corresponding to foods not well specified.
** Even if kava brings energy when consumed it is not considered food. Tobacco does not bring energy and is not considered food. These products are considered to be toxic.

SOURCE: Marshall Islands 2019/20 HIES.

Out of the 17 food groups, seven groups bring 90 percent of the dietary energy consumed and the group of "cereals and products" alone brings 41 percent of dietary energy, followed well behind by "meals consumed away from home" (16 percent). Meat, fish and sweets contribute 9, 8 and 7 percent respectively to the average dietary energy consumed. With an average of around 150 g/capita/day,[I] the consumption of fruits and vegetables is well below the 400 g/capita/day recommended by WHO as one of the 25 indicators of its Global Action Plan for the Prevention and Control of Noncommunicable Diseases.[13] The contribution of 3 percent to the average dietary energy consumed by the group "pulses, seeds and nuts" is mainly due to the consumption of brown coconut.

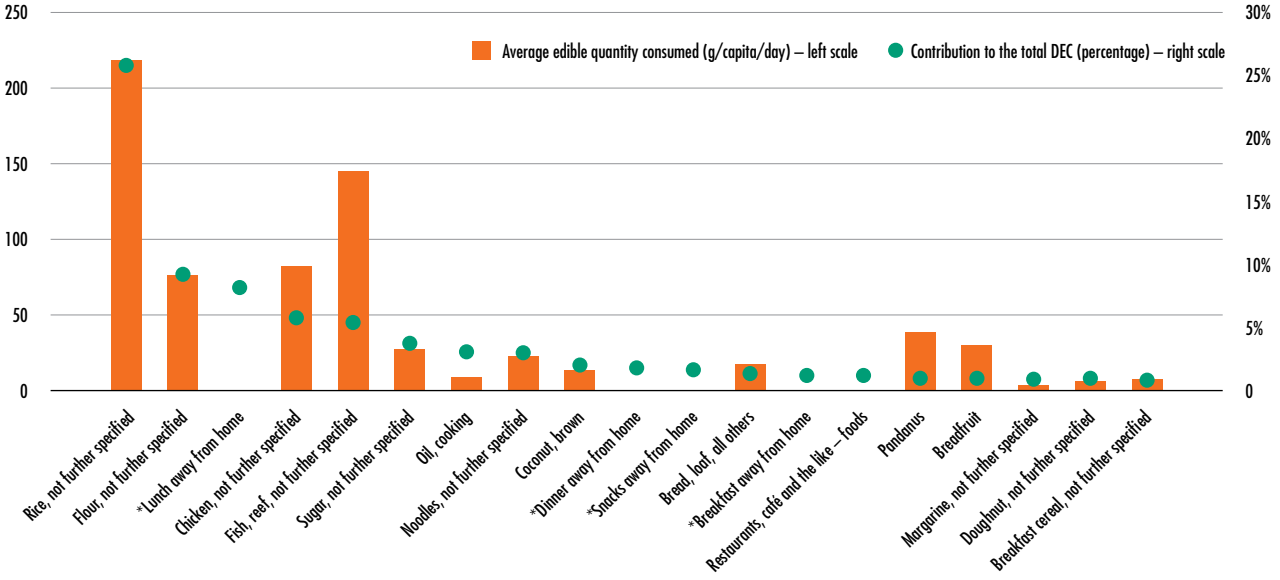
3.2 Main food products consumed in terms of quantities

Out of the 167 products collected in the food recall section of the 2019/20 HIES, 33 food products bring 90 percent of the average dietary energy consumed, but not all these products contribute the same. With an average daily quantity consumed of around 220 grams per capita, rice alone brings more than one calorie in four consumed, followed by flour with an average daily quantity consumed of 76 grams per capita and contributing to more than 9 percent of the dietary energy consumed. After lunch consumed away from home, chicken is the fourth main source of energy bringing 6 percent of the dietary energy consumed for an average quantity consumed of 83 g/capita each day.[II] Less dense in energy,[III] the quantity

[I] Edible quantity is after the non-edible portion of the food (peel, seeds, bones) has been removed. For instance, 35 percent of the banana or 20 percent of breadfruit is not edible, while 100 percent of rice or milk is edible.
[II] Edible quantity. Around 27 percent of chicken is not edible.
[III] 100 grams of edible reef fish brings 110 kcal compared to 207 kcal per 100 grams of edible chicken.

FIGURE 9
Average edible quantity consumed of the products contributing to 80 percent of the average DEC

Average edible quantity and contribution to the average DEC of the food products contributing 80 percent of the DEC



* Only number of meals consumed away from home were collected, with no quantity.
SOURCE: Marshall Islands 2019/20 HIES.

of reef fish consumed is also quite important with an average of 145 g/capita/day,[I] which makes reef fish the most consumed food in terms of edible quantity after rice and contributing to a bit more than 5 percent of the average dietary energy consumed (ADePT table 3.1). With an average energy of 240 kcal/capita/day, lunches consumed away from home also represent a significant source of dietary energy, contributing more than 8 percent of the average dietary energy consumed. Pandanus, breadfruit and banana (among of the rare locally grown products) together contribute no more than 3 percent of the average dietary energy consumed with an average edible quantity of respectively 39,[II] 30 and 22 g/capita/day. Of note also is the important quantity of bottled water consumed, with an average daily quantity of 200 grams per capita. The shortage of safe sources of drinking water in the Marshall Islands requires that many households consume bottled water. Daily salt consumption is at an average of around 9 grams per capita, well above the WHO recommendation of no more than 5 grams of salt per day per adult;[III] high sodium consumption contributes to high blood pressure and increases the risk of heart disease and stroke. This risk is further increased by the high consumption of other high salt content products like soy sauce (around 10 g/capita/day).

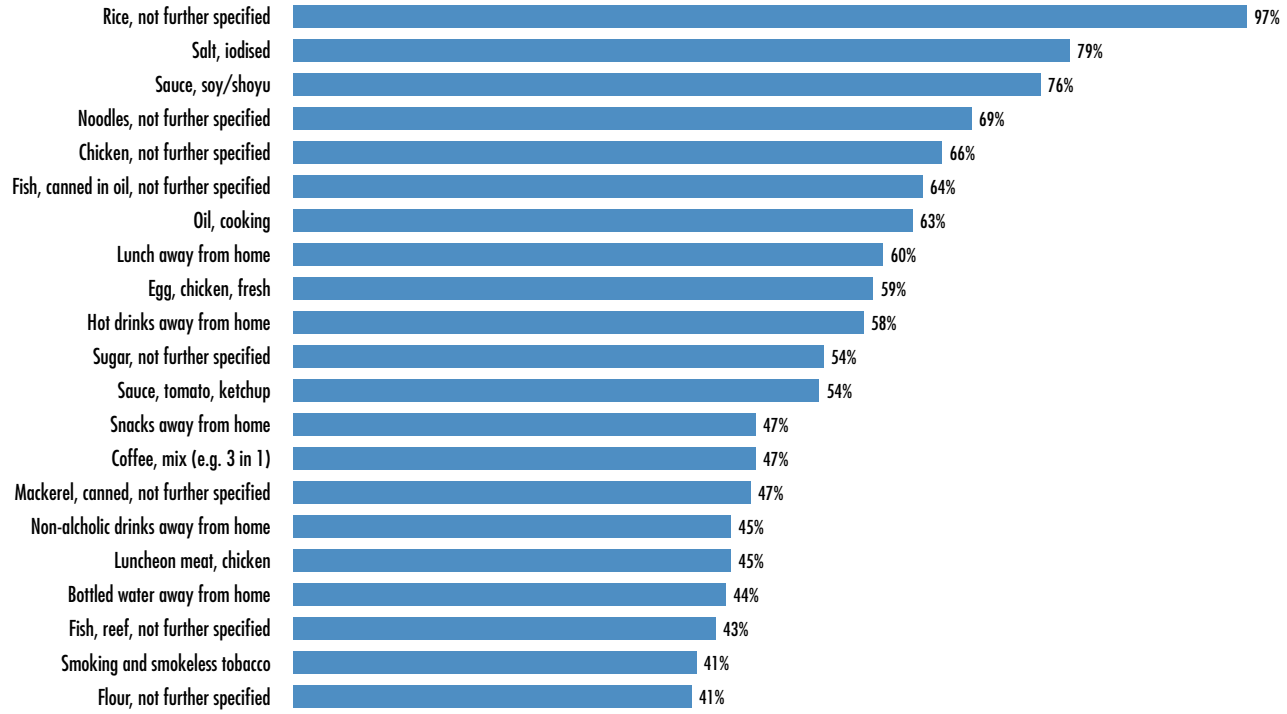
3.3 Main food products consumed in terms of percentage of households consuming the food

The percentage of households who reported having consumed the food in the previous 7 days is a good indicator not only of consumer preference but also of product availability and accessibility. As seen in table 1, only 3 of the 21 different kinds of fruit reported are consumed by at least one household in three. Conversely, if flour contributes 9 percent of the average dietary energy consumed, it is consumed by only 40 percent of the households, and despite the high quantity of reef fish consumed, only 43 percent of households consume reef fish, while 64 percent of households consume fish canned in oil, even though in small amounts (6 g/capita/day). Rice remains the most consumed and preferred food, since 97 percent of households in the Marshall Islands consume rice, followed by salt and soy sauce which are consumed by more than three households in four. Two households in three consume chicken. Conversely to what is observed in other PICTs, around 60 percent of households consume fresh eggs, with an average edible quantity of 8 grams consumed on average per day per capita.

I Edible quantity. Around 29 percent of reef fish is not edible.
II Note however the important difference between pandanus as procured (194 g/capita/day) and pandanus as consumed (39 g/capita/day). The difference between both quantities lies in the 80 percent of the non-edible portion.
III See WHO. 2012. Guideline: sodium intake for adults and children https://www.who.int/publications/i/item/9789241504836

FIGURE 10
Main products consumed by at least one household in two (percentage)

Percentage of households who consumed the food product in the previous 7 days



SOURCE: Marshall Islands 2019/20 HIES.

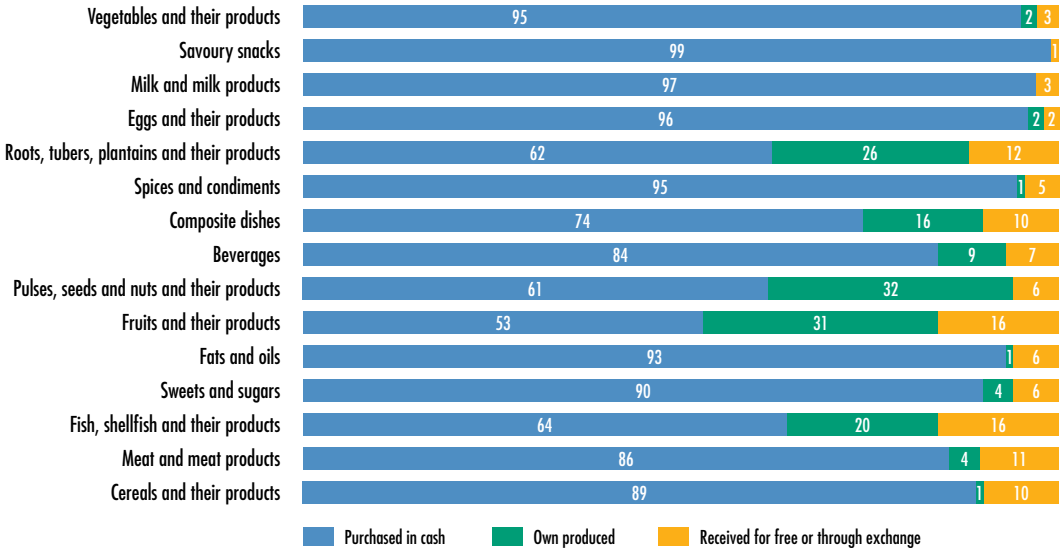
Around 60 percent of the households have at least one of their members consuming a lunch away from home and 47 percent a snack away from home. Cola type drinks are consumed by 40 percent of households with an average daily consumption of 20 grams per capita. One household in three consumes imported foods like apples and oranges while only 28 percent of households consume locally produced breadfruit and 16 percent consume pandanus. Only one household in four consumes long-life milk (UHT) with an average quantity of 14 g/capita/day. Finally, but importantly, 41 percent of households consume tobacco, with an average consumption of 1 gram per day per capita (one standard cigarette). See Annex 5 for more detailed information on food consumption for each food product reported in the 2019/20 HIES.

3.4 Sources of acquisition of the food product

Around 90 percent of the dietary energy consumed from cereals, sweets and sugar, oil and fat products is purchased; the rest is mainly received for free or through exchange. This finding is not surprising, as these products cannot be own produced. But more surprising in turn, is that less than 4 percent of the dietary energy coming from meat products (that is around 10 kcal/capita/day out of 250 kcal/capita/day from meat products) is own produced, even though around one household in four is involved in livestock activities. Conversely, fish consumed from own fishing or received in kind contribute together 36 percent of the total amount of energy coming from fish (around 80 kcal/capita/day out of the 220 kcal/capita/day consumed from fish and fish products). The same can be observed for fruits, for which the contribution of own produced fruits, or fruits received for free or through exchange, contribute 47 percent of the total amount of dietary energy coming from fruits (around 50 kcal/capita/day from the 107 kcal/capita/day of fruits consumed on average). In addition, fish and fruit products are also the two groups for which the contribution of dietary energy from foods received for free or through exchanges is the highest (16 percent). Finally, 95 percent of the almost insignificant dietary energy coming from vegetables (6 kcal/capita/day) comes from purchases, as a consequence of the difficulties in growing vegetables in the Marshall Islands due to recurrent drought and poor soil conditions (the soil is sandy, saline, contaminated with radioisotopes and its organic content is low).

The further analysis of the main sources of acquisition of each product, expressed in terms of percentage of households, shows that almost one household in three who has a lunch away from home was provided with it for free (maybe from church,

FIGURE 11
Sources of acquisition of dietary energy by food group (percentage)



SOURCE: Marshall Islands 2019/20 HIES.

from work or other households). Around 95 percent of households who consume eggs purchase them, which is somehow unexpected if we consider that one household in four is raising chickens. Of the 43 percent of the households who consume reef fish, more than 60 percent consume reef fish from their own fishing activities (40 percent) or are provided with it for free (21 percent). The 35 percent of households who consume bananas consume them from their own production or receive them for free. Breadfruit or pandanus are purchased by less than one household in four; the remaining households consume these fruits from their own production or receive it for free. Exchange remains a marginal way of procuring foods, since less than 3 percent of households procure some of their food through exchange of other foods or handicraft products.

3.5 Cost of food[1]

Of the 42 food products consumed by at least one household in five, bottled water is the least expensive, with a cost lower than 10 cents per 100 grams. Following water, reef fish and rice are the two most affordable foods, as it costs less than 11 cents to get 100 grams of these products, but compared to reef fish, rice remains the cheapest source of dietary energy as it costs 31 cents to get 1 000 kcal from rice. Flour, banana, sugar and breadfruit also belong to the least expensive food products, as it costs less than 20 cents to get 100 grams of these products. Even though the dietary energy coming from reef fish or chicken has very similar costs of around USD 1.3 per 1 000 kcal, with respective costs of 20 cents per 100 grams and 10 cents per 100 grams, chicken is a far more expensive product than reef fish. Conversely, tuna fish is five times more expensive than reef fish, and this is also why tuna consumption is relatively marginal in the Marshall Islands compared to reef fish; (only 19 percent of households consume tuna fish with an average daily edible quantity of around 12 grams per capita). Even if it costs less than 20 cents to get 100 grams of breadfruits, households tend to prefer imported fruits like apples or oranges that are twice as expensive as breadfruits but are consumed by at least one household in three, whereas breadfruits are consumed by only 28 percent of households. Coconut water, poor in energy but rich in nutrients, is consumed by less than 25 percent of the households and is also half the cost of soft drinks like cola, which is less healthy as it is rich in sugar but consumed by more than 40 percent of households. It is interesting to note that despite their relatively high price and dietary energy cost (of respectively 57 cents per 100 grams and USD 5.1 per 1 000 kcal), eggs are still consumed by around 60 percent of households.

A Marshallese spends on average USD 5.2 per day to get food. With an average expenditure of 45 cents per day per capita, lunches consumed away from home represent the main food expenditure contributing 9 percent to the average amount spent on food. Rice and chicken are the second main

[1] To account for the small dispersion observed in the price of some products, the values presented in this section refer to the median unit value of 100 grams of product estimated from the survey.

TABLE 2
Percentage of households consuming the food product in the previous seven days by source of consumption

Food product	Percentage of households accessing the food				
	Total	Cash	Home production	Gift	Exchange
Rice, not further specified	97	88	2	9	2
Salt, iodised	79	93	1	4	1
Sauce, soy/shoyu	76	93	0	4	2
Noodles, not further specified	69	92	0	6	1
Chicken, not further specified	66	86	2	11	1
Fish, canned in oil, not further specified	64	90	0	9	1
Oil, cooking	63	93	1	5	1
Lunch away from home	60	66	0	34	0
Egg, chicken, fresh	59	95	1	4	0
Hot drinks away from home	58	80	0	20	0
Sugar, not further specified	54	92	1	4	3
Sauce, tomato, ketchup	54	97	0	2	1
Snacks away from home	47	86	0	14	0
Coffee, mix (e.g. 3 in 1)	47	92	1	5	2
Mackerel, canned, not further specified	47	87	0	9	3
Non-alcoholic drinks away from home	45	86	0	14	0
Luncheon meat, chicken	45	95	0	3	2
Bottled water away from home	44	83	0	17	0
Fish, reef, not further specified	43	37	40	21	1
Smoking and smokeless tobacco	41	94	0	5	1
Flour, not further specified	41	86	2	8	3
Cola flavour soft drink	40	95	0	4	1
Beef, canned, corned	39	93	0	5	2
Canned meat, not further specified	38	92	0	6	2
Banana, common e.g. Cavendish	35	43	34	23	0
Onion, brown	35	98	1	1	0
Apple, not further specified	34	94	2	4	0
Orange	33	98	1	1	0
Bread, loaf, all others	33	90	4	6	0

SOURCE: Marshall Islands 2019/20 HIES.

contributors to the food expenditures, with a contribution of around 5 percent corresponding to an average expenditure of 25 cents. With an average expenditure of 19 cents per day, reef fish is the fourth main food expenditure item. An average amount of 16 cents per day is spent on both noodles and tobacco, contributing the same amount to the overall budget of a Marshallese. Overall, meals consumed away from home for breakfast, lunch, dinner, snacks, hot drinks or non-alcoholic beverages represent more than 20 percent of the budget devoted to food, with an average daily expenditure of USD 1.2. Finally, bottles of water represent 2.5 percent of food expenditure and one household in two consumes bottled water.

TABLE 3
Cost of 1 000 kcal and of 100 grams of the food products consumed by at least one household in five and contributing to 80 per cent of the average DEC

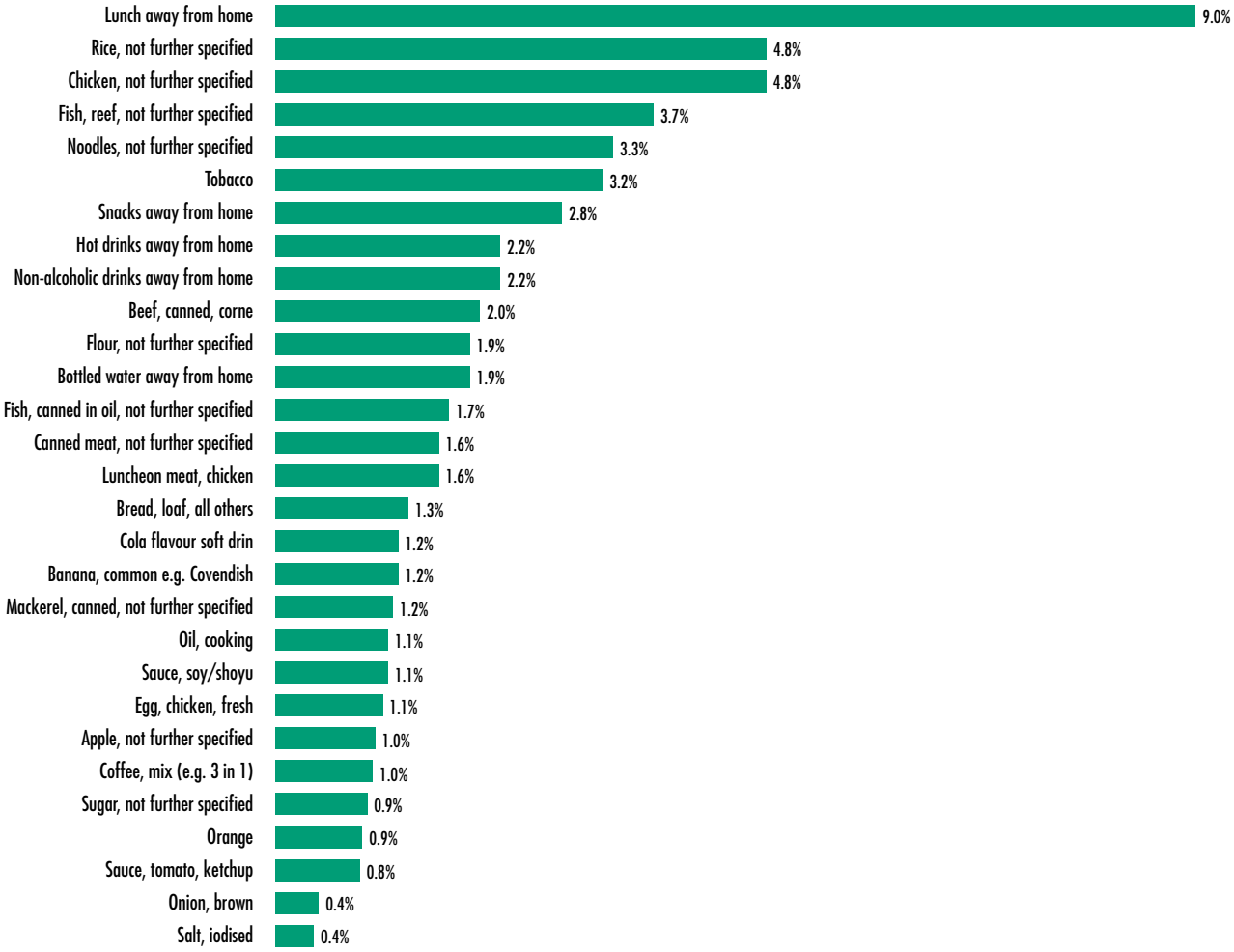
Food product	Average food consumption in monetary value (USD/capita/day)	Median dietary energy unit value (USD/1000 kcal)	Median price (USD/100g)	Contribution to total DEC (%)	Percentage of household that consumed the food in the last 7 days (%)
Bottled water away from home	0.096	NA	0.05	0	44
Bottled water/spring water	0.034	NA	0.10	0	25
Fish, reef, not further specified	0.193	1.32	0.10	6	43
Rice, not further specified	0.248	0.31	0.11	26	97
Banana, common e.g. Cavendish	0.060	1.79	0.11	1	35
Coconut, green	0.032	8.76	0.12	0	20
Flour, not further specified	0.098	0.38	0.13	9	41
Coconut, water only	0.039	7.70	0.14	0	23
Sugar, not further specified	0.045	0.38	0.15	4	54
Breadfruit	0.077	2.19	0.19	1	28
Salt	0.021	0.00	0.20	0	79
Chicken, not further specified	0.247	1.35	0.20	6	66
Milk, long life, shelf stable (UHT)	0.038	4.76	0.24	0	26
Cola flavour soft drink	0.060	8.82	0.27	0	40
Onion, brown	0.022	17.92	0.37	0	35
Orange	0.044	12.78	0.40	0	33
Sauce, tomato, ketchup	0.043	3.52	0.40	0	54
Apple, not further specified	0.051	9.38	0.47	0	34
Bread, loaf, all others	0.069	1.92	0.47	2	33
Mackerel, canned, not further specified	0.060	3.33	0.49	1	47
Hot drinks away from home	0.112	6.33	0.50	1	58
Oil, cooking	0.058	0.62	0.56	3	63
Sauce, soy/shoyu	0.058	17.55	0.56	0	76
Egg, chicken, fresh	0.057	5.1	0.57	0	59
Butter, not further specified	0.012	1.0	0.66	0	22
Bacon, not further specified	0.063	4.4	0.69	0	25
Noodles, not further specified	0.168	1.9	0.75	3	69
Luncheon meat, chicken	0.083	5.2	0.81	1	45
Canned meat, not further specified	0.083	4.4	0.82	1	38
Coffee, mix (e.g. 3 in 1)	0.050	1.9	0.83	1	47
Peanut butter, not further specified	0.022	1.3	0.85	1	21
Breakfast cereal, not further specified	0.063	2.3	0.85	1	23
Snacks away from home	0.142	3.0	1.00	2	47
Non-alcoholic drinks away from home	0.111	4.9	1.00	1	45
Fish, canned in oil, not further specified	0.090	7.0	1.06	0	64
Beef, canned, corned	0.101	6.1	1.38	1	39
Coffee, instant, powder	0.035	13.7	1.47	0	21
Lunch away from home	0.463	1.7	2.00	8	60
Smoking and smokeless tobacco	0.164	0.0	14.00	0	41

* Price per meal in case of breakfast, lunch and dinner consumed away from home.
SOURCE: Marshall Islands 2019/20 HIES.

FIGURE 12

Contribution of the food product consumed to the total food expenditures (percentage)

Contribution of the food to the total food expenditures (product consumed by around 30 percent of the households)



SOURCE: Marshall Islands 2019/20 HIES.

CHAPTER 4
CONSUMPTION PATTERN OF ESSENTIAL NUTRIENTS

Essential nutrients are composites that the body cannot produce or cannot produce in sufficient quantity to survive, grow and reproduce. While there are many essential nutrients, they can be broken down into two categories: macronutrients and micronutrients.

Macronutrients (protein, carbohydrates, fibre and fats) are eaten in large amounts and include the primary building blocks of the diet and provide the body with energy. Vitamins and minerals are micronutrients, and small doses are usually sufficient.

For a healthy diet it is important to eat a variety of foods rich in these essential nutrients and for a balanced diet it is important to eat quantities of each of these foods within acceptable limits.

4.1 Macronutrients contribution to the diet of a Marshallese

Proteins, fats and carbohydrates contribute respectively around 16, 23 and 60 percent to the average dietary energy consumed, and the Marshallese therefore have a diet rich in proteins and fats, exceeding or close to the upper limit of the WHO/FAO/United Nations University (UNU) norms for a balanced diet[14] (ADePT table 1.10).

BOX 2
Essential macronutrients

Carbohydrates are critical to the function of the body. They are broken down into glucose, which is the primary source of fuel for the body and brain. Not only do they provide energy for the body, but they also help stabilize blood sugar levels and preserve muscle mass by preventing the breakdown of proteins for energy. Whole grains, fruits and vegetables are considered as healthy carbohydrates.

Fibre is an indigestible form of carbohydrate. It is not an essential nutrient and therefore an inadequate amount does not result in biochemical or clinical symptoms of a deficiency. However, diets high in fibre have shown de-creased risk for obesity, high cholesterol and heart disease. Fruits, vegetables and whole grain products all contain high amounts of fibre.

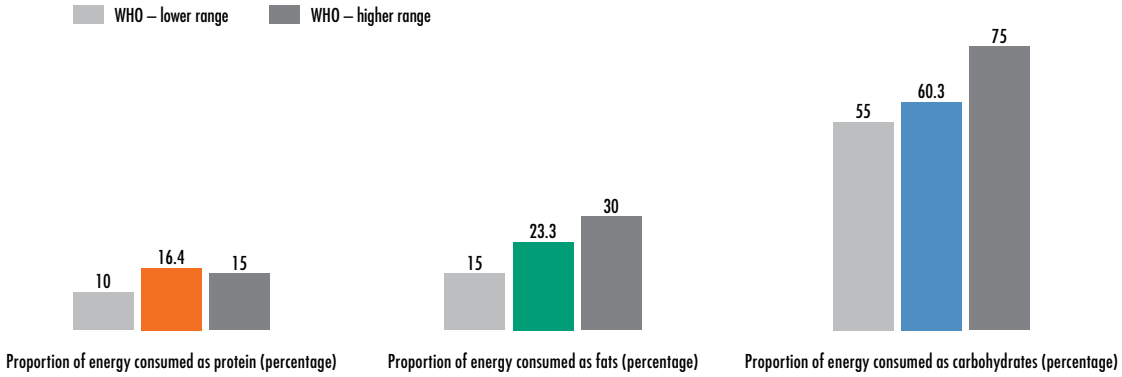
Proteins are critical to good health. From forming muscle to creating new enzymes and hormones, getting enough protein into the diet is key. Proteins are made up of building blocks called amino acids. There are 20 types of amino acids, all of which are important. While animal proteins provide adequate amounts of all essential amino acids, plant-based proteins are typically lacking in one or more. The best way to ensure adequate protein intake is to include a variety of protein foods in the diet, such as fish, meat, eggs, dairy, nuts and beans.

Fat is an essential nutrient that provides energy, boosts the absorption of certain vitamins and helps protect your organs from damage. Some types of fat are better than others, however. Saturated fats for example, are a type of fat found in red meat, whole milk and other whole-milk-based dairy foods, cheese, coconut oil, and many commercially prepared baked goods and other foods. A diet rich in saturated fats can increase the risk of heart disease and they should be limited to less than 10 calories a day. Unsaturated fats, on the other hand, can actually help protect the heart and aid in the prevention of heart disease. Healthy sources of fat include nuts, avocados, salmon, olive oil, flaxseed and nut butters.

To reach a balanced diet, WHO recommends that on average, proteins contribute 10 to 15 percent of total dietary energy consumed, fats contribute 15 to 30 percent and carbohydrates contribute 55 to 75 percent.

FIGURE 13
Overall diet is rich in saturated fats and proteins

Contribution of macronutrients to the total dietary energy consumption (percentage)



SOURCE: Marshall Islands 2019/20 HIES.

Only one individual in three in the Marshall Islands has access to a balanced diet. The contribution of fats and proteins to the average dietary energy is much higher for rural households than for urban households and the same trend is observed among the wealthiest households or households involved in fishing, livestock or copra activities. With respective contributions of 62 percent and 60 percent, the diet of food insecure households is richer in carbohydrates than that of food secure households. For the latter, the contribution of fats is much higher, at 24 percent compared to 21 percent. Food insecure households tend therefore to consume energy-dense foods that are richer in carbohydrates while food secure households tend to consume energy-dense foods richer in fats.

On average, a Marshallese consumes 119 grams of proteins per day, 77 grams of fats and 415 grams of carbohydrates, with higher quantities of macronutrients observed among the wealthiest households or households with no child. This is not surprising because macronutrients yield the energy consumed,[I] and these population groups are also those presenting the highest level of DEC.

Fish and meat products alone contribute more than 43 percent of the proteins consumed and cereal products bring more than 60 percent of the carbohydrates consumed. Even if on average the quantity of fish and fish products consumed is much higher than that of meat and meat products (180 edible grams/capita/day versus 123 edible grams/capita/day), 23 percent of the fat consumed comes from meat, while fish and fish products bring only 11 percent of the total amount of fats consumed.

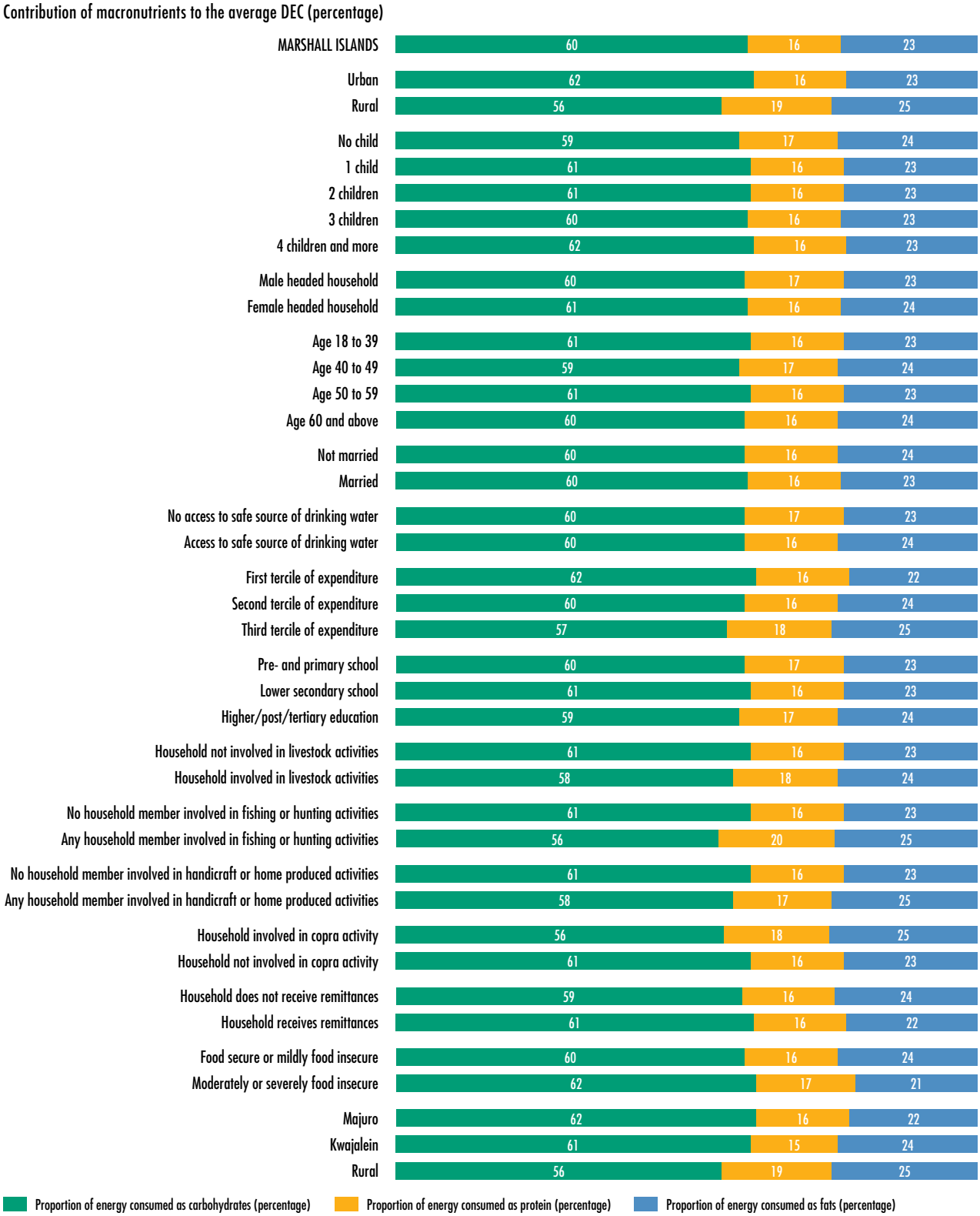
It may be recommended to reduce the overall consumption of high-fat meat products and consume other sources of foods rich in protein with lower fat content (such as low-fat meat, fish or pulses). Of note also is the higher contribution of proteins consumed among households involved in fishing or livestock activities compared to those not involved in these activities. This finding is not suprising for households involved in fishing activities, but is surprising for households involved in livestock activities, for which less than 3 percent of the dietary energy consumed from meat comes from their own production. This could be because 42 percent of households involved in fishing activities are also involved in livestock activities.

Despite fibre not being an essential nutrient, consumption of foods rich in fibre decreases intestinal obstruction, lowers the risk of diabetes, heart disease and colon cancer. There is no determined average requirements for fibre, only population intake goals or adequate intake. And only when the mean consumption of fibre is higher than the adequate intake can it be said that the risk of fibre inadequacy is low. A Marshallese consumes on average 14 grams of fibre per day, which is far below the 25 grams of dietary fibre per day recommended by most authoritative institutions.[II] In the Marshall Islands all population groups present an average level of fibre consumption well below the recommended quantity, and the least wealthy households are the group most at risk. Increasing consumption of pulses, avocado, whole wheat cereals, brown rice or green leafy vegetables would substantially reduce fibre inadequacy in the Marshall Islands.

[I] One gram of protein, fats, carbohydrate, fibre and alcohol brings respectively 4, 9 4,2 and 7 kcal.
[II] Such as European Food Safety Authority (EFSA), United States Health and Medicine Division, and the World Cancer Research Fund (WCRF).

FIGURE 14

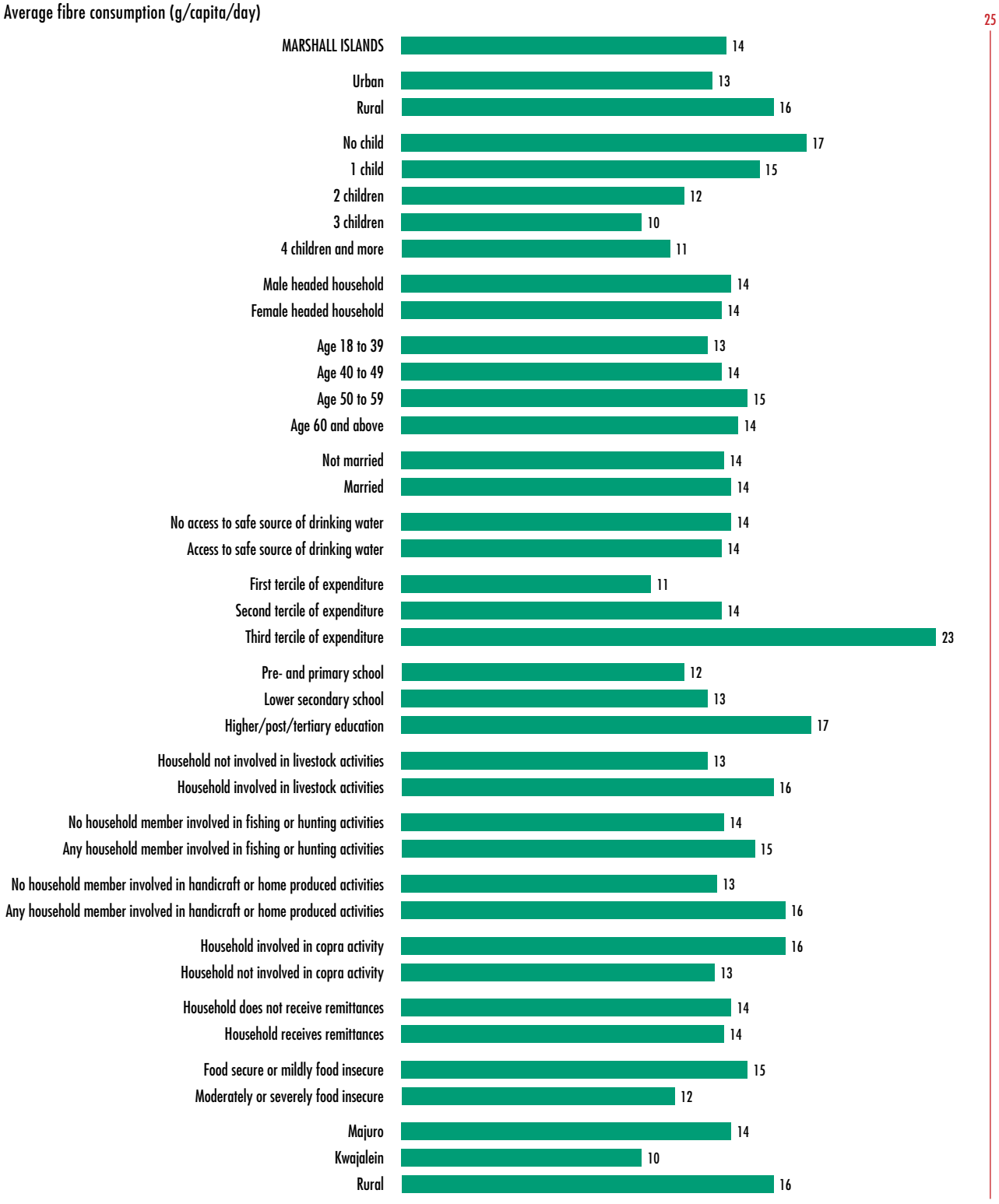
National disparities in the contribution of macronutrients to the average dietary energy consumption by population groups



SOURCE: Marshall Islands 2019/20 HIES.

FIGURE 15

Average quantity of fibre consumption by population groups (g/capita/day)



SOURCE: Marshall Islands 2019/20 HIES.

4.2 Apparent consumption of vitamins[I, II]

Vitamins help the body grow and function the way it should. They are five types of vitamins (A, B, C, D, E and K) and they have different jobs in the body, from helping resist infections to keeping the nerves healthy, helping the body get energy from food, or blood to clot properly. This report looks at vitamins A, B1, B2, B12 and C.

4.2.1 Vitamin A

BOX 3
Vitamin A

Vitamin A is essential for health, supporting cell growth, immune function, foetal development and vision. According to the WHO, vitamin A deficiency is the leading cause of preventable blindness in children worldwide; it also increases the severity and risk of dying from infections like measles and diarrhoea, raises the risk of anaemia and death in pregnant women and negatively affects the foetus by slowing growth and development.

There are two forms of vitamin A found in food: beta-carotene (found in certain plant foods, such as kale and cabbage and especially those that are orange, red and yellow, such as sweet potatoes) and retinol (found in certain animal foods like egg yolks, salmon and organ meats).

With an average quantity available for consumption of around 300 µg/capita/day (expressed in retinol equivalent), vitamin A adequacy (percentage corresponding to the ratio of vitamin available for consumption to average requirement[III] and 100 being the target) is partly reached for the Marshall Islands.[IV] However, this does not hold for all population groups, as adequacy is reached only in urban areas, or within the wealthiest households or households with no more than one child or with a high level of education. Adequacy is also reached for households with access to a safe source of drinking water and for food secure households, which tends to confirm the assumption that poor access to a safe source of drinking water limits access to diversified and nutritious foods.[V] Of note also are the disparities in vitamin A available for consumption between Majuro, Kwajalein and rural areas. With an average quantity of vitamin A available for consumption of 362 µg/capita/day, vitamin A adequacy is reached in Majuro, while it is far from being reached in Kwajalein and rural areas where vitamin A available for consumption represents respectively 75 percent and 80 percent of the requirements.

Despite their very low consumption (respectively 5 g/capita/day and less than 2 g/capita/day), margarine and butter contribute alone 21 percent of vitamin A available for consumption. Reef fish and chicken are the other main sources of vitamin A, together bringing 24 percent of the vitamin A available for consumption, but mainly because of their high consumption, as the vitamin A content of these products is very low.[VI] Therefore, to increase vitamin A consumption it is recommended that households eat more carrots or green leafy vegetables such as cabbages or taro leaves, both very rich in vitamin A and lower in fat than chicken.

I Here we refer to the quantity of vitamins available for consumption by the household. Note that the content and quality of the vitamin is affected by the way the food is stored, prepared, processed, held warm or reheated and cooked and therefore there may be a considerable difference between the amount and quality of vitamins available for consumption and amount and quality of vitamins ingested.

II This analysis excludes the potential contribution of food consumed away from home to the total amount of vitamins available for consumption.

III The source for estimated average requirements of vitamin A is the FAO/WHO expert consultation on vitamin and mineral requirements in human nutrition. Second edition 2004.

IV It is important to note that the amount of vitamin available for consumption may be enough to cover the requirements of a population group but this does not automatically imply that all households (or household members) belonging to this population group have equal access to this amount of vitamin. This footnote holds for all the vitamins discussed in this report.

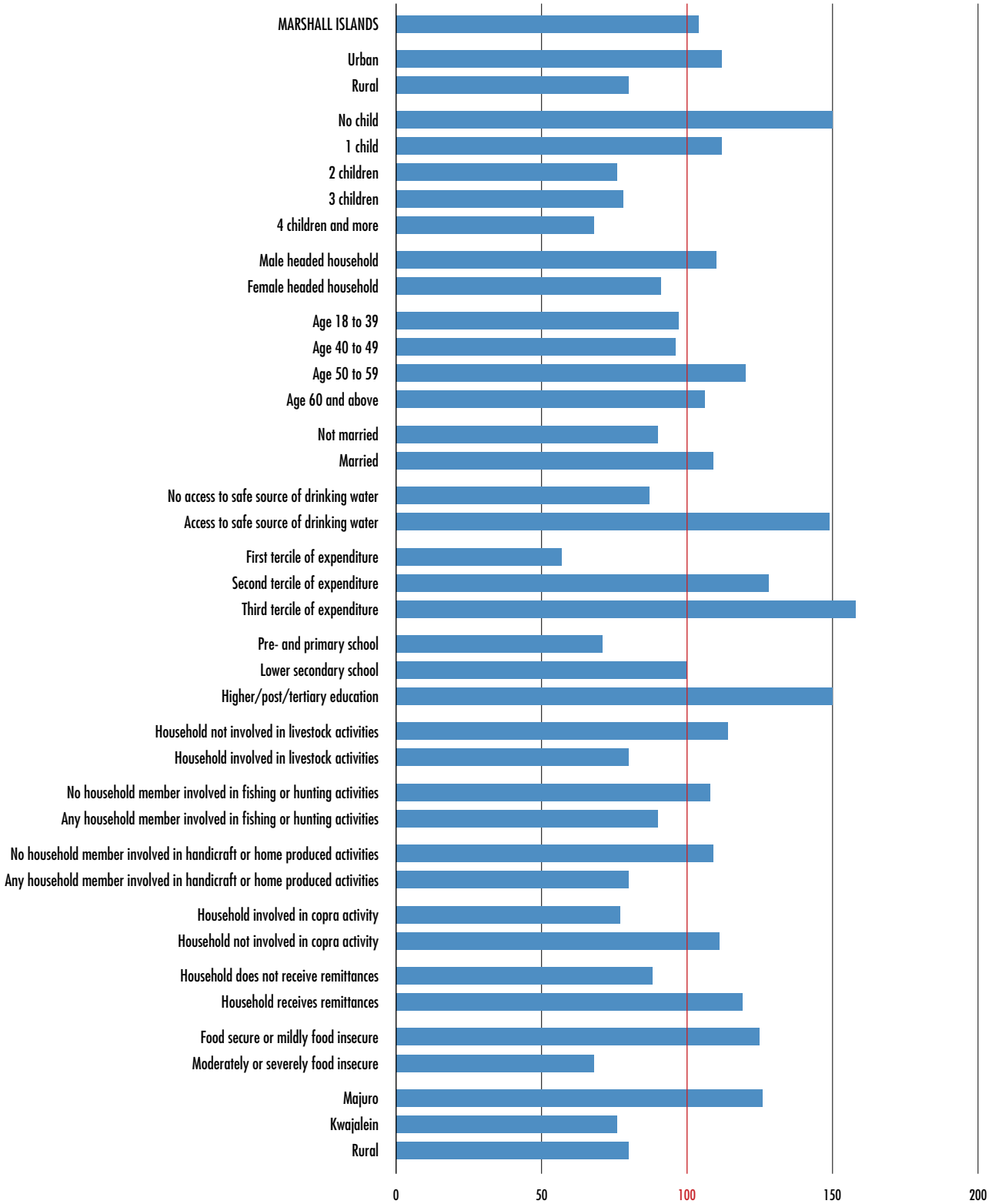
V The quality of the water used to clean or cook the food also hampers the property of the nutrient absorbed, but the nutrient loss due to poor access to a safe source of drinking water cannot be assessed through food data collected in HIES.

VI 100 grams of reef fish or chicken meat bring respectively 31 µg and 33 µg of vitamin A (retinol equivalent) compared to 1 730 µg and 1 010 µg brought by carrot and margarine respectively.

FIGURE 16

National disparities in the vitamin A available for consumption

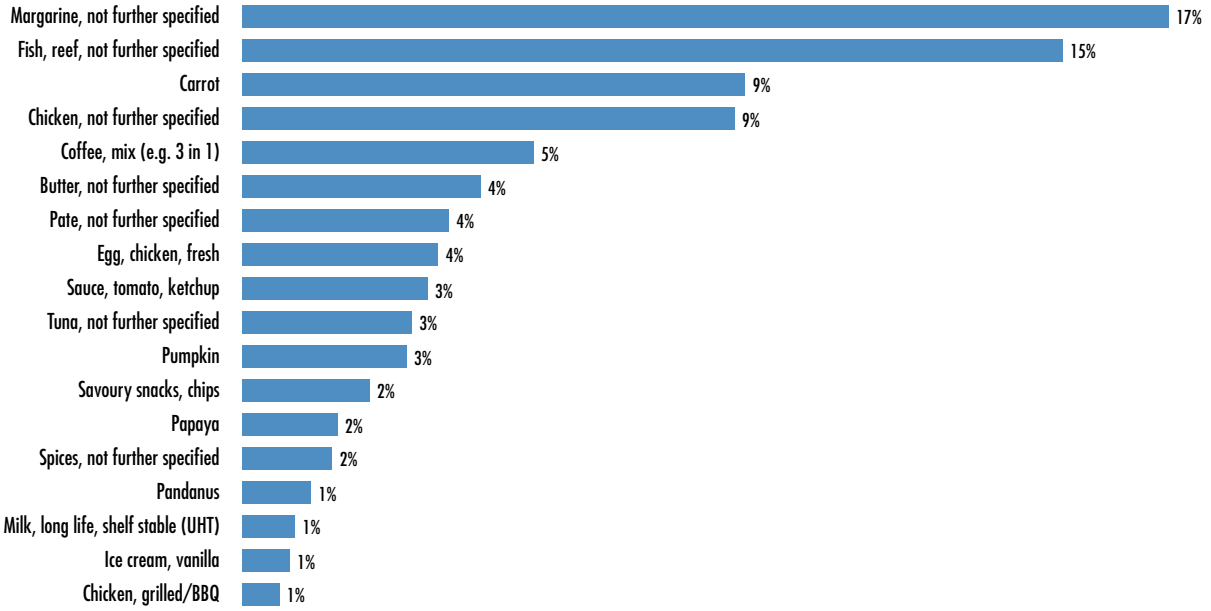
Vitamin A adequacy as measured by the ratio of the amount of vitamin A available for consumption as a percentage of the average requirements (percentage)



SOURCE: Marshall Islands 2019/20 HIES.

FIGURE 17
Main sources of vitamin A

Contribution of main food products to the vitamin A available for consumption (percentage)



SOURCE: Marshall Islands 2019/20 HIES.

4.2.2 Vitamin B group

BOX 4
B Vitamins

B vitamins are water soluble and therefore do not stay long in the body. After the body uses these vitamins, amounts left over leave the body through the urine. B vitamins are important for the metabolism of proteins. They offer the following health benefits:

- Vitamin B1 (thiamine) helps to release energy from foods and is important in maintaining nervous system function.
- Vitamin B2 (riboflavin) helps to promote good vision and healthy skin and is also important in converting the amino acid tryptophan into niacin.
- Vitamin B12 helps in the formation of red blood cells and in the maintenance of the central nervous system.

Apart from B12, the body cannot store these vitamins for long periods, so they have to be replenished regularly through food. Foods rich in Vitamin B are meat, poultry, seafood, eggs, dairy products and fortified cereals.

With an average daily quantity available for consumption of vitamin B1 and B2 of around 1.1 mg/capita and vitamin B12 of 6.3 µg/capita, adequacy with respect to the average daily requirements[I] of 0.88 mg/capita, 0.91 mg/capita and 1.83 µg/capita is met at national level (100 percent or more being the target) (ADePT table 5.2). Adequacy in vitamin B12 is reached for all population groups, and for vitamin B1 it is almost reached for all population groups except for households belonging to the first tercile of expenditure. The picture is, however, different for vitamin B2, for which adequacy is not reached for some households belonging to the first tercile of expenditure, or households with at least two children, or households with the lowest level of education, or food insecure households or those involved in handicraft activities.

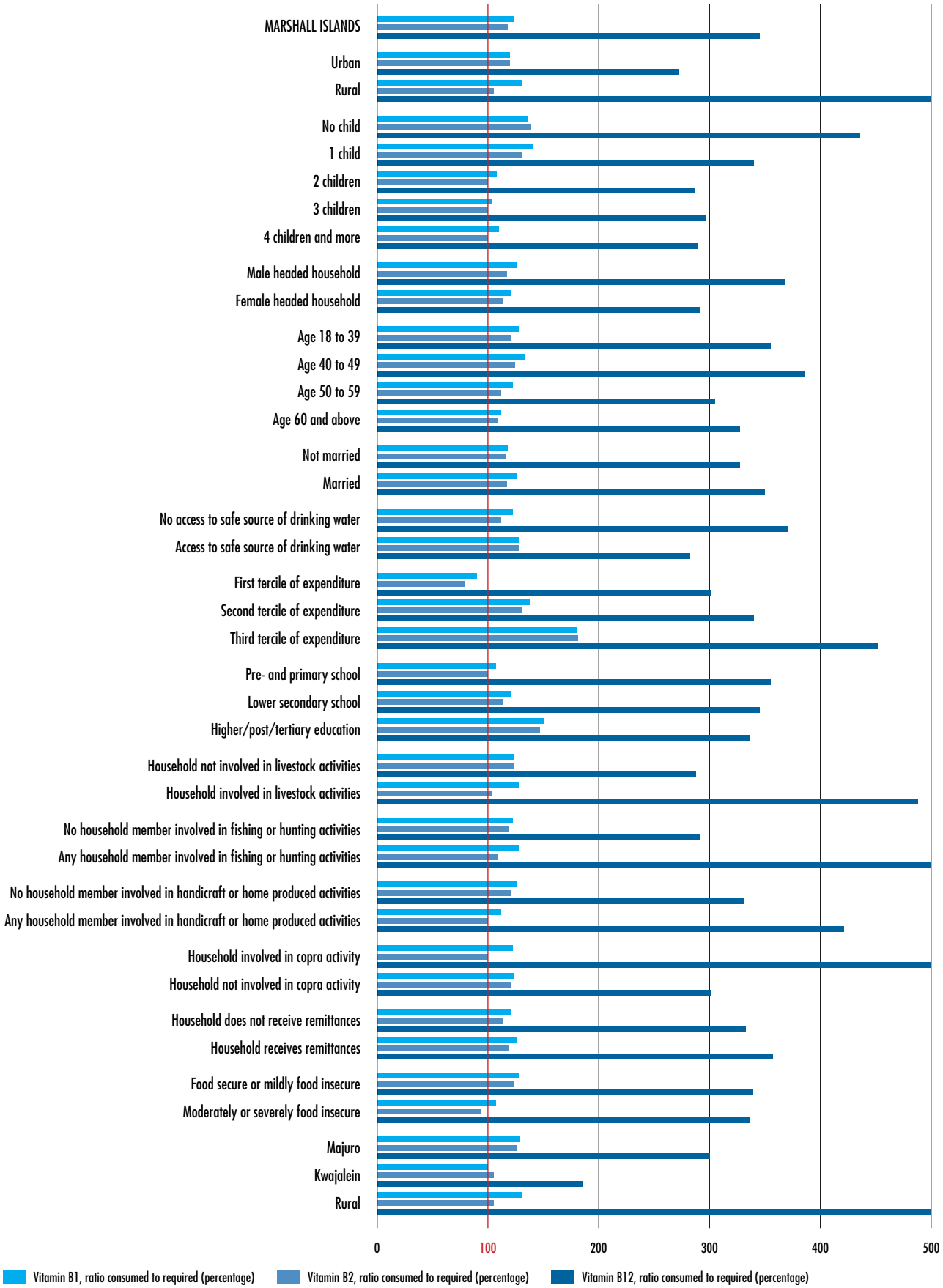
Fish being the main provider of vitamin B12, its consumption is much higher among households involved in fishing activities than among others.

[I] The source of the estimated average requirements used for vitamins B1, B2 and B12 is the FAO/WHO expert consultation on human vitamin and mineral requirements in human nutrition. Second Edition (2004).

FIGURE 18

National disparities in adequacy of vitamin B

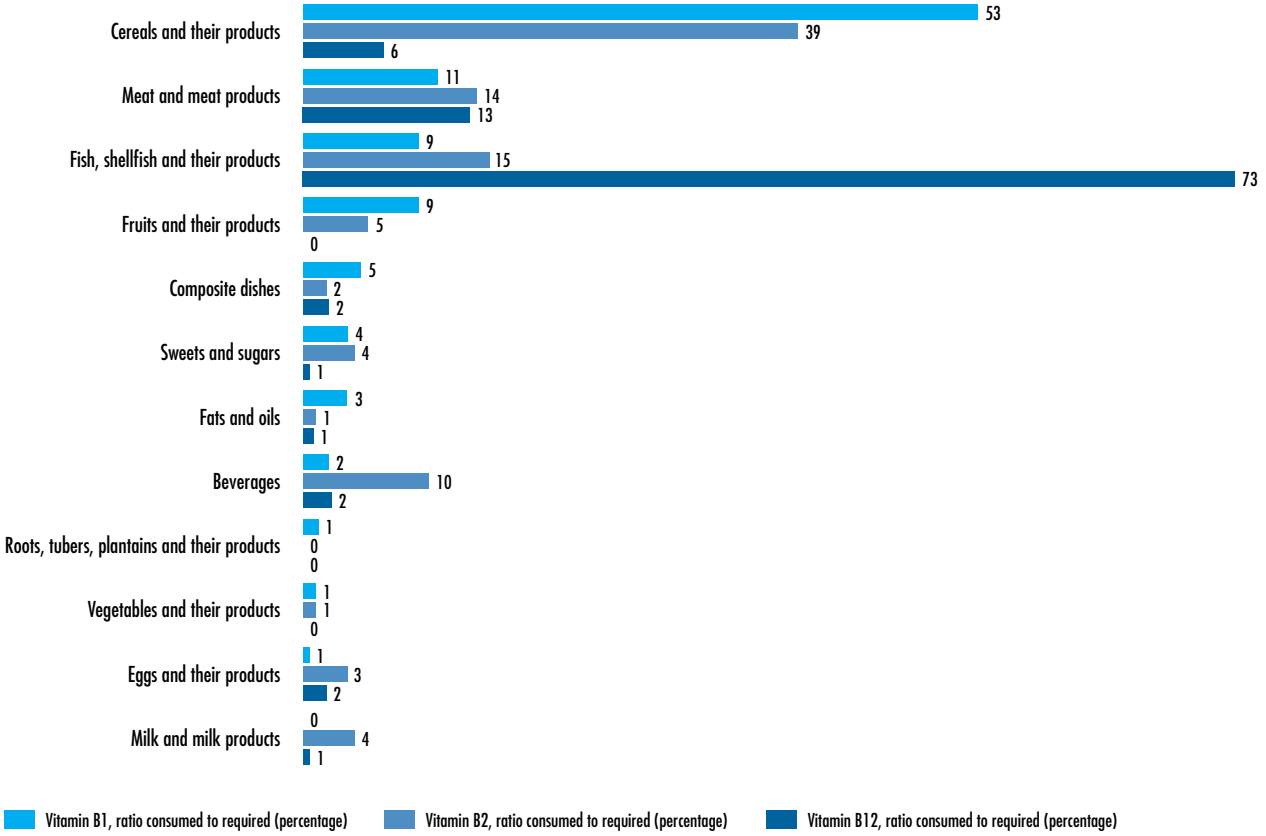
Vitamin B1, B2 and B12 adequacy as measured by the ratio of the amounts of vitamin B1, B2 and B12 available for consumption as a percentage of the average requirements (percentage)



SOURCE: Marshall Islands 2019/20 HIES.

FIGURE 19
Main sources of vitamin B

Main sources of vitamin B1, B2 and B12 available for consumption (percentage)



SOURCE: Marshall Islands 2019/20 HIES.

With respective contributions of 53 percent and 39 percent, cereals and cereal products are the main providers of vitamin B1 and B2. The main cereal products bringing most of the vitamin B1 available for consumption are flour (16 percent), rice (14 percent) and breakfast cereals (13 percent), and the main cereal products bringing most of the vitamin B2 are noodles (18 percent) and breakfast cereals (9 percent). Chicken and reef fish are also an important source of vitamin B2 in Marshall Islands, together bringing almost 19 percent of the vitamin B2 available for consumption. Of note also is the important contribution of non-alcoholic beverages like coffee mix (6 percent) or tea (2 percent) to the total quantity of vitamin B2 available for consumption. To increase vitamin B1 and B2 consumption, and ensure adequacy for all, more breakfast cereals (provided their fat and sugar content are reduced) or skimmed milk powder are recommended. Fish and fish products alone bring 73 percent of the vitamin B12 available for consumption.

4.2.3 Vitamin C

BOX 5
Vitamin C

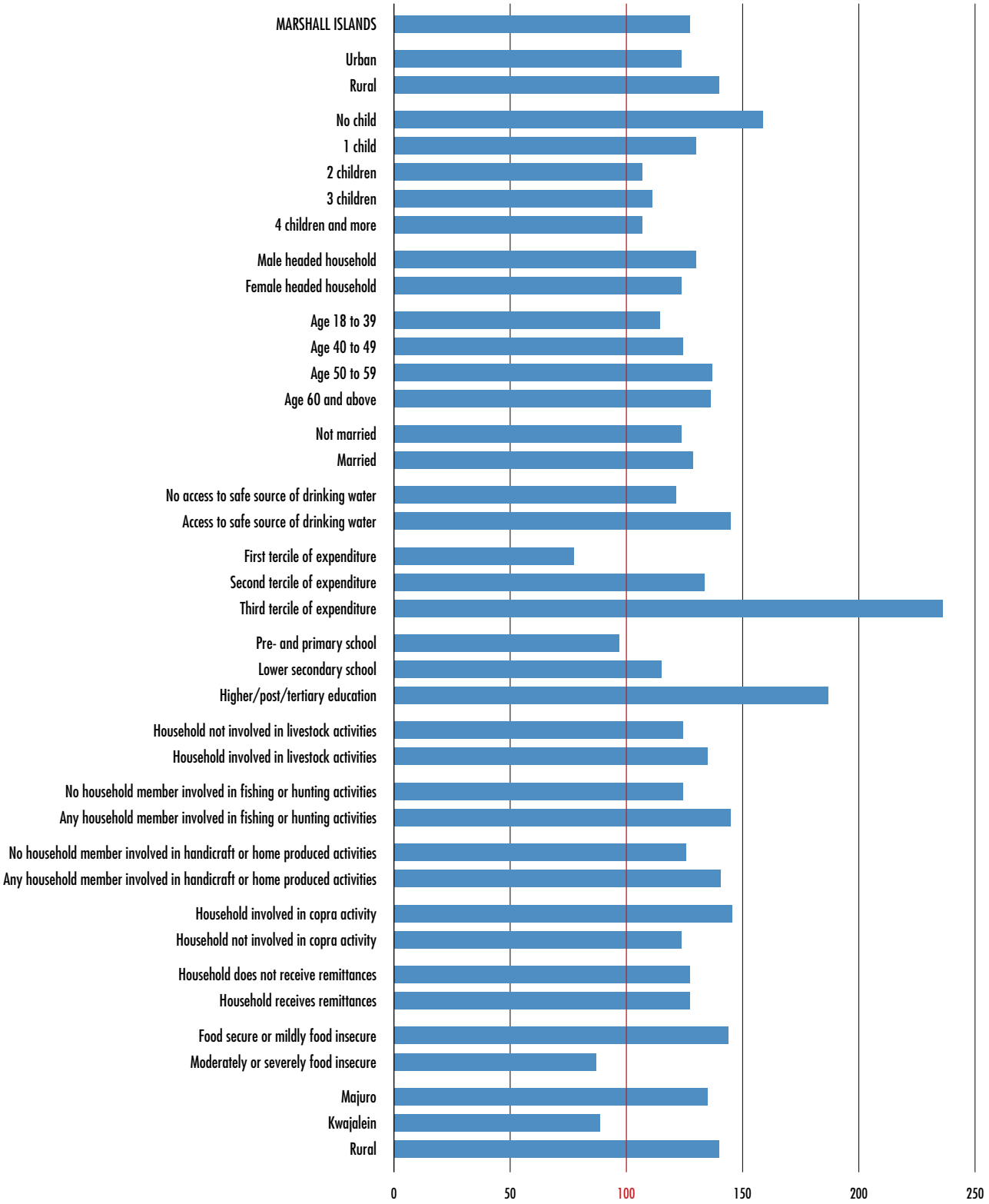
Vitamin C, or ascorbic acid, is a water-soluble vitamin. It is central to iron absorption and synthesis of collagen. It aids in wound healing and bone formation while improving overall immune function; for example, it is important for defence against infections such as common colds. Vitamin C stimulates system immunization, it is an anti-allergic and antioxidant, it helps in the formation of "cement" for connective tissues, it heals wounds, maintains teeth and gum health, facilitates iron absorption and is necessary for eye health.

The richest natural sources of vitamin C are fruits and vegetables.

FIGURE 20

Average consumption and average requirement of vitamin C by population groups

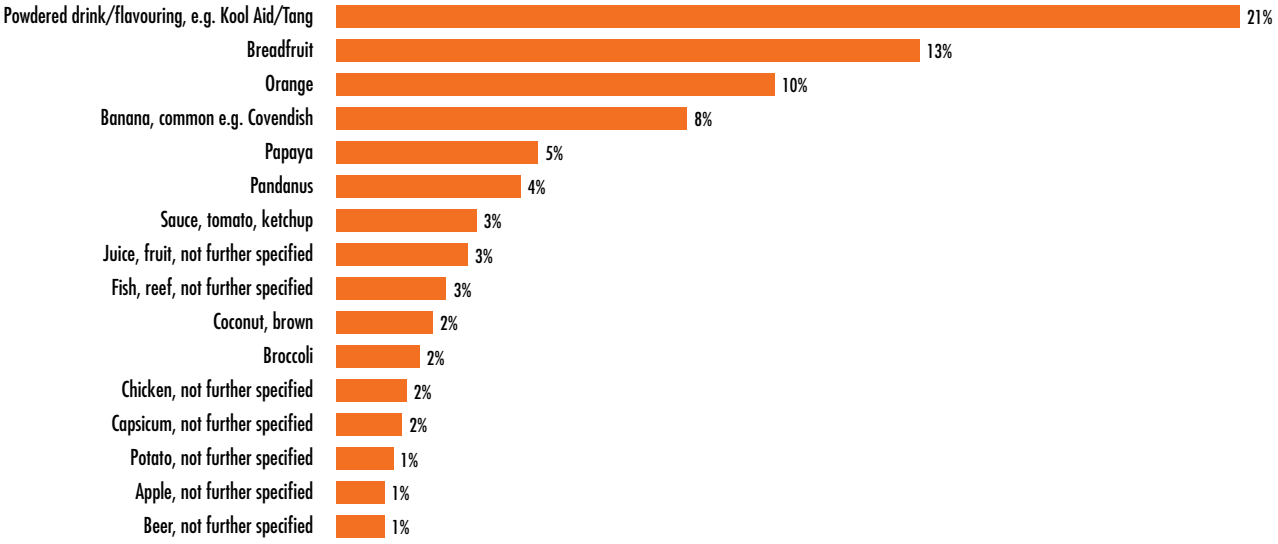
Vitamin C adequacy as measured by the amount of vitamin C available for consumption as a percentage of the average requirements (percentage)



SOURCE: Marshall Islands 2019/20 HIES.

FIGURE 21
Main sources of vitamin C

Contribution of food products to the average of vitamin C available for consumption (percentage)



SOURCE: Marshall Islands 2019/20 HIES.

Despite the low quantities of fruits and vegetables consumed on average per day, vitamin C adequacy in the Marshall Islands is reached at national level with an average quantity available for consumption of around 44 mg/capita/day that is well above the national requirements of 35 mg/capita/day[I] (ADePT table 5.3).

Vitamin C adequacy is reached for almost all population groups except for households belonging to the first tercile of expenditure or households whose head has a pre- or primary school level of education or households who are experiencing moderate or severe levels of food insecurity. Households with at least two children are also at risk of inadequacy, as the quantity of vitamin C available for consumption is close to their requirements. Disparities among urban households can also be observed, since the amount of vitamin A available for consumption in Kwajalein is one third lower than that observed in Majuro so that adequacy in vitamin A is not reached in Kwajalein.

Rural households tend to have access to a higher quantity of vitamin C available for consumption than urban households, with respective quantities of 48 mg/capita/day and 43 mg/capita/day. Rural households have better access to locally grown fruits like breadfruit, banana, papaya or pandanus, which are important sources of vitamin C, together contributing 31 percent of the overall vitamin C available for consumption. But flavoured powdered drinks remain the main source of vitamin C in the Marshall Islands, contributing alone more than 21 percent of the vitamin C available for consumption. To increase the consumption of vitamin C it is recommended that households eat more locally grown fruits and substitute powdered drinks rich in sugar and energy with fresh fruit juice[II] when possible.

4.3 Apparent consumption of essential minerals

Minerals such as calcium and iron are essential nutrients found in many different types of plant- and animal-based foods. Calcium is a macro-mineral required in greater amounts than trace minerals such as iron. Both types of minerals support a wide variety of bodily functions, ranging from building and maintaining healthy bones and teeth to keeping muscles, heart and brain working properly.

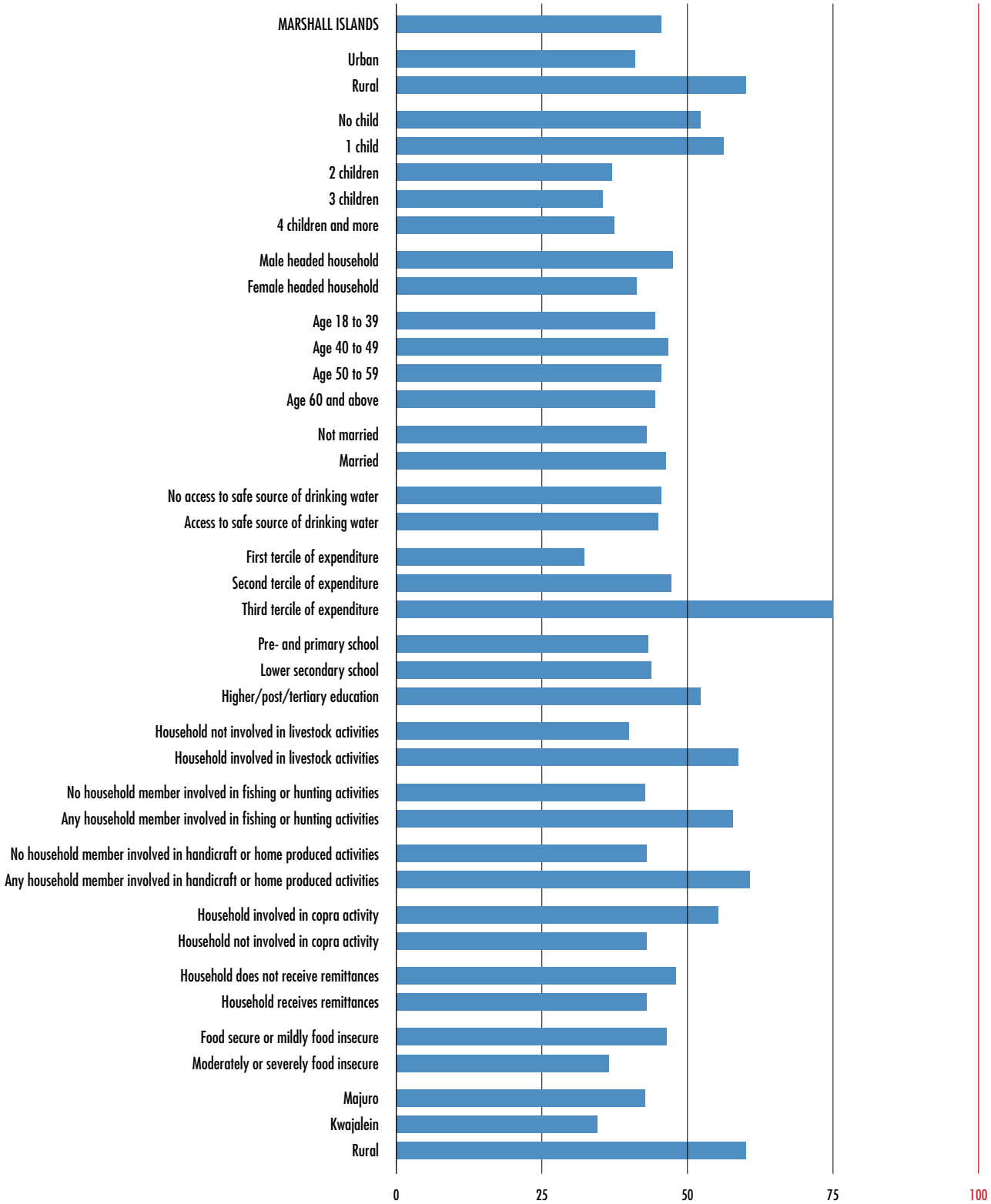
[I] The source of the estimated average requirement used for vitamin C is the FAO/WHO expert consultation on human vitamin and mineral requirements in human nutrition. Second Edition (2004).

[II] A 100 gram drink made with 20 grams of powdered drink brings around 19 grams of carbohydrates and 76 kcal compared with 100 grams of orange juice that brings 8.4 grams of carbohydrates and 33.6 kcal.

FIGURE 22

Calcium adequacy is far from being reached for all population groups

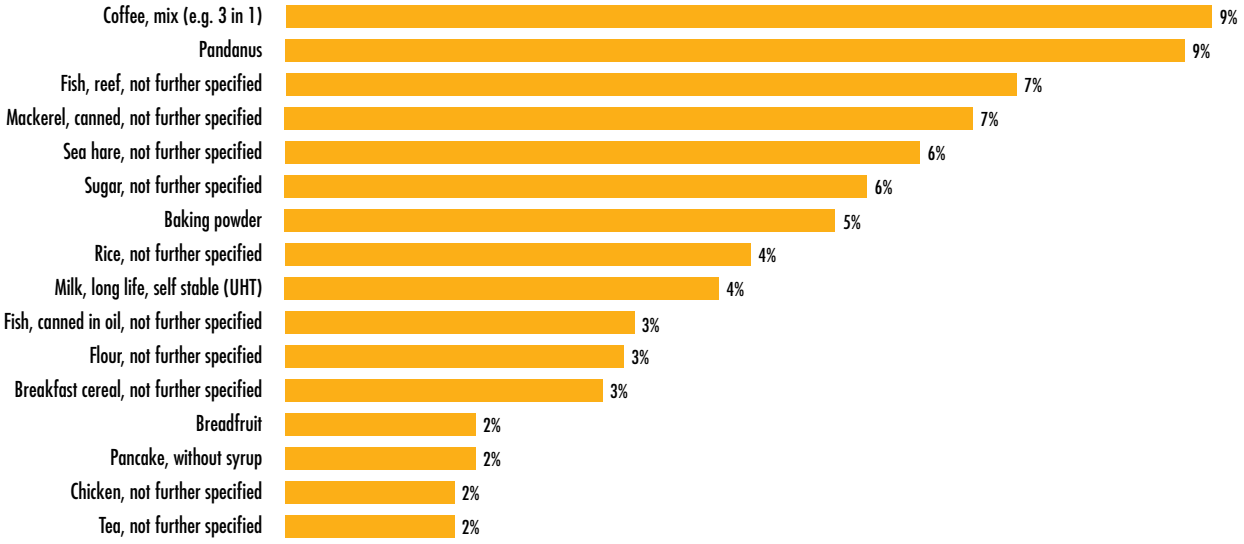
Calcium adequacy as measured by the amount of calcium available for consumption as a percentage of the average requirements (percentage)



SOURCE: Marshall Islands 2019/20 HIES.

FIGURE 23
Main sources of calcium

Main products contributing to the amount of calcium available for consumption (percentage)



SOURCE: Marshall Islands 2019/20 HIES.

4.3.1 Calcium

BOX 6
Calcium

Most of the calcium in the body is found in the bones, and its primary role is to promote healthy bones and teeth. The main foods rich in calcium are dairy products like milk, cheese and yoghurt. However, many non-dairy sources such as seafood, leafy greens, legumes, dried fruit and tofu are also high in calcium. Foods such as cereal and flour can also be fortified in calcium.

With an average consumption of less than 400 mg/capita/day, calcium consumption in the Marshall Islands is well below the average requirements of 857 mg/capita/day[I] (ADePT table 5.3). Calcium supply adequacy is far from being reached for all population groups.

Despite its relatively low consumption of 34 edible g/capita/day, pandanus is the second main source of calcium, contributing 9 percent of the calcium available for consumption, after coffee mix, which is the first source of calcium because of the powdered milk contained in these coffee mix preparations. Because of their marginal consumption in the Marshall Islands (less than 15 g/capita/day), milk and milk products contribute only 6 percent of the total quantity of calcium available for consumption. These products being very rich in calcium, a slight increase of their consumption would considerably affect the overall calcium consumption in the Marshall Islands. One spoon of skimmed milk powder alone (around 10 grams) dissolved in 250 ml of drinking water brings 125 mg of calcium. With an average contribution of 25 percent, the group of fish, shellfish and their products is the main source of calcium, and mainly through the consumption of canned fish (10 percent) (ADePT tables 6.1 and 6.7).

4.3.2 Iron

Iron is one of the essential nutrients for the proper growth and development of the human body. The body cannot prepare iron on its own, so to maintain the amount of iron in the body, iron-rich foods are consumed. Two different sources of iron are found: non-haem sources of iron mostly refer to vegetables like beans, turnips, leafy vegetables, pumpkins and so on, along with other products like legumes, lentils, dairy products and tofu; haem sources of iron include lean meat, chicken liver, lamb, oysters, and tuna fish. The main difference between the two is that haem iron is absorbed faster than plant iron but absorption of haem iron is not regulated.[II]

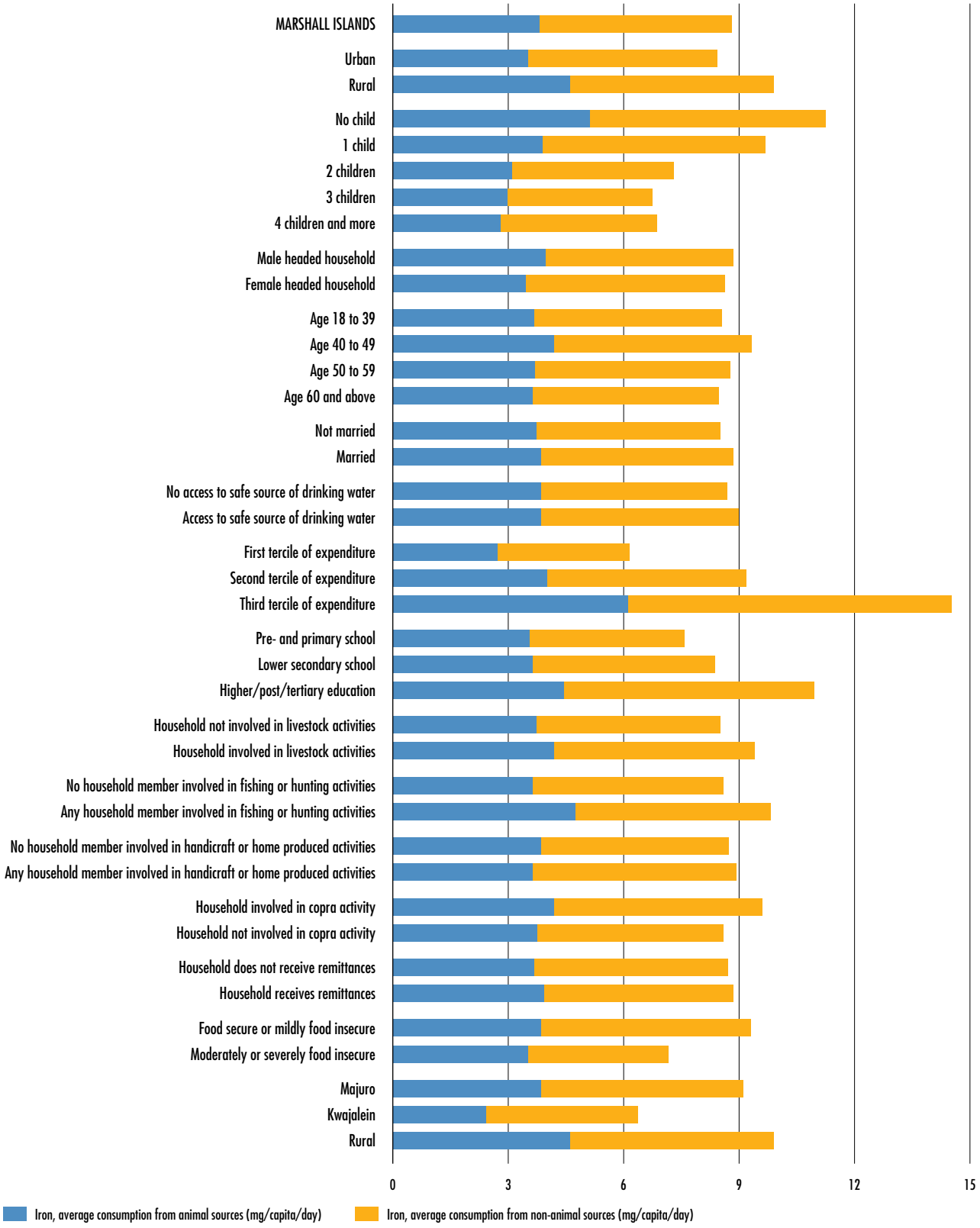
[I] The source of the estimated average requirement used for calcium was HMD (Health and Medicine Division of the USA National Academies of Sciences). Dietary Reference Intakes Tables and Application – Estimated Average Requirements and Adequate Intakes. (As of 30 March 2016)

[II] If your body needs iron, it absorbs more from plants. If you don't need more iron, it absorbs less plant iron, but it will keep on absorbing haem iron, even reaching dangerous levels.

FIGURE 24

National disparities in the amount of iron available for consumption

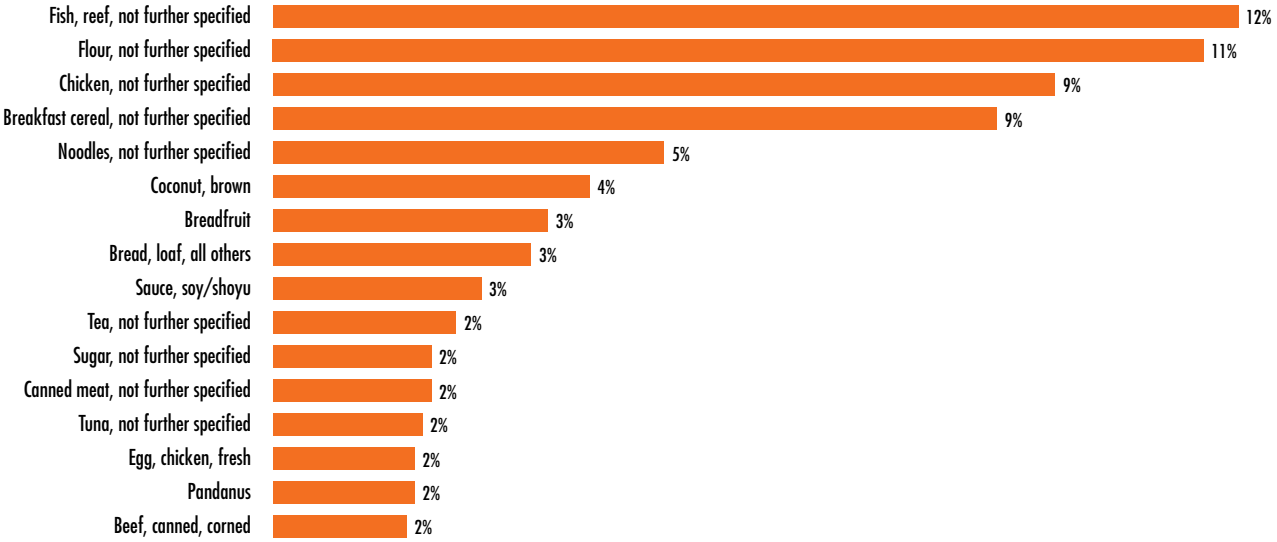
Iron consumption by population groups (mg/capita/day)



SOURCE: Marshall Islands 2019/20 HIES.

FIGURE 25
Main sources of iron

Main products contributing to the amount of iron available for consumption (percentage)



SOURCE: Marshall Islands 2019/20 HIES.

Quantities of iron needed vary greatly by age and gender and are higher for women than for men. Children need on average 7 mg to 10 mg of iron per day, a male aged from 19 to 99 years needs 8 mg of iron per day, while a woman aged from 19 to 50 years needs more than 18 mg of iron a day, and older women will need only 8 mg a day.[15]

At 9 mg/capita/day, the average quantity of iron available for consumption in the Marshall Islands is very low and 44 percent of iron is from animal origin (ADePT table 5.4). Important inequalities in accessing iron can be observed within the population. The largest differences are observed between the wealthiest and least wealthy households or between households with no child and households with at least two children. Food insecure households access on average 7 mg/capita/day of iron, which is 2 mg/capita/day less than the amount accessed by food secure households. An important gap can also be observed between households living in Majuro and those living in Kwajalein: the latter access 2.7 mg/capita/day of iron less than households living in Majuro. But in all population groups except that of the wealthiest households, average iron consumption is well below the recommended level.

Reef fish is the main source of iron, contributing 12 percent of the total iron available for consumption, followed by flour (11 percent) and chicken (9 percent). Breakfast cereals, with an average consumption of around 8 g/capita/day, constitute another important source of iron and contribute around 9 percent of the iron available for consumption. To decrease the prevalence of anaemia it may be recommended to further increase the consumption of iron-enriched foods such as cereal flours (the most common vehicles for iron fortification programmes), breakfast cereals (provided the added sugar and fat content is low), green leafy vegetables, seafood and dried fruits. Animal offal also presents a very rich source of iron, but should be consumed in limited amounts because of its very high cholesterol content.

4.4 Healthy living pattern

BOX 7

Group categories following the Pacific guidelines for healthy living

1. Energy-dense foods
   a. To choose: mainly local staple foods
   b. To limit: white rice or processed cereals with low fat or sugar content
   c. To avoid: sugar, fats, or processed foods from cereals with high fat or sugar content
2. Body building foods
   a. To choose: lean meat, fish, nuts, beans, low-fat dairy products
   b. To limit: medium-fat meat, medium fat dairy products, low-fat canned fish, etc.
   c. To avoid: high-fat meat, high-fat dairy products, processed meat
3. Protective foods
   a. To choose: fresh fruits and vegetables
   b. To limit: dried fruits or processed fruits and vegetables with low sugar or salt content
   c. To avoid: processed fruits or vegetables with high sugar content
4. Unclassified foods
   i. Food consumed away from home
   ii. Spices/coffee/tea
   iii. Alcoholic beverages
   iv. Tobacco and kava*

* Not considered as food products

The earlier analysis of the nutrient consumption shows that it is important to eat diverse foods to access all the essential nutrients. It is not only important to have a diversified diet but also to eat these foods in proportions that lead to a healthy diet. In 2018 the Public Health Division of the Pacific Community (SPC) published guidelines for healthy living in the Pacific.[16] The main purpose of the guidelines is to provide background information and guidance for healthy living. Following the recommendations from the guidelines, the food products collected in the 2019/20 HIES were categorized into three groups recommended for consumption for a healthy diet. The groups were further disaggregated into three categories: foods to choose, foods to limit and foods to avoid. In addition to these groups, a fourth category was created to accommodate all the foods not classified according to the Pacific guidelines.

According to this food group classification, around 60 percent of the average dietary energy consumed comes from energy-dense imported foods like rice or flour or locally grown products like breadfruits or brown coconut. Body building foods rich in protein like fish, meat or dairy products contribute around 19 percent of the dietary energy consumed. Protective foods rich in vitamins like fruits and vegetables contribute less than 3 percent of the average dietary energy consumed.[I] Within the products to choose, limit or avoid, the foods to limit and foods to avoid contribute respectively 45 percent and 17 percent of the dietary energy consumed. Around 20 percent of the dietary energy consumed is composed of nutritious foods in the to choose category. Alcoholic beverages as well as spices and meals consumed away from home are classified within the “not classified foods”, but if they were classified there is no doubt that these products would increase the contribution of foods to avoid or limit.

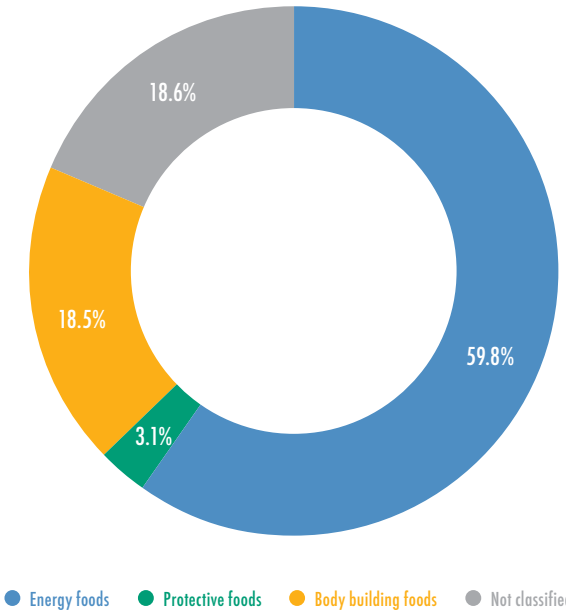
Among the foods to choose, breadfruit is the main energy-dense food, with an average daily edible quantity of 30 g per capita, followed by brown coconut with an average edible quantity of 15 g/capita/day. With average quantities of 39 g/capita/day and 22 g/capita/day respectively, locally grown fruits like pandanus and banana are the main protective foods among which to choose, followed by imported fruits like apple and orange, with a quantity close to 10 g/capita/day. Reef fish and chicken, with an average edible quantity of 145 and 83 g/capita/day respectively, are the main body building foods among which to choose. In terms of foods to limit or avoid, rice alone, with an average consumption of 220 g/capita/day, contributes 61 percent of the dietary energy coming from energy foods to limit, and processed meat contributes 60 percent of the dietary energy coming from body building foods to avoid.

[I] Looking at the contribution of each group to the total dietary energy consumed obviously gives more weight to the group composed of energy-dense foods. Protective foods like fruits and vegetables that are less energy-dense obviously have a lower contribution to average DEC, but dietary energy is the only measure that allows comparison between heterogenous groups. The Pacific guidelines therefore recommend portion sizes for the different foods.

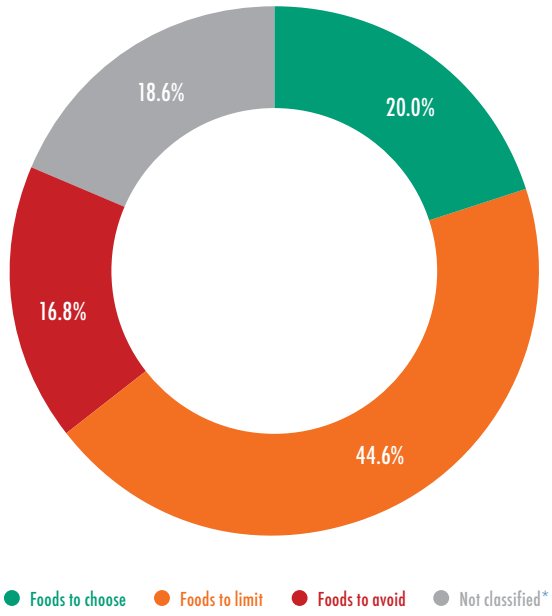
FIGURE 26

Disaggregation of the average DEC according to the Pacific guidelines for healthy living

Disaggregation of the average dietary energy consumption into the three main groups for healthy living



Disaggregation of the average dietary energy consumption in foods to choose, limit or avoid

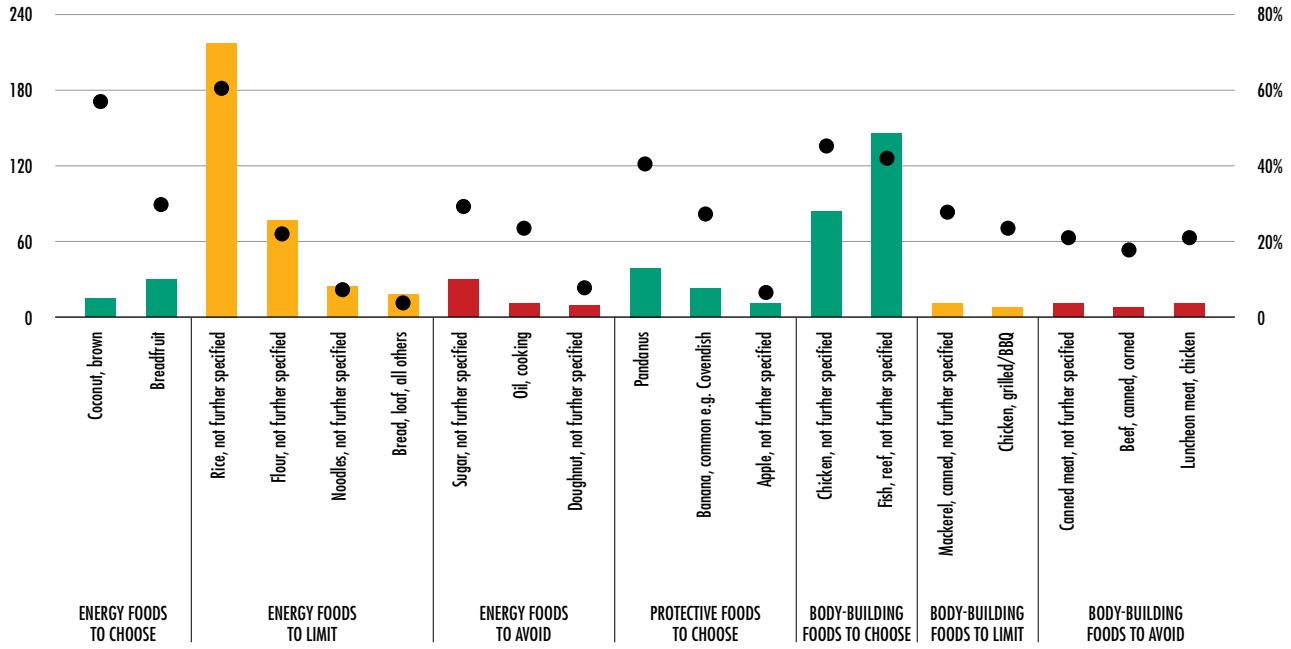


* Food not classified corresponds to food like spices, alcoholic beverages, lunch, breakfast, snacks and dinner consumed away from home.
SOURCE: Marshall Islands 2019/20 HIES.

FIGURE 27

Main products consumed categorized according to the Pacific guidelines

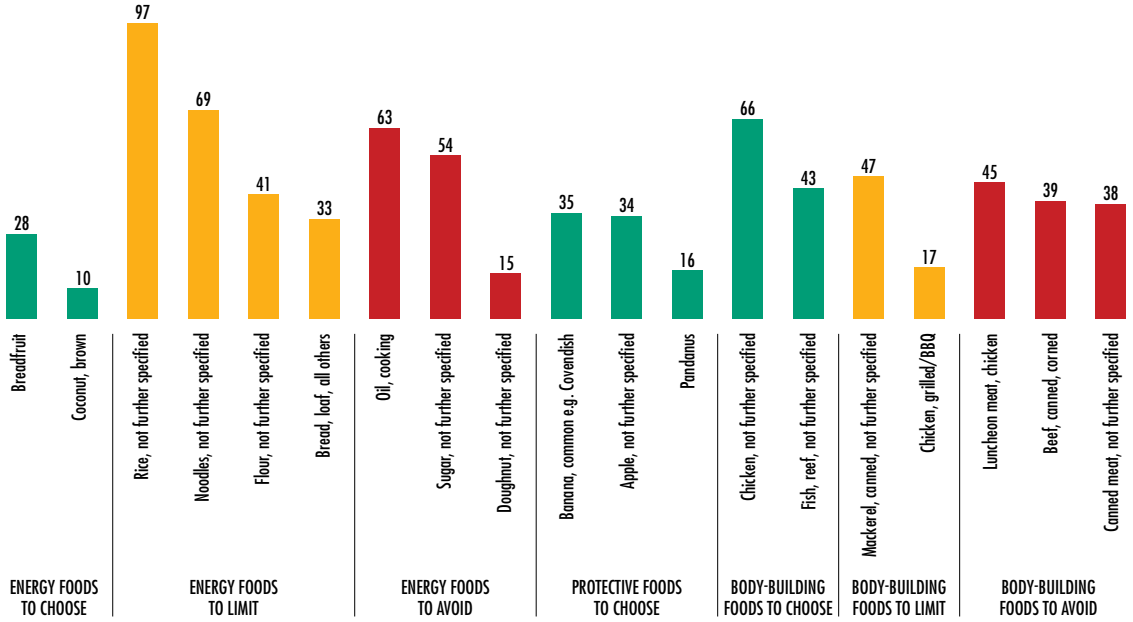
Edible quantities of food products (bar chart) according to healthy living guidelines classification (g/capita/day – left scale) and their contribution (black point) to the dietary energy coming from each category (percent – right scale)



SOURCE: Marshall Islands 2019/20 HIES.

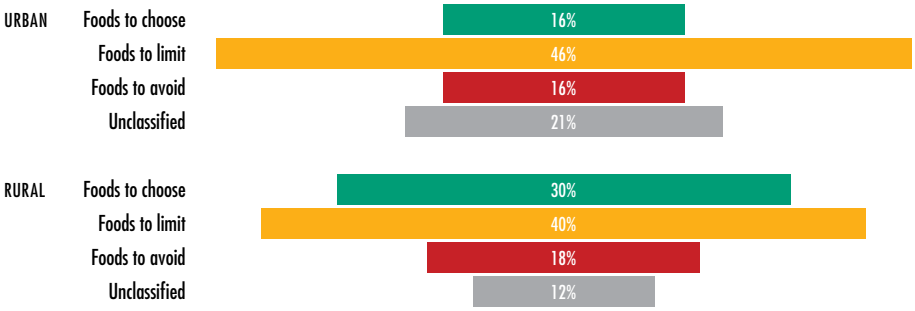
FIGURE 28
Percentage of households consuming the food products to choose, limit or avoid

Percentage of households consuming the foods classified according to the Pacific guidelines for healthy living (percentage)



SOURCE: Marshall Islands 2019/20 HIES.

FIGURE 29
Differences in the dietary pattern between rural and urban areas (as percentage of DEC in each group)



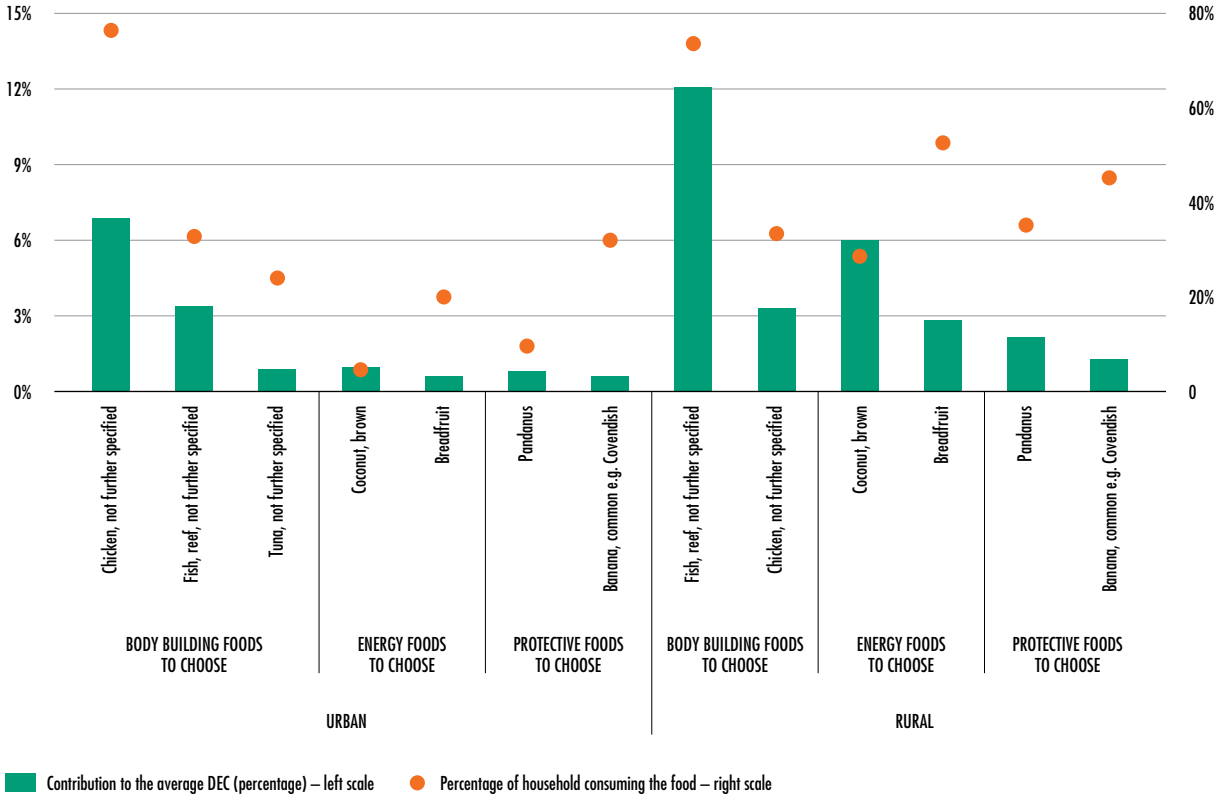
SOURCE: Marshall Islands 2019/20 HIES.

Of the foods contributing the most to the diet, foods to choose are consumed by less than 45 percent of households, except for chicken which is consumed by at least two households in three. When further zooming in on protective foods from which to choose, only 16 percent of households consume pandanus, which is a locally grown food, while 34 percent prefer consuming imported apples. Rice is a food to limit, and it is consumed by 97 percent of households.[I] More than 45 percent of households consume foods to avoid like oil, sugar or luncheon meat. These trends tend to point towards household preferences for imported foods rich in fats and sugar rather than more nutritious local products.

[I] Most of the rice consumed in the Pacific is in the form of white rice, which is less nutritious than brown rice and therefore its consumption should be limited.

FIGURE 30
Distribution of main foods among which to choose in urban and rural areas

Distribution by areas of residence of the main foods among which to choose

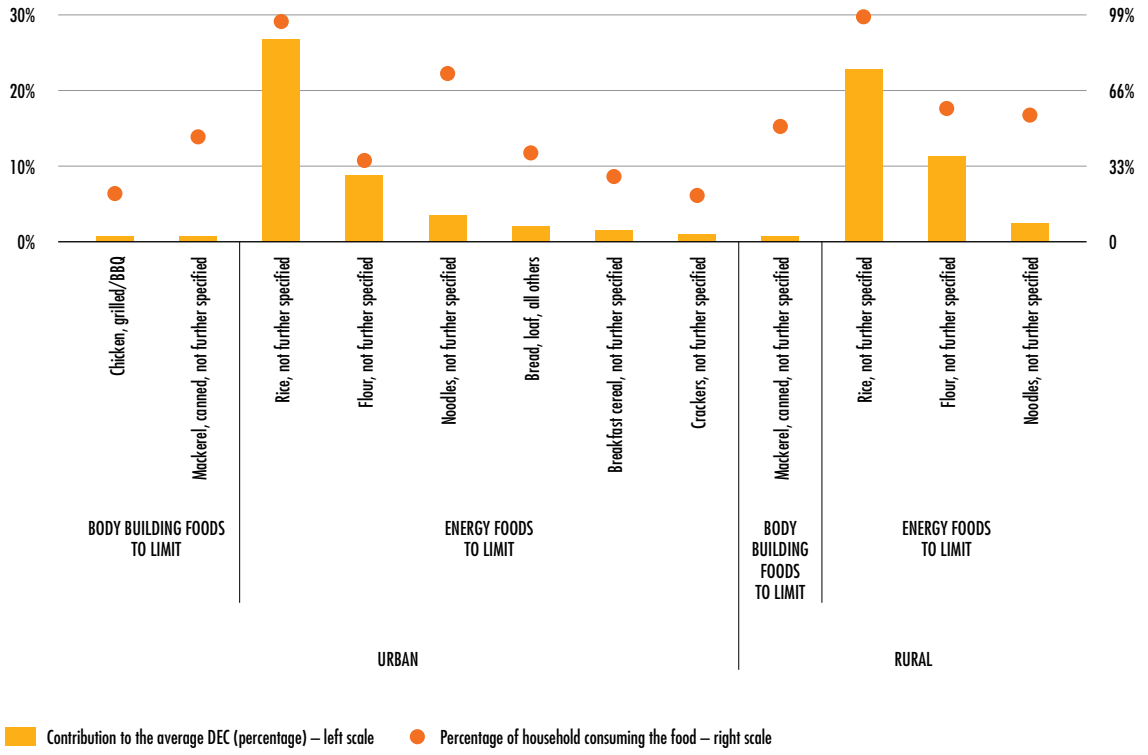


SOURCE: Marshall Islands 2019/20 HIES.

The contribution of foods to avoid to the average dietary energy consumed is higher in rural areas than in urban areas with respective contributions of 18 percent and 16 percent. But in turn, foods among which to choose or foods to limit contribute a larger portion of the dietary energy consumed in rural areas than in urban areas. Unclassified foods such as alcoholic beverages or meals consumed away from home constitute a more important source of dietary energy in urban areas than in rural areas, with respective shares of 21 percent and 12 percent.

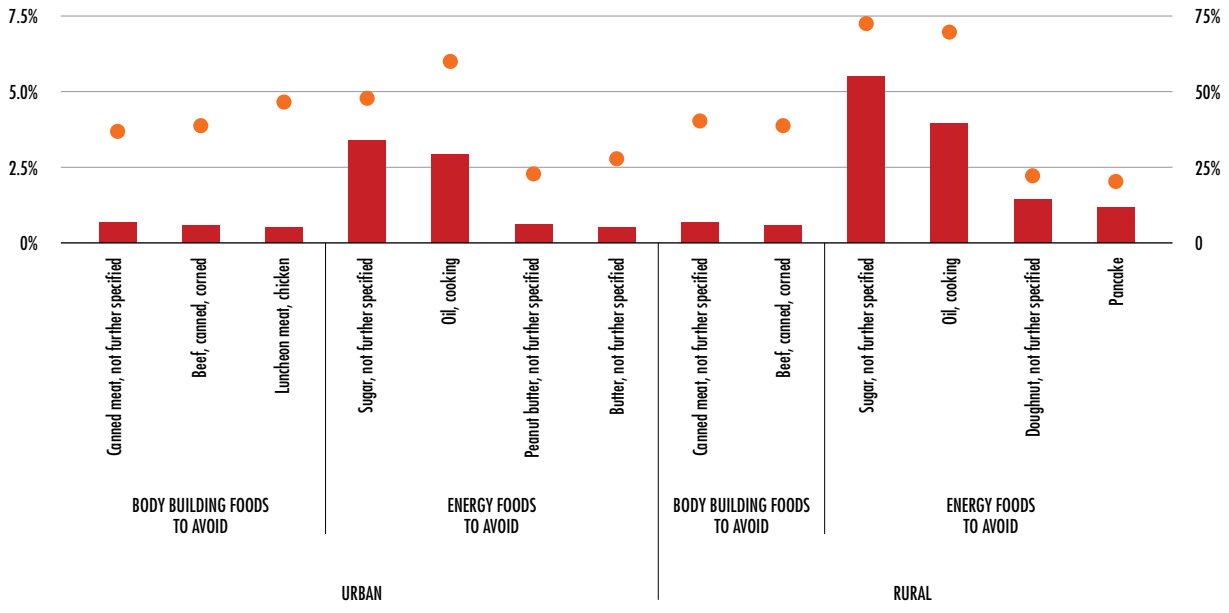
A broader look at the distribution of body building foods among which to choose shows that in urban areas, chicken contributes the most to the average dietary energy of urban areas (7 percent) and is consumed by 77 percent of the urban households, while reef fish contributes only 3 percent to the average dietary energy and is consumed by less than one urban household in three. Conversely, three rural households in four consume reef fish, bringing 13 percent of the average dietary energy consumed in rural areas, and chicken is consumed by 34 percent of rural households and contributes 3 percent of the rural DEC. It is interesting to note that whereas fresh tuna is consumed by around 24 percent of urban households, it is not consumed at all in rural areas where mainly reef fish is consumed. In terms of energy foods to choose, whereas consumption of brown coconut and breadfruits is almost insignificant in urban areas, these locally grown products dense in energy together contribute 10 percent of the average dietary energy in rural areas and they are consumed by more than one household in four. The same trend is observed for protective foods like pandanus and banana.

FIGURE 31
Distribution of main foods to limit in urban and rural areas



SOURCE: Marshall Islands 2019/20 HIES.

FIGURE 32
Distribution of main foods to avoid in urban and rural areas

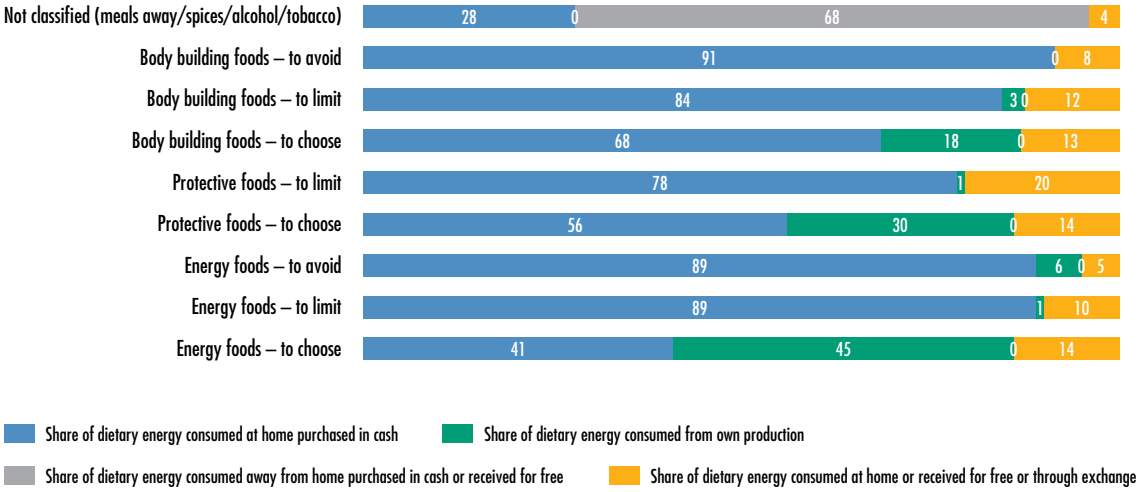


SOURCE: Marshall Islands 2019/20 HIES.

FIGURE 33

DEC split by main sources of acquisition and Pacific guidelines classification

Contribution of the source of acquisition to the DEC according to the Pacific guidelines classification



SOURCE: Marshall Islands 2019/20 HIES.

With an average contribution of around 35 percent, in both areas, rice and flour remain the main energy-dense foods to limit and rice is the most preferred, with more than 96 percent of households consuming it. Urban households also consume a wider variety of cereal products than rural households. The contribution of cooking oil and sugar to the average dietary energy is much higher in rural areas than in urban areas, and these products are accessed by at least 70 percent of rural households compared to less than 60 percent in urban areas. This trend further confirms the larger share of fat consumption in the average DEC in rural areas than in urban areas (respectively 26 percent versus 23 percent). Doughnuts and pancakes are also consumed more in rural areas than in urban areas where households prefer even more energy-dense products like butter or peanut butter. In both areas canned meat is consumed by more than 35 percent of the households.

Finally, more than 85 percent of dietary energy coming from foods to avoid or limit is purchased. This finding is not surprising as most of these foods are imported and in turn 45 percent of the energy foods from which to choose come from own production. An important share of dietary energy from protective foods to choose also comes from in kind sources like own production or is received for free. Protective foods to limit mainly come from baked vegetables and canned fruits but their consumption in the Marshall Islands is very marginal (less than 5 g/capita/day) and most of these products are purchased.

CHAPTER 5
ANALYSIS OF THE DIETARY PATTERNS OF THE FOOD INSECURE[I]

It is only through the inclusion of the Food Insecurity Experience Scale (FIES) module in the 2019/20 HIES that we can now better understand the food consumption pattern of the food insecure in the Marshall Islands. First, in combining information on the socioeconomic and demographic characteristics of the households it is possible to derive a profile for the food insecure; and second, in cross-analysing the food consumption and the FIES data collected in the 2019/20 HIES it is possible to derive food consumption indicators by severity levels of food insecurity.

As further described in the methodological note, the scale passed all the statistical validity tests, and the number of affirmative answers to the eight questions of the scale (raw score) can be considered an ordinal measure of the food insecurity.[II] Based on these findings, a level of food insecurity was associated to each household. A household is classified as "food secure or mildly food insecure" when the raw score is less than or equal to 3, a household is considered as "moderately or severely food insecure" when the raw score is higher than or equal to 4.[III] Following this categorization, it was found that 34 percent of households in the Marshall Islands are experiencing moderate or severe levels of food insecurity, which means that these households are having difficult access to safe and nutritious foods and some of them do not have access to enough foods, to the point of experiencing hunger.[IV]

5.1 Profile of the food insecure

This analysis is based on cross-tabulation of level of severity of the household with socioeconomic and demographic characteristics of the head of the household. The analysis finds that the probability of a household experiencing moderate or severe levels of food insecurity is higher for households belonging to the group of least wealthy households, or for households whose head has a primary or preschool level of education, or for households with more than two children, or households whose head is not married, or households without access to a safe source of drinking water, or households involved in copra, livestock or fishing activities and who do not receive remittances. Being food insecure or not does not depend on the gender of the head of the household but a higher proportion of food insecure households can be observed among households whose head is less than 39 years of age. More than 40 percent of rural households are food insecure compared to 32 percent of urban households, but as will be seen later, this finding is contradicted by the logit regression after we control for income.

[I] This analysis excludes 86 households (13 households from Ailing (38 percent of sampled households in Ailing), 8 households from Enewet (17 percent of households sampled in Enewet), 4 households from Jaluit (17 percent of households sampled in Jaluit), 53 households from Kwajalein (34 percent of households sampled in Kwajalein), 4 from Lib (33 percent of households sampled in Lib) and 4 in Namu (33 percent of households in Namu), and is therefore not fully representative of the households living in these atolls

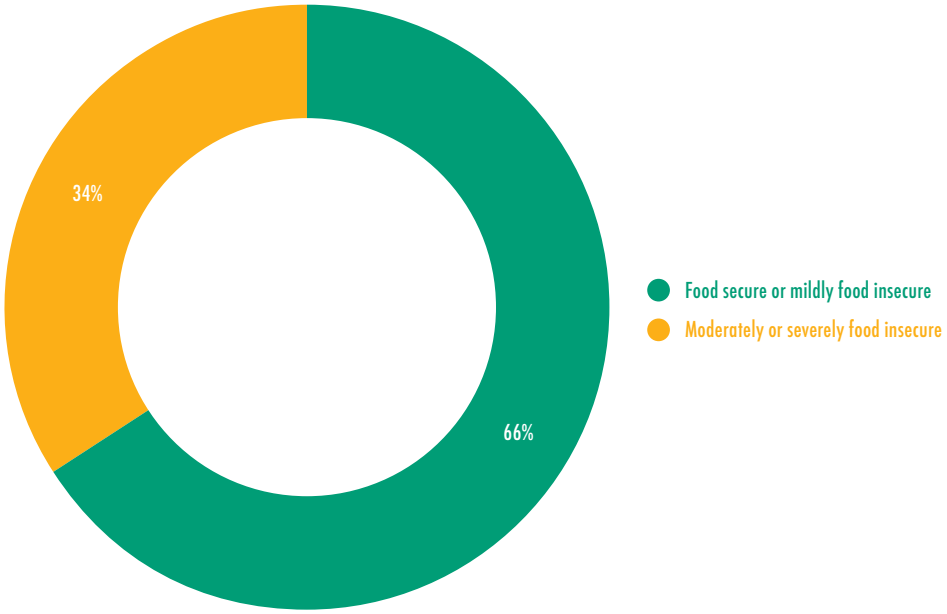
[II] The higher the raw score, the higher the probability that the level of food insecurity is severe. For more detail, see the annex 1.2 and refer to the Voices of the Hungry website: http://www.fao.org/in-action/voices-of-the-hungry/en/

[III] At this threshold the probability of being moderately or severely food insecure is 71 percent.

[IV] The last question of the FIES asked the respondent if they or anyone from the household spent the whole day without eating. One respondent in five replied "yes" to this question. If we cross-tabulate with the 5 percent of Marshallese who are chronically hungry, this identifies those whose dietary energy intake is lower than their basic requirements: hunger remains an issue in the Marshall Islands.

FIGURE 34
Percentage of food insecure households versus food secure

Distribution of household by level of food insecurity

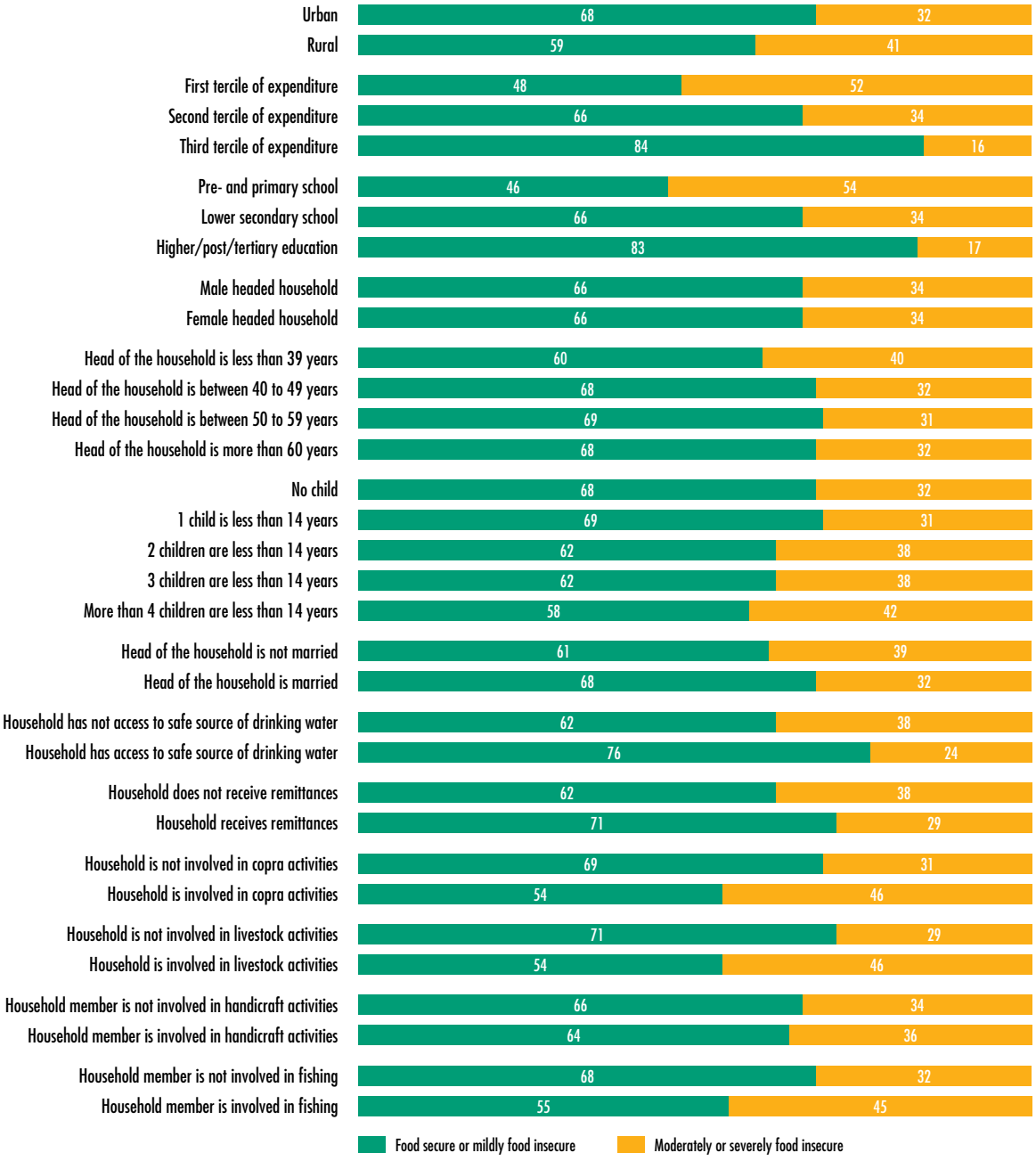


SOURCE: Marshall Islands 2019/20 HIES.

To confirm all the trends discussed above, a logistic regression was performed linking the status of food insecurity (food secure/food insecure) to all the demographic and socioeconomic characteristics of the households. The model as a whole is statistically significant with a *p* value = 0 as compared to the null model with no predictors. To facilitate the interpretation, only the direction of the change and the statistical significance of the variable in the regression are discussed. The log odds of all the socioeconomic or demographic characteristics and their respective significance levels are reported in Annex 6. The model confirms that total expenditure is an important determinant of food insecurity and for a one unit increase in total expenditure the probability of being food insecure (versus being food secure) significantly decreases. The probability of being food insecure also decreases when the level of education of the head of the household is higher. Households whose head is married or is older than 39 years of age also tend to have a lower probability of experiencing food insecurity than households whose head is not married or is younger than 39 years of age. Being involved in handicraft activities or receiving remittances also tends to reduce the probability of being food insecure. Households with access to a safe source of drinking water also have a lower probability of experiencing moderate or severe food insecurity than households with no access to a safe source of drinking water, even if this result is significant only at a 15 percent level. Conversely, the number of children in the household is a significant determinant of food insecurity and the higher the number of children in the household, the higher the probability the household will experience severe levels of food insecurity. The model also confirms that food insecurity is higher among households involved in fishing, livestock or copra activities than among households not involved in those activities, and all the log odds are significant with a p value of 0. Note also that the model reveals no significant association between the food security status of the household (food secure or food insecure) and the gender of the head of the household. Finally, after controlling for income and other determinants, the probability for a household to be food insecure is higher in urban areas than in rural areas. This finding is mainly due to the larger proportion of urban households than rural households (10 468 versus 3 396). With an incidence of food insecurity of 32 percent in urban areas and 41 percent in rural areas, there is a higher probability of a Marshallese living in an urban area and therefore being food insecure than of living in a rural area and being food insecure.

FIGURE 35
Profile of the food insecure

Socioeconomic and demographic characteristics of the food secure and food insecure households (percentage)



SOURCE: Marshall Islands 2019/20 HIES.

5.2 Overall pattern of food consumption of the food insecure and food secure

Households experiencing moderate or severe levels of food insecurity, that is households who have insufficient access to safe and nutritious foods or to enough quantity of foods, consume around 450 kcal/capita/day less than food secure households or mildly food insecure. The difference is slightly higher when we remove the effect of the composition of the household and convert the average amount of dietary energy consumed to adult male equivalent.

As discussed above and confirmed in the graph below, food insecure households are less wealthy than food secure households, with an average income (proxy by total expenditures) that is 35 percent lower than that of food secure households. Food insecure households spend on average USD 4 per capita per day to acquire food, which is 30 percent less than food secure households. They spend on average 34 cents less to get 1 000 kcal than food secure households. The lower cost of dietary energy points towards differences in the diversity and maybe quality of the foods accessed by moderately or severely food insecure households compared to food

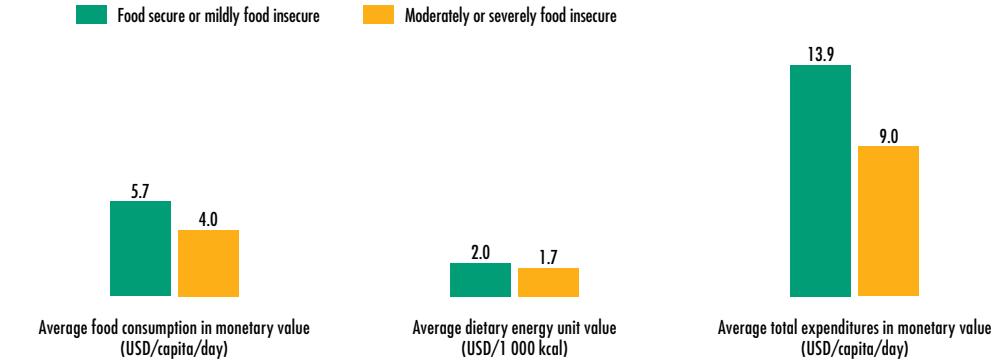
FIGURE 36
Distribution of dietary energy consumption by level of food insecurity

Average dietary energy consumption by level of severity of food insecurity (kcal/day)

SOURCE: Marshall Islands 2019/20 HIES.

FIGURE 37
Distribution of the cost of food by level of food insecurity

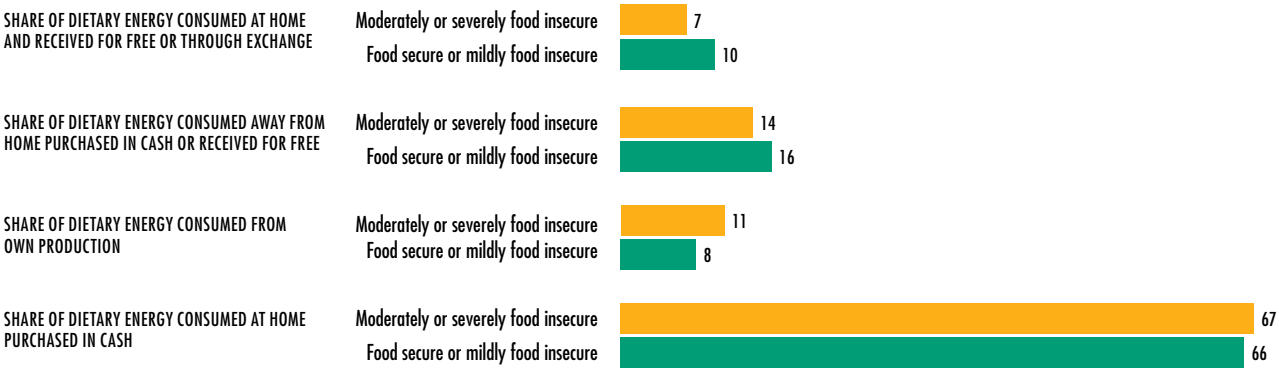
Difference in the amount spent on food between food secure and food insecure households



SOURCE: Marshall Islands 2019/20 HIES.

FIGURE 38
Main sources of acquisition of the DEC of the food secure

Contribution of the average DEC of the main source of consumption (percentage)



SOURCE: Marshall Islands 2019/20 HIES.

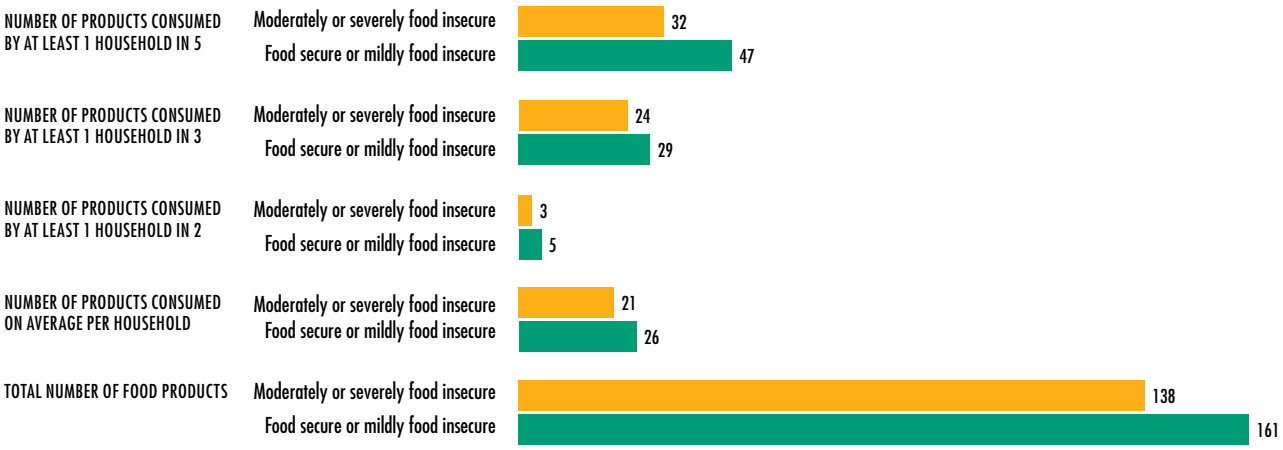
secure or mildly food insecure households, and the difference in the amount of dietary energy points towards access by food insecure households to lower quantities of foods than food secure households.

Both food secure and food insecure households purchase in cash more than two thirds of the dietary energy consumed in the house. But food insecure households tend to consume more from their own production, since 11 percent of the dietary energy consumed by food insecure households comes from home produced foods compared to 8 percent for food secure households. This trend confirms that more food insecure households are found among households involved in fishing or livestock activities than among households not involved in these activities. Strangely, the contribution to the average dietary energy consumed of food received for free or through exchange is lower for food insecure households than for food secure households. Food insecure households might be surrounded by other food insecure households between which offerings become difficult.

FIGURE 39

Number of products reported by level of severity of food insecurity and percentage of households who consumed the food

Number of products consumed by food secure and food insecure households

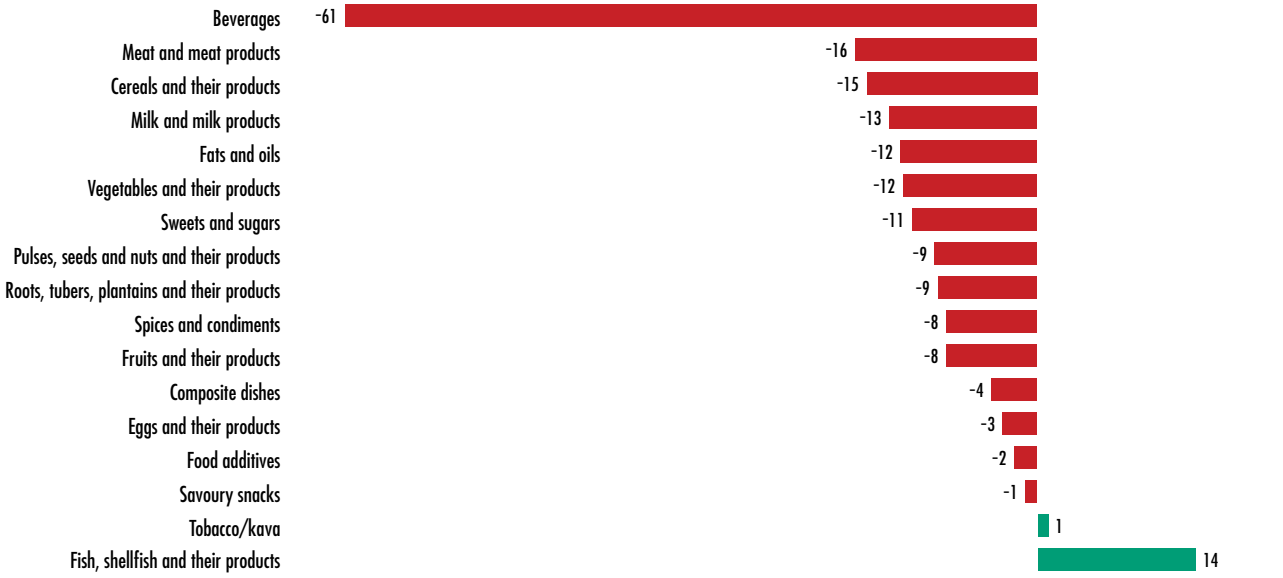


SOURCE: Marshall Islands 2019/20 HIES.

FIGURE 40

Differences in quantities of the main products consumed by food secure and food insecure households

Difference between the quantity of food products consumed by food insecure versus food secure households (g/capita/day)*



SOURCE: Marshall Islands 2019/20 HIES.

* A positive value refers to higher quantity consumed by food insecure households compared to the quantity consumed by food secure households and a negative value refers to a lower quantity consumed by food insecure households compared to the quantity consumed by food secure households.

5.3 Main food products consumed by food insecure and food secure households

As discussed earlier, food insecure households spend on average 35 cents less to get 1 000 kcal than food secure households, pointing towards a diet that might be less diversified and bringing therefore lower amounts of essential nutrients.

When comparing the total number of food products reported by at least one food secure or food insecure household, 161 different types of food were reported by food secure households compared to 138 reported by food insecure. This shows that the choice of foods available for consumption is much lower among food insecure households than among food secure households. This finding is further confirmed by the number of food products consumed on average by food insecure compared to that consumed by food secure households (21 percent versus 26 percent). If we consider the food products consumed by at least 66 percent of the households as being essential, 5 food products are consumed by at least 66 percent of food secure households compared to only 3 products in food insecure households. And if we

consider as non-essential the food products consumed by at least 20 percent of the households, the difference is even more striking with 47 food products consumed by at least 20 percent of food secure households compared to 32 food products consumed by at least 20 percent of food insecure households. These findings point towards important differences in the number of foods accessed by food secure or food insecure households.

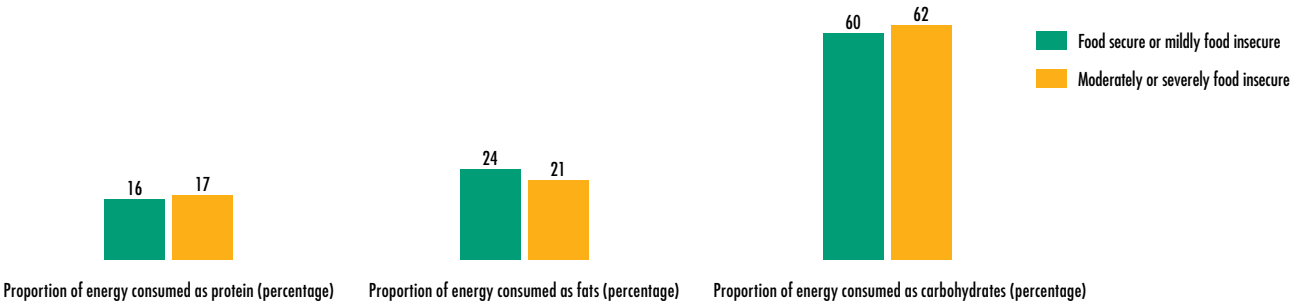
If the number of products consumed differs by level of food insecurity, the quantity of the main products consumed by food groups is also different. Except for fish and tobacco products, the average quantities of food products consumed by food group is lower for food insecure households than for food secure households. The main differences in the quantities are observed for groups of beverages, with the quantity consumed being 60 g/capita/day lower, followed by meat, cereals, milk, vegetables, sweets and sugar, with an average quantity consumed by the food insecure being lower by more than 10 g/capita/day. Conversely, the food insecure consume on average 8 grams more of fish per capita per day than food secure households.

5.4 Nutrient consumption of food insecure versus food secure

The contribution of carbohydrates to the average dietary energy consumed is slightly higher for food insecure households than for food secure households, with respective contributions of 62 percent and 60 percent. The reverse is observed with fats, which contribute 24 percent of the dietary energy of the food secure compared to 21 percent of the diet of the food insecure. Proteins contribute the same amount for both groups to the average dietary energy and is slightly above the upper limit of the WHO norms for a balanced diet.[1] This translates into an average consumption of protein, fats and carbohydrates for food secure or mildy food insecure of respectively 56 , 180 and 206 kcal/capita/day more compared to modertaley or severely food insecure. So the percentage of overweight and obesity could be

FIGURE 41
Contribution of macronutrients to the average DEC (percentage)

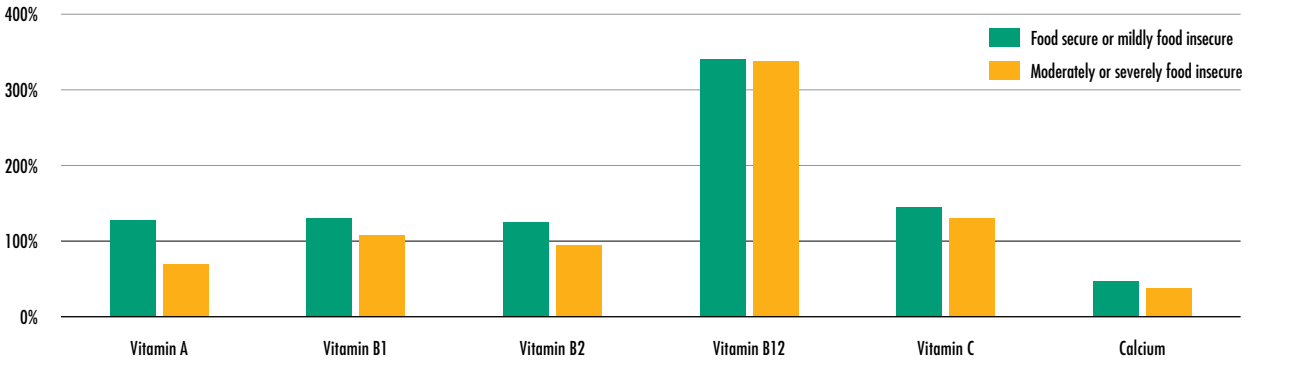
Contribution of macronutrients to the average dietary energy consumed by level of food insecurity (percentage)



SOURCE: Marshall Islands 2019/20 HIES.

FIGURE 42
Nutrient adequacy of the food secure versus food insecure (percentage)

Nutrient adequacy of food secure and food insecure households (as measured by the amount of nutrient available for consumption as percentage of the average requirements)



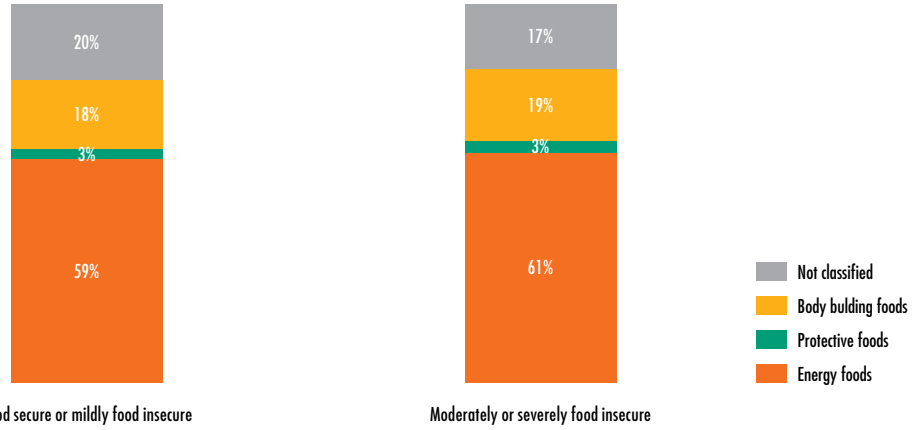
SOURCE: Marshall Islands 2019/20 HIES.

[1] A balanced diet refers to respective contributions of 10–15 percent, 15–30 percent and 55–75 percent of proteins, fats and carbohydrates to the average dietary energy intake.

FIGURE 43

Contribution of energy, protective and body building foods to the average DEC by level of severity of food insecurity

Contribution of energy, protective and body building foods to the average DEC of the food secure and food insecure households

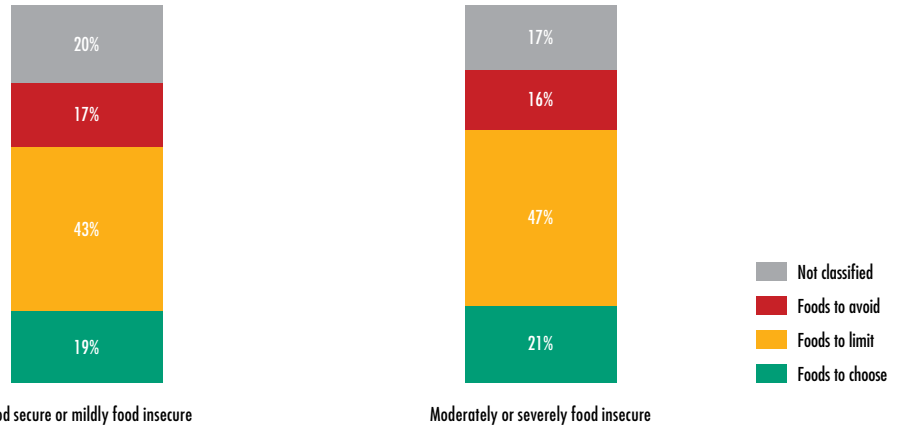


SOURCE: Marshall Islands 2019/20 HIES.

FIGURE 44

Contribution of foods to choose, limit or avoid to the average DEC by level of severity of food insecurity

Contribution of foods to choose, limit or avoid to the average DEC of the food secure and food insecure (percentage)

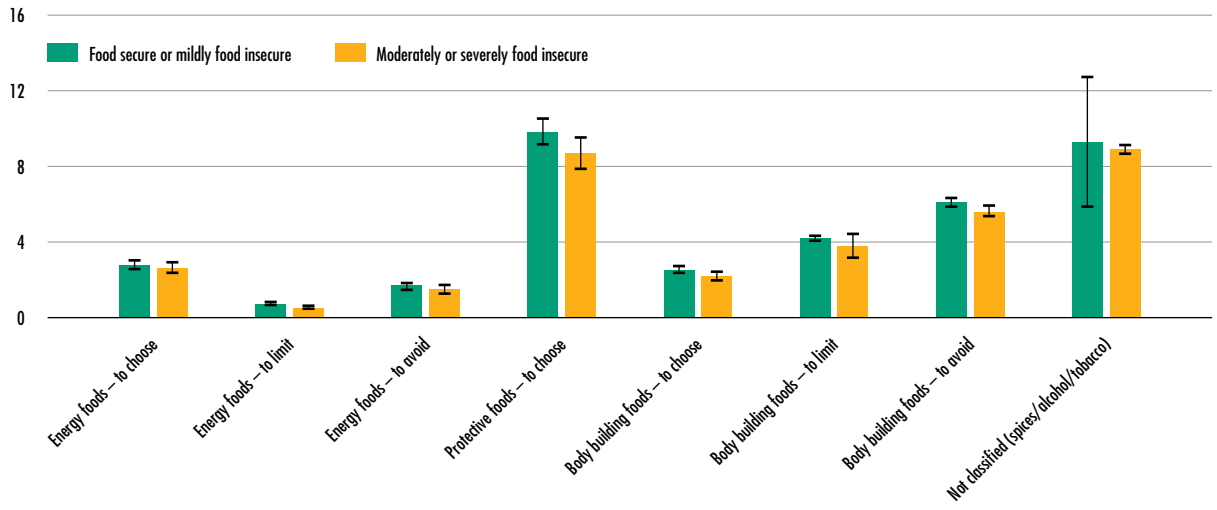


SOURCE: Marshall Islands 2019/20 HIES.

FIGURE 45

Diet of food insecure is less expensive and less diversified

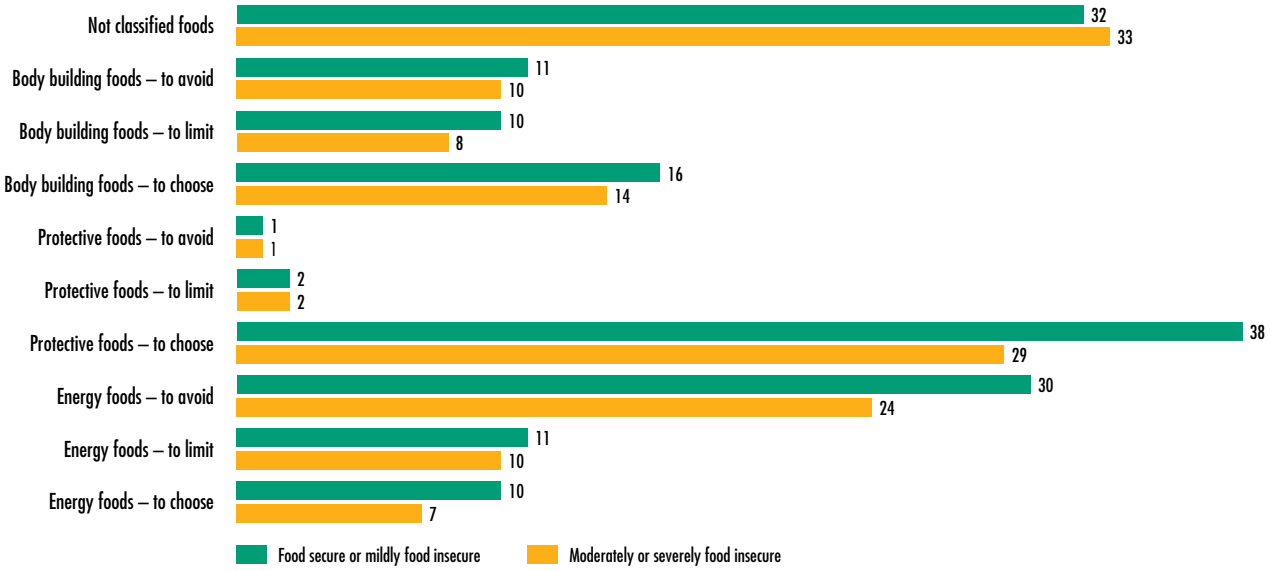
Average dietary energy cost of food secure and food insecure (USD/1 000 kcal)



SOURCE: Marshall Islands 2019/20 HIES.

FIGURE 46
Distribution of the number of foods consumed by at least one household

Distribution of the number of foods consumed by at least one household according to the Pacific guidelines and by class of food insecurity



SOURCE: Marshall Islands 2019/20 HIES.

important among wealthier and food secure households and food secure households might be characterized by access to a more diversified diet but of low nutritious quality.[I] The percentage of households for which the contributions of proteins, fats and carbohydrates is within the WHO norms for a balanced diet is very similar within food secure or food insecure households and is around 28–30 percent of households. Therefore, for both population groups the diet remains relatively unbalanced and is too rich in proteins and fats and too poor in carbohydrates.

On average the quantity available for consumption of all essential micronutrients and minerals is lower for food insecure households than for food secure households. Vitamin B12 and vitamin C adequacy is reached for food secure and food insecure households due to the high consumption of fish rich in vitamin B12 and the consumption of powdered drink, breadfruit and oranges rich in vitamin C. Adequacy of vitamin B1 is also reached for both food secure and food insecure households, but the amount of vitamin B1 available for consumption is only slightly above the average requirements for the food insecure. Vitamin A and vitamin B2 adequacy is reached only for food secure households mainly due to their higher consumption of foods rich in vitamin A like carrot (2.3 g/capita/day versus 0.5 g/capita/day) and margarine (7.7 g/capita/day versus 1.6 g/capita/day), and products rich in vitamin B2 like breakfast cereals or noodles.

5.5 Healthy living pattern

When the foods consumed are categorized according to the Pacific guidelines for a healthy diet, it can be seen that the contribution of energy-dense foods to the average dietary energy consumed is higher for food insecure households than for the food secure, with respective contributions of 61 percent and 59 percent, and no significant difference can be observed in the contribution of body building or protective foods to the overall diets of the food secure or food insecure. But 47 percent of the dietary energy consumed by the food insecure comes from foods to limit compared to 43 percent for food secure households. However, if we bring this in terms of total dietary energy consumed, food secure or mildy food insecure households consume more energy from foods to limit than moderately or severely food insecure households.

This difference in the quality of the diet is further reflected in the difference in the cost of the dietary energy consumed. Except for energy-dense foods to choose, for which the difference in the cost of 1 000 kcal is marginal, food insecure households tend to spend less to acquire 1 000 kcal than food secure households for all other foods, which means that food insecure households in general have access to less expensive sources of dietary energy. The higher difference is observed for protective foods, for which food insecure households spend on average USD 1.2 less than food secure households to get 1 000 kcal.

[I] In Marshall Islands, the level of severity associated to the questions related to accessing few kind or healhty foods are the lowest. Which means many food secure or mildly food insecure households consider they are eating healhty foods (even if too rich in fats and sugar) based on their own opinion of what is considered a "healthy" food.

TABLE 4
Products consumed by at least 33 percent of food secure and food insecure households in the previous seven days (percentage)

Food type	Description of food	Percentage of households who acquired the food in the previous seven days (%)	
		Food secure or mildly food insecure	Moderately or severely food insecure
Energy foods – to choose	Breadfruit	27	31
Energy foods – to limit	Rice, not further specified	98	97
	Noodles, not further specified	72	60
	Flour, not further specified	42	38
	Bread, loaf, all others	37	25
Energy foods – to avoid	Oil, cooking	65	55
	Sugar, not further specified	57	55
	Cola flavour soft drink	43	36
Body building foods – to choose	Chicken, not further specified	70	58
	Egg, chicken, fresh	65	45
	Fish, reef, not further specified	43	42
Body building foods – to limit	Mackerel, canned, not further specified	44	53
Body building foods – to avoid	Fish, canned in oil, not further specified	64	62
	Luncheon meat, chicken	45	50
	Beef, canned, corned	40	36
	Canned meat, not further specified	37	38
Protective foods – to choose	Onion, brown	41	24
	Banana, common e.g. Cavendish	39	30
	Apple, not further specified	39	26
	Orange	38	23
Not classified (spices/alcohol/tobacco)	Salt, iodised	84	74
	Sauce, soy/shoyu	80	69
	Lunch away from home	64	54
	Sauce, tomato, ketchup	60	39
	Hot drinks away from home	58	50
	Snacks away from home	50	34
	Bottled water away from home	50	41
	Non-alcoholic drinks away from home	46	38
	Coffee, mix (e.g. 3 in 1)	45	49
	Tobacco	37	47

SOURCE: Marshall Islands 2019/20 HIES.

The number of protective foods consumed by at least one food insecure household is 32 compared to 41 foods consumed by at least one food secure household. This finding confirms that the number of protective foods available for consumption is lower for food insecure households than for food secure households. The same is also observed among energy foods to limit.

Apart from breadfruits, canned mackerel, chicken luncheon meat and canned meat, which are accessed by a slightly higher percentage of food insecure households than that of food secure households, all the other foods consumed by at least one household in three are consumed by a lower percentage of food insecure households than food secure households.

Again, protective food is the category for which the percentage of food insecure households consuming the food is much lower than the percentage of food secure households (around 40 percent of food secure households consume banana, apple, orange or onion compared to less than 30 percent of food insecure households consuming these foods). It is important to note that the percentage of households consuming tobacco is higher for food insecure households than for food secure households (47 percent versus 37 percent). However, this finding disadvantages the food insecure, since higher tobacco consumption (1.19 g/capita/day versus 1.07 g/capita/day) increases the risk factor for heart attacks, strokes, chronic obstructive pulmonary disease (COPD) and several cancers.

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CONCLUSIONS

Target 2.1 of the SDGs aims to end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round by 2030.

The analysis of the food and the food insecurity experience scale data collected in the 2019/20 HIES confirms that in the Marshall Islands, access to varied and nutritious food is a real struggle. More than 60 percent of the dietary energy consumed comes from foods that should be limited or avoided for a healthy diet. Consumption of locally produced energy-dense foods such as breadfruits or pandanus remains marginal and is surpassed by that of rice or other cereal products. However, fish remains an important source of energy and the main source of protein but around 8 percent of the dietary energy consumed comes from chicken and canned meat. The meals consumed away from home in the form of snacks, lunch and beverages represent an important component of the diet of a Marshallese, bringing more than 400 kcal per capita per day and contributing one fifth of the amount spent on food. Of note also, in Marshall islands, 36 percent of food insecure households and 46 percent of food secure households received remittances at the time of this survey and, as seen in this report, remittances are an important determinant of access to dietary energy. Any external shock (such as COVID-19) cutting back this source of extra income could further increase the magnitude and severity of food insecurity in Marshall Islands.

Achieving SDG Target 2.1 by 2030 remains for the Marshall Islands an outstanding challenge that needs to be addressed by appropriate policies. It is hoped that this report will help in designing such policies.

Further uses of this report

This report is the first of its kind in Marshall Islands. The information assembled in the report should be a catalyst for the further development and implementation of food and food system policies and interventions. The report may be used, for example, to:

- communicate to all stakeholders the status of food security and nutrition in the Marshall Islands;
- assess the data gap and needs in terms of food consumption and nutrition information and develop further nutrition assessment tools and surveys;
- form recommendations aiming to improve the overall diet of the Marshallese and reduce risks associated with bad eating habits and/or access to an unhealthy diet;
- develop policies aiming to increase access to more traditional, healthy local foods;
- identify pockets of food insecurity and further develop policies targeting the most vulnerable populations;
- report on SDG Target 2.1 indicators;
- further assess the impact of COVID-19 on food security and food systems in providing a baseline for future evaluations;
- serve as a baseline to assess the changes over time in food security and food consumption patterns in the Marshall Islands; and
- complement further analysis such as that on poverty.


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ANNEX 1
Methodological annex related to SDG 2.1 estimates

ANNEX 1.1 SDG 2.1.1 – The prevalence of undernourishment

Definition: Undernourishment is defined as the condition of an individual whose habitual food consumption is insufficient to provide, on average, the amount of dietary energy required to maintain a normal, active, healthy life.

How it is reported: The SDG 2.1.1 indicator is reported as a prevalence and is denominated as "prevalence of undernourishment" (PoU), which is an estimate of the percentage of individuals in the total population that are in a condition of undernourishment.

Methodology: To compute an estimate of the PoU in a population, the probability distribution of habitual dietary energy intake levels (expressed in kcal per person per day) for the average individual is modelled as a parametric probability density function (pdf), f(x). The indicator is obtained as the cumulative probability that the habitual dietary energy intake (x) is below the minimum dietary energy requirements (MDER) (i.e. the lowest limit of the range of energy requirements for the population's representative average individual) as in the formula below:

$$PoU = \int x < MDER\ f(x|\theta)dx$$

where θ is a vector of parameters that characterizes the pdf. The distribution is assumed to be lognormal, and thus fully characterized by only two parameters: the mean dietary energy consumption (DEC), and its coefficient of variation (CV).

	PoU (%)	Average DEC (kcal/capita/day)	Minimum dietary energy requirement (kcal/capita/day)	CV (%)
Marshall Islands	4	2 862	1 742	27

Data sources: main source used to estimate the three parameters for the Marshall Islands.

- Minimum dietary energy requirement (MDER): Human energy requirements for an individual in a given sex/age class are determined on the basis of normative requirements for basic metabolic rate (BMR) per kilogram of body mass, multiplied by the ideal masses that a healthy person of that class may have, given his or her height, and then multiplied by a coefficient of physical activity level (PAL) to take into account physical activity. Given that both healthy BMIs and PALs vary among active and healthy individuals of the same sex and age, a range of energy requirements applies to each sex and age group of the population. The MDER for the average individual in the population, that is the threshold used in the PoU formula, is obtained as the weighted average of the lower bounds of the energy requirement ranges for each sex and age group, using the shares of the population in each sex and age group as weights.
- Information on the median height and on the population structure by sex and age is extracted from the anthropometric and demographic information on height, age and gender collected in the 2019/20 HIES.
- DEC and CV were extracted from the food data collected in the 2019/20 HIES, which collects the quantities of products consumed by the household and the number of meals consumed outside the house during the previous seven days. The quantities were converted into grams using conversion factors provided by the market survey and ad hoc conversions from EPPSO and further converted into nutrient values using the Pacific Nutrient Database developed jointly by SPC, FAO and Wollongong University and based on the Food Composition Table of the PICTs. The dietary energy provided by the food consumed away from home is estimated by applying an adjustment factor of 10 percent to the median cost of one calorie consumed in the house to the amount spent on meals consumed away from home. From the distribution of average daily DEC

in the population it is possible then to estimate the average DEC and the CV that describe the distribution. However, because of excess variability[I] observed in the distribution of daily energy, additional data treatment[II] was needed to get a reliable estimate of the CV. The treatment of excess variability leads to a reduction of the total CV from 50 percent to around 27 percent.

Challenges and limitations: While formally the state of being undernourished or not is a condition that applies to individuals, given that the data is usually available on a large scale it is impossible to reliably identify which individuals in a certain group are actually undernourished. Through the statistical model described above, the indicator can only be computed with reference to a population or a group of individuals for which a representative sample is available. In the case of the Marshall Islands, the sample does not allow for a valid estimate of the minimum requirement at a low level of disaggregation and therefore only the prevalence at national level is provided. Finally, due to the probabilistic nature of the inference and the margins of uncertainty associated with estimates of each of the parameters in the model, the precision of the PoU estimates is generally low with margins of error that can be expected to probably exceed 2.5 percentage points in most cases. As can be seen from the table below, which shows the values of PoU associated with different values of DEC and CV or MDER, PoU is very sensitive to a change in any of these parameters, which is why it is important to frequently update the parameters used to report on SDG 2.1.1. An increase in the DEC of 100 kcal decreases PoU from 4 percent to 3 percent and conversely a 2 percentage point increase in inequality, keeping all other parameters constant, increases PoU from less than 4 percent to around 6 percent.

	Average dietary energy consumption (kcal/capita/day)	Full CV of DEC	Minimum dietary energy requirements (kcal/capita/day)	Prevalence of undernourishment in Marshall Islands (%)	Number of people undernourished
Using information from the survey	2 867	0.27	1 742	**3.9**	**2 112**
Using a higher DEC, keeping inequality unchanged	3 000	0.27	1 742	**2.7**	**1 486**
Using a lower DEC, keeping inequality constant	2 700	0.27	1 742	**6.4**	**3 468**
Decreasing inequality, keeping DEC constant	2 867	0.24	1 742	**2.3**	**1 229**
Increasing inequality, keeping DEC constant	2 867	0.29	1 742	**5.7**	**3 081**

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I Excess variability is due to survey design (the 2019/20 HIES of the Marshall Islands was not designed to measure individual food consumption), field work, data entry or other measurement errors.

II The CV that measures inequality in accessing dietary energy is estimated as the sum of inequality in accessing energy due to socioeconomic differences (CV of income) and inequality in accessing energy due to differences in energy requirements (CV of requirements). See http://www.fao.org/3/a-i4046e.pdf for more details about the estimation of the CV and treatment for excess variability. In the case of the Marshall Islands, we used expenditure distribution as a welfare indicator to measure inequality in access to food.

ANNEX 1.2 SDG 2.1.2 – The prevalence of moderate or severe food insecurity based on the FIES

Definition: Food insecurity as measured by this indicator refers to limited *access to food*, at the level of individuals or households, due to lack of money or other resources. The severity of food insecurity is measured using data collected with the *Food Insecurity Experience Scale survey module* (FIES-SM), a set of eight questions asking individuals or households to self-report conditions and experiences typically associated with limited access to food because of a lack of money or other resources. In the case of the Marshall Islands one household member older than 15 years was asked questions to report on behalf of the household. Referring to a period of the previous twelve months, the eight questions of the scale are:

Q1.	Were you worried you would run out of food because of a lack of money or other resources?
Q2.	Were you unable to eat healthy and nutritious food because of a lack of money or other resources?
Q3.	Did you eat only a few kinds of food because of a lack of money or other resources?
Q4.	Did you have to skip a meal because there was not enough money or other resources to get food?
Q5.	Did you eat less than you thought you should because of a lack of money or other resources?
Q6.	Did your household run out of food because of a lack of money or other resources?
Q7.	Were you hungry but did not eat because there was not enough money or other resources?
Q8.	Did you go without eating for a whole day because of a lack of money or other resources?

This indicator is particularly relevant for countries where severe food deprivation may no longer be of concern, but where sizeable pockets of food insecurity still remain. In this sense, it is an indicator that is fully aligned with the universality principles of the 2030 Agenda. Of note also is the reference to the 12-month period so that the indicator reflects chronic food insecurity. To that extent the SDG 2.1.2 is also aligned to SDG 2.1.1, since both are a measure of chronic food insecurity.

How the indicator is reported: The estimates correspond to the prevalence (%) of individuals in the population living in households where *at least one adult was found to be food insecure*.

Data source: The eight questions of the FIES-FM were introduced for the first time in the Marshall Islands in the 2018 survey experiment. The performance of the scale could not be assessed because of the high number of missing cases (more than 11 percent) and the small number of non-extreme cases (160). The scale was introduced again in the 2019/20 HIES.

Methodology: The data were validated and used to construct a scale of food-insecurity severity using the Rasch model, which postulates that the probability of observing an affirmative answer by respondent *I* to question *j* is a logistic function of the distance, on an underlying scale of severity, between the position of the respondent, *ai*, and that of the item, *bj*.

$$Prob\ (Xi,\ j = \text{Yes}) = \exp\ (ai - bj)\ /\ (1 + \exp\ (ai - bj))$$

By applying the Rasch model to the FIES data, it is possible to estimate the probability of being food insecure ($pi,\ L$) at each level of severity of food insecurity L (moderate or severe, or severe), for each respondent I, with $0 < pi,\ L < 1$.

The prevalence of food insecurity at each level of severity (*FIL*) in the population is computed as the weighted sum of the probability of being severely food insecure for all respondents (i) in a sample:

$$FIL = \Sigma pi,\ Lwi$$

where *wi* are post-stratification weights that indicate the proportion of individuals or households in the national population represented by each record in the sample.

Challenges: to produce comparable measures over time and across different populations, a common scale was established as a reference (exactly as converting measures of temperature across different measuring scales – such as Celsius and Fahrenheit)). The national scale of severity of food insecurity is then equated to the global standard to obtain an SDG 2.1.2 estimate that can be further compared to global, regional or country levels of severe food insecurity based on the FIES.

In the case of the Marshall Islands, the scale performs relatively well except in some specific islets of the atoll of Kwajalein due to some issues during field work. Around 86 households were dropped from the analysis. Because of that, the prevalence is not representative of the Marshall Islands and SDG 2.1.2 cannot be reported. However, and given the results of the statistical validation performed on the 780 remaining households, the raw score can be considered a reliable, ordinal indicator of food security severity. The global FIES scales are calibrated on the scale produced by the FIES application in the Marshall Islands and the results reveal that, after appropriate scaling of the severity values, the items WHLDAY corresponding to the question "*Did you go without eating for a whole day because of a lack of money or other resources?*" was unique and the correlation between the remaining seven items of the Marshall Islands with the global standard is 97.4 percent.

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ANNEX 2
Description of the groups

ANNEX 2.1 Population groups

Population group	Number of sampled households	Percentage	Representative households	Percentage
Geographic characteristics				
Area of residence				
Urban	551	63.1	11 214	75.3
Rural	322	36.9	3 675	24.7
Demographic characteristics of the household				
Gender of the head of the household				
Male	612	70.1	10 507	70.6
Female	261	29.9	4 382	29.4
Class of age for the head of the household (in years)				
Age 18 to 39	220	25.2	3 818	25.6
Age 40 to 49	241	27.6	3 838	25.8
Age 50 to 59	194	22.2	3 488	23.4
Age 60 and above	218	25.0	3 745	25.2
Categories for the number of children less than 14 years old				
No child	203	23.3	6 995	47.0
1 child	195	22.3	3 343	22.5
2 children	211	24.2	2 576	17.3
3 children	132	15.1	1 271	8.5
4 children and more	132	15.1	704	4.7
Marital status of the head of the household				
Married	648	74.2	10 473	70.3
Not married	225	25.8	4 416	29.7
Health and sanitation				
Access to a safe source of drinking water				
Yes	256	29.3	4 559	30.6
No	617	70.7	10 330	69.4

SOURCE: Marshall Islands 2019/20 HIES.

Population group	Number of sampled households	Percentage	Representative households	Percentage
Socioeconomic characteristics of the head of the household				
Education level of the head of the household				
Pre- and primary school	212	24.3	3 412	22.9
Lower secondary school	467	53.5	7 587	51.0
Higher/post/tertiary education	194	22.2	3 890	26.1
Any household member involved in fishing activities				
Yes	192	22.0	2 267	15.2
No	681	78.0	12 622	84.8
Any household member involved in handicraft or home food processing				
Yes	148	17.0	1 831	12.3
No	725	83.1	13 058	87.7
Head of the household involved in livestock activities				
Yes	304	34.8	4 009	26.9
No	569	65.2	10 880	73.1
Household receives remittances				
Yes	437	50.1	6 766	45.4
No	436	49.9	8 123	54.6
Household involved in copra activities				
Yes	188	21.5	2 544	17.1
No	685	78.5	12 345	82.9
Level of severity of food insecurity*				
Food secure or mildly food insecure	503	63.9	9 168	66.1
Moderate or severe food insecure	284	36.1	4 696	33.9
Total	**873**	**100.0**	**14 889**	**100.0**

* Excluding 86 households from Kwajalein atoll.

SOURCE: Marshall Islands 2019/20 HIES.

ANNEX 2.2 Classification of the food products collected in the 2019/20 HIES according to GIFT and Pacific guidelines

Food product reported in the 2019/20 KHIES	GIFT classification	Pacific guidelines classification	Percentage of households that consumed the food
Rice, brown, uncooked	Cereals and their products	Energy foods – to choose	0
Rice, not further specified	Cereals and their products	Energy foods – to limit	97
Flour, not further specified	Cereals and their products	Energy foods – to limit	41
Bread, loaf, all others	Cereals and their products	Energy foods – to limit	33
Bread, loaf, not further specified	Cereals and their products	Energy foods – to limit	12
Breakfast cereal, flakes of corn, added vitamin	Cereals and their products	Energy foods – to limit	0
Oats, porridge, dry	Cereals and their products	Energy foods – to limit	2
Breakfast cereal, not further specified	Cereals and their products	Energy foods – to limit	23
Noodles, not further specified	Cereals and their products	Energy foods – to limit	69
Potato, not further specified	Roots, tubers, plantains	Energy foods – to choose	20
Kumara/sweet potato	Roots, tubers, plantains	Energy foods – to choose	2
Cassava/tapioca/manioc	Roots, tubers, plantains	Energy foods – to choose	0
Taro, common	Roots, tubers, plantains	Energy foods – to choose	2
Banana, cooking, raw	Roots, tubers, plantains	Energy foods – to choose	17
Flour, cassava	Roots, tubers, plantains	Energy foods – to choose	1
Cream, coconut, canned/UHT	Pulses, seeds and nuts	Energy foods – to avoid	8
Coconut, brown	Pulses, seeds and nuts	Energy foods – to choose	10
Mixed dried fruit, not further specified	Pulses, seeds and nuts	Body building foods – to choose	0
Beans, legumes canned, e.g. red kidney, lima	Pulses, seeds and nuts	Protective foods – to choose	1
Baked beans, canned, not further specified	Pulses, seeds and nuts	Protective foods – to limit	8
Peanut butter, not further specified	Pulses, seeds and nuts	Energy foods – to avoid	21
Milk, long life, shelf stable (UHT), not specified	Milk and milk products	Body building foods – to choose	26
Milk, powdered, not further specified	Milk and milk products	Body building foods – to limit	2
Cheese, block, e.g. Cheddar, Edam, Swiss	Milk and milk products	Body building foods – to limit	4
Yoghurt, not further specified	Milk and milk products	Body building foods – to limit	2
Egg, chicken, fresh	Eggs and their products	Body building foods – to choose	59
Tuna, not further specified	Fish, shellfish and products	Body building foods – to avoid	19
Fish, pelagic/ocean, not further specified	Fish, shellfish and products	Body building foods – to choose	1
Shark	Fish, shellfish and products	Body building foods – to choose	0
Fish, reef, not further specified	Fish, shellfish and products	Body building foods – to choose	43
Fish, not further specified	Fish, shellfish and products	Body building foods – to choose	2
Mackerel, canned, not further specified	Fish, shellfish and products	Body building foods – to limit	47
Fish, canned in oil, not further specified	Fish, shellfish and products	Body building foods – to limit	64
Fish, canned, not further specified	Fish, shellfish and products	Body building foods – to limit	3
Crab, land	Fish, shellfish and products	Body building foods – to choose	2
Crayfish/lobster, not further specified	Fish, shellfish and products	Body building foods – to choose	2
Scallop	Fish, shellfish and products	Body building foods – to choose	0
Oyster	Fish, shellfish and products	Body building foods – to choose	2
Sea snail	Fish, shellfish and products	Body building foods – to choose	0
Sea-hare, not further specified	Fish, shellfish and products	Body building foods – to choose	1

SOURCE: Marshall Islands 2019/20 HIES.

Food product reported in the 2019/20 KHIES	GIFT classification	Pacific guidelines classification	Percentage of households that consumed the food
Beef, regular, cut not specified	Meat and meat products	Body building foods – to choose	20
Pork, regular, cuts not specified	Meat and meat products	Body building foods – to choose	12
Lamb and mutton, regular, cuts not specified	Meat and meat products	Body building foods – to choose	2
Chicken, not further specified	Meat and meat products	Body building foods – to choose	66
Bird, all others, e.g. pigeon, noddy bird	Meat and meat products	Body building foods – to choose	1
Beef, canned, corned	Meat and meat products	Body building foods – to avoid	39
Canned meat, not further specified	Meat and meat products	Body building foods – to avoid	38
Paté, not further specified	Meat and meat products	Body building foods – to avoid	0
Devon/fritz, processed meat, beef and pork	Meat and meat products	Body building foods – to avoid	2
Luncheon meat, chicken	Meat and meat products	Body building foods – to avoid	45
Cabbage, Chinese	Vegetables and products	Protective foods – to choose	4
Cabbage, European, white	Vegetables and products	Protective foods – to choose	5
Broccoli	Vegetables and products	Protective foods – to choose	8
Lettuce, not further specified	Vegetables and products	Protective foods – to choose	4
Leaves, watercress	Vegetables and products	Protective foods – to choose	0
Cucumber, unpeeled	Vegetables and products	Protective foods – to choose	2
Eggplant	Vegetables and products	Protective foods – to choose	0
Tomato, common	Vegetables and products	Protective foods – to choose	5
Pumpkin	Vegetables and products	Protective foods – to choose	2
Capsicum, not further specified	Vegetables and products	Protective foods – to choose	6
Beans, green	Vegetables and products	Protective foods – to choose	3
Beans, long	Vegetables and products	Protective foods – to choose	1
Carrot	Vegetables and products	Protective foods – to choose	9
Garlic, peeled	Vegetables and products	Protective foods – to choose	14
Onion, brown	Vegetables and products	Protective foods – to choose	35
Corn, cob, not further specified	Vegetables and products	Protective foods – to choose	7
Mushrooms, canned	Vegetables and products	Protective foods – to choose	1
Avocado	Fruits and their products	Protective foods – to choose	0
Banana, common, e.g. Cavendish	Fruits and their products	Protective foods – to choose	35
Mango	Fruits and their products	Protective foods – to choose	4
Papaya	Fruits and their products	Protective foods – to choose	10
Pineapple	Fruits and their products	Protective foods – to choose	2
Coconut, green	Fruits and their products	Protective foods – to choose	20
Breadfruit	Fruits and their products	Energy foods – to choose	28
Pandanus	Fruits and their products	Protective foods – to choose	16
Lime	Fruits and their products	Protective foods – to choose	9
Orange	Fruits and their products	Protective foods – to choose	33
Mandarin	Fruits and their products	Protective foods – to choose	0
Apple, not further specified	Fruits and their products	Protective foods – to choose	34
Pear, Packham's	Fruits and their products	Protective foods – to choose	1
Peach	Fruits and their products	Protective foods – to choose	1
Strawberry	Fruits and their products	Protective foods – to choose	1
Grapes	Fruits and their products	Protective foods – to choose	3
Kiwi fruit, with skin	Fruits and their products	Protective foods – to choose	1
Melon, not further specified	Fruits and their products	Protective foods – to choose	2
Watermelon	Fruits and their products	Protective foods – to choose	3
Fruit, not further specified	Fruits and their products	Protective foods – to choose	0
Fruit, canned, not further specified	Fruits and their products	Protective foods – to limit	6

SOURCE: Marshall Islands 2019/20 HIES.

Food product reported in the 2019/20 KHIES	GIFT classification	Pacific guidelines classification	Percentage of households that consumed the food
Bacon, not further specified	Fats and oils	Body building foods – to avoid	25
Oil, cooking	Fats and oils	Energy foods – to avoid	63
Oil, not further specified	Fats and oils	Energy foods – to avoid	1
Butter, not further specified	Fats and oils	Energy foods – to avoid	22
Margarine, not further specified	Fats and oils	Energy foods – to avoid	8
Crackers, not further specified	Sweets and sugars	Energy foods – to limit	18
Biscuits, sweet, all others	Sweets and sugars	Energy foods – to avoid	5
Cake, not further specified	Sweets and sugars	Energy foods – to avoid	9
Pastry, not further specified	Sweets and sugars	Energy foods – to avoid	9
Doughnut, not further specified	Sweets and sugars	Energy foods – to avoid	15
Cake mix	Sweets and sugars	Energy foods – to limit	10
Milk, condensed, whole, sweetened	Sweets and sugars	Body building foods – to avoid	8
Pudding (dairy based)	Sweets and sugars	Energy foods – to avoid	0
Sugar, not further specified	Sweets and sugars	Energy foods – to avoid	54
Jam	Sweets and sugars	Energy foods – to avoid	2
Chocolate, not further specified	Sweets and sugars	Energy foods – to avoid	10
Nutella, or other chocolate spread	Sweets and sugars	Energy foods – to avoid	1
Ice blocks, flavoured ice, popsicles	Sweets and sugars	Energy foods – to avoid	8
Ice cream, cone or bar	Sweets and sugars	Energy foods – to avoid	9
Ice cream, vanilla	Sweets and sugars	Energy foods – to limit	6
Sorbet, not further specified	Sweets and sugars	Energy foods – to avoid	0
Chewing gum, bubble gum	Sweets and sugars	Energy foods – to avoid	5
Sweets, jelly lollies	Sweets and sugars	Energy foods – to avoid	0
Salt, iodised	Spices and condiments	Not classified	79
Sauce, chilli, Asian, commercial	Spices and condiments	Not classified	5
Sauce, soy/shoyu	Spices and condiments	Not classified	76
Sauce, tomato, for pasta	Spices and condiments	Not classified	2
Sauce, tomato, ketchup	Spices and condiments	Not classified	54
Sauce, tabasco	Spices and condiments	Not classified	19
Vinegar, not further specified	Spices and condiments	Not classified	5
Ginger root, fresh	Spices and condiments	Not classified	5
Spices, not further specified	Spices and condiments	Not classified	17
Milk, soy	Beverages	Body building foods – to choose	4
Coconut toddy, fresh	Beverages	Not classified	5
Coconut, water only	Beverages	Protective foods – to choose	23
Juice, vegetable	Beverages	Protective foods – to choose	0
Juice, fruit, not further specified	Beverages	Protective foods – to avoid	7
Coffee, ground	Beverages	Not classified	4
Coffee, instant, powder (e.g. Nescafé)	Beverages	Not classified	21
Coffee, mix (e.g. 3 in 1)	Beverages	Not classified	47
Tea, black, bag	Beverages	Not classified	11
Tea, not further specified	Beverages	Not classified	13
Iced chocolate, commercial	Beverages	Not classified	2
Beverage, chocolate flavour, from base (Milo)	Beverages	Energy foods – to avoid	1
Bottled water/spring water	Beverages	Not classified	25
Cola flavour, soft drink, e.g. Coco cola/Pepsi	Beverages	Energy foods – to avoid	40
Lemonade, soft drink, e.g. Sprite, 7 Up	Beverages	Energy foods – to avoid	13

SOURCE: Marshall Islands 2019/20 HIES.

Food product reported in the 2019/20 KHIES	GIFT classification	Pacific guidelines classification	Percentage of households that consumed the food
Soft drink, not further specified	Beverages	Energy foods – to avoid	0
Coconut toddy, boiled	Beverages	Energy foods – to avoid	3
Powdered drink/flavouring	Beverages	Energy foods – to avoid	19
Cordial, not further specified	Beverages	Energy foods – to avoid	0
Vodka	Beverages	Not classified	0
Whiskey	Beverages	Not classified	2
Wine, not further specified	Beverages	Not classified	5
Beer, homebrew	Beverages	Not classified	1
Beer, not further specified	Beverages	Not classified	20
Restaurants, cafés and the like – foods	Food not classified	Not classified	17
Breakfast away from home	Food not classified	Not classified	15
Lunch away from home	Food not classified	Not classified	60
Dinner away from home	Food not classified	Not classified	15
Non-alcoholic drinks away from home	Food not classified	Not classified	45
Bottled water away from home	Food not classified	Not classified	44
Hot drinks away from home	Food not classified	Not classified	58
Snacks away from home	Food not classified	Not classified	47
Baking powder	Food additives	Not classified	1
Baking soda	Food additives	Not classified	0
Yeast/baker's yeast	Food additives	Not classified	0
Beef, grilled/bbq	Composite dishes	Body building foods – to limit	3
Chicken, grilled/bbq	Composite dishes	Body building foods – to limit	17
Banana, cooking, boiled	Composite dishes	Energy foods – to choose	2
Pancake, without syrup from café or restaurant	Composite dishes	Energy foods – to avoid	11
Pasta, with cream sauce	Composite dishes	Energy foods – to avoid	0
Takeaway, Chinese, noodle dish	Composite dishes	Energy foods – to avoid	2
Takeaway, fish, fried, bbq	Composite dishes	Body building foods – to avoid	6
Takeaway, hamburger, bread roll, beef patty	Composite dishes	Body building foods – to avoid	5
Takeaway, pizza, not further specified	Composite dishes	Body building foods – to avoid	4
Savoury snacks, chips e.g. Twisties, Pringles	Savoury snacks	Energy foods – to avoid	17
Tobacco	Tobacco/kava	Not classified	41
Kava	Tobacco/kava	Not classified	6

SOURCE: Marshall Islands 2019/20 HIES.

ANNEX 3
Processing of the food data collected in the 2019/20 HIES

In the food consumption module of the 2019/20 Household Income Expenditure Survey of the Marshall Islands, households were given a list of some specific foods and they were asked if they consumed any of these foods in the previous seven days in their house. In the case of an affirmative answer, they were then further asked to report the total quantity they consumed of this food, the quantity they purchased in cash, or they took from their own production or they received for free or in exchange for some specific foods like coconut, copra, fish or handicrafts. Together with the quantity consumed, households were also asked to report the unit of measurement in which the quantity was procured, and the amount spent or the amount they would spend to acquire the quantity consumed. In addition to their in-house consumption, households were also asked to report on the number of meals (breakfast, lunch and dinner), snacks, hot drinks or non-alcoholic beverages they consumed away from home and the amount spent to get these meals.

Food quantities collected in the in-house food consumption module were converted into grams and nutrient values were allocated to the quantities using the nutrient values from the Pacific Nutrient Database (PNDB) developed by SPC in collaboration with FAO and University of Wollongong.[II]

Households were asked to report the quantities consumed in the unit of measurement in which the product was acquired (bundle, bag, kg, cup etc). To convert all the quantities into grams,[II] a regional market survey collecting information on the weight in grams of one unit of product or on the price of one gram was also conducted in parallel to the HIES. The information was collected for 19 atolls/islands. The market survey collected information for around 420 combinations of products/unit of measurement while from the food files we had 758 combinations of products/units (of which less than 25 percent corresponded to combinations of product/standard units such as kg, g, litre, ml, ounce or pound). For the uncovered combinations (around 4 300 transactions), we used ad hoc conversions provided by EPPSO or the median price of one gram.

To correct for some improbable/implausible quantities, we used a two steps outlier procedure. We looked first at the quantities reported for each combination product/unit of measurement together with the respective amount spent and the unit value. Outliers were detected using the Tukey method based on the interquartile range (IQR) approach with a multiplier of 2 to determine the outlier fence, and respective quantities or values were corrected using the median quantity or amount corresponding to the combination of product/unit. At the end of this first outlier detection, 0.48 percent of the amounts were corrected and 1.33 percent of the original quantities were corrected. After all the quantities were converted into grams, we further looked at the outstanding quantities consumed per capita. The Tukey approach was used again, and whenever the quantity was out of the range (25th percentile - 1.5*IQR, 75th percentile + 1.5*IQR) the quantity in grams was replaced by the median quantity reported of that product in that area. Around 1.74 percent of the quantities in grams were corrected. Note that we also corrected the corresponding amount using the corrected quantity and the median price of one gram of product.

- All the quantities in grams were then further converted to kcal using nutrient factors from the PNDB database after applying a refuse factor to obtain the edible portion of the food.
- To convert the food consumed away from home to kcal, the approach was different because only the number of meals consumed away from home was collected. The dietary energy content of breakfast, lunch and dinner was estimated using the median cost of one kcal consumed in the house by expenditure quintile and area and applying a cost adjustment factor of 1.1.[III] For snacks and non-alcoholic beverages we used the median cost of

[I] SPC, UOW and FAO (2020). The Pacific Nutrient Database User Guide: A tool to facilitate the analysis of poverty, nutrition and food security in the Pacific region. Pacific Community, University of Wollongong and the Food and Agriculture Organization of the United Nations. 15 pp.

[II] The gram is the reference unit used in all the Food Composition Tables that allocate the nutrient value for 100 grams of the edible portion of the products. Therefore, to convert the quantities into nutrient values it is important to first convert all quantities collected in the local unit of measurement into grams.

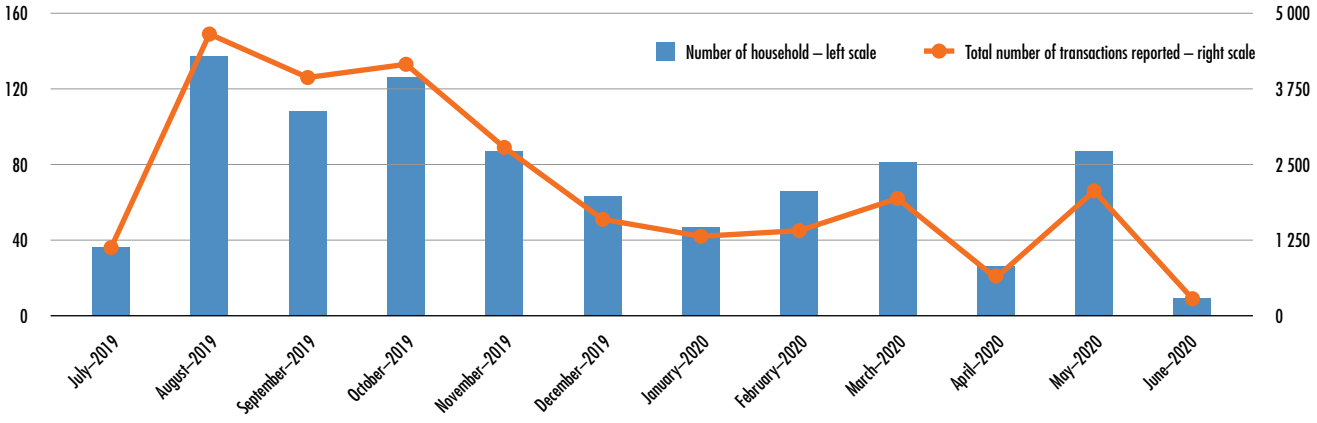
[III] The Pacific Statistics Method Board recommends using a cost adjustment of 1.25 to account for the difference in the cost of one kcal consumed in house and outside the house, due to the margin applied by the food seller, the recovery for the rent and salaries required to run a business. However, this multiplier is too high when we further account for the difference that exists in the cost of one kcal consumed in the house by the least versus the most wealthy households.

one snack or non-alcoholic beverages consumed in the house, aggregating only among products corresponding to a snack or non-alcoholic beverage. For bottled water we applied a conversion of 0 as water does not yield energy, and for hot drinks consumed away from home we used the average of the nutrient content of different kinds of hot drinks and we assumed that one hot drink consumed away from home has an average weight of 250 grams (corresponding to one cup without applying a density factor).

- To account for the exact number of people who consumed the food, information on visitors and number of meals they consumed with the household members was also collected in a special module of the survey. This information was added to the household members who were present in the household in the seven days before the interview.
- To account for seasonal consumption the survey was conducted from July 2019 to June 2020. We looked at the distribution of the total and average number of transactions per household for each month to evidence potential issues during data collection due to fatigue of the enumerator or other causes. As seen from the graphs below, data collection was not homogenous over time, and after November 2019 there is a drop in the overall number of transactions and number of households mainly due to the dengue outbreak that complicated field work. The further analysis of the distribution of the number of transactions per household shows that the average number of transactions was the lowest in February 2020. All this will affect the overall distribution of dietary energy consumed on average per household, and true consumption may be underreported for some households. For this reason it is recommended that single household consumption is not studied but rather the average consumption of groups of households.

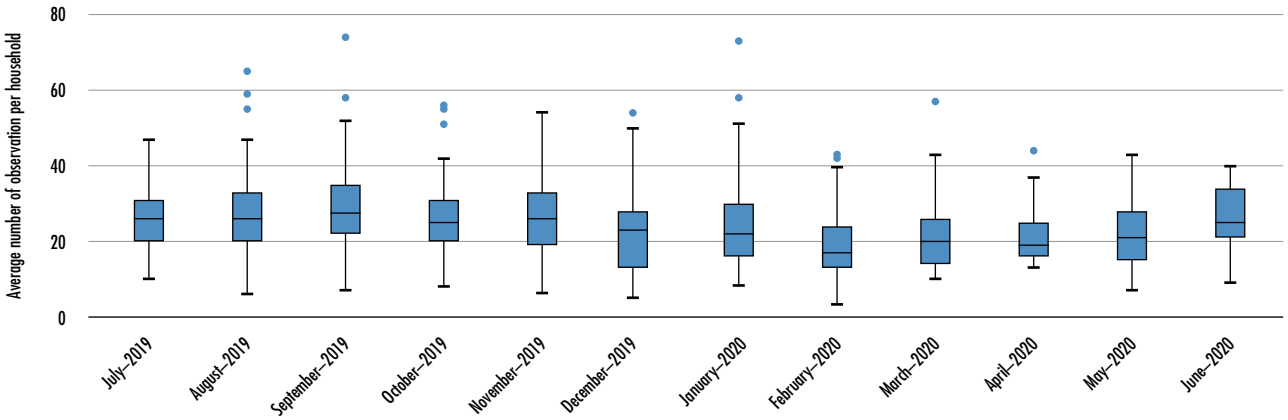
FIGURE 47
Distribution of number of transactions per household by survey round over the previous seven days

Distribution of the sample over time and total number of transactions reported



SOURCE: Marshall Islands 2019/20 HIES.

FIGURE 48
Distribution of number of transactions per household by survey round



SOURCE: Marshall Islands 2019/20 HIES.

ANNEX 4
Regression analysis of the impact of characteristics of the household on the average dietary energy consumption

To assess the impact of the socioeconomic, demographic and regional characteristics of the household on the DEC, a simple linear regression was performed linking the average DEC to household characteristics:

$$ln(DEC_i) = \beta_0 + \beta_1 \ ln(inc_i) + \sum_j^n \beta_j HHchar_{ij}$$

where

DEC_i is the dietary energy consumption of household i

inc_i is the total expenditures of household I (proxied by household total expenditures)

$HHchar_{ij}$ is the socioeconomic or demographic characteristic j of the household i.

	Coefficient	Std. Err.	t	$p > t$
Logarithm household total expenditures	0.24***	0.03	7.09	0.000
Strata[1]				
Kwajalein	−0.20*	0.08	−2.55	0.013
Rural	0.02	0.06	0.35	0.725
Gender of the head of the household[2]				
Female	0.07	0.05	1.57	0.122
Total number of children less than 14 years in the household[3]				
1 child	−0.21***	0.04	−4.80	0.000
2 children	−0.41***	0.05	−7.49	0.000
3 children	−0.54***	0.05	−11.77	0.000
4 children and more	−0.62***	0.05	−13.15	0.000
Age class of the head of the household[4]				
Age 40 to 49	−0.05	0.04	−1.25	0.216
Age 50 to 59	−0.08	0.05	−1.69	0.096
Age 60 and above	−0.10*	0.05	−2.08	0.042
Marital status of the head of the household[5]				
Married	−0.03	0.06	−0.50	0.621
Education level of the head of the household[6]				
Lower secondary school	0.00	0.05	0.09	0.932
Higher/post/tertiary education	0.07	0.06	1.25	0.215
Household member involved in fishing activities[7]	0.13**	0.05	2.88	0.005
Household involved in handicraft activities[7]	−0.01	0.04	−0.32	0.749
Household involved in livestock activities[7]	0.02	0.06	0.43	0.669
Household is selling copra[7]	0.09	0.06	1.42	0.160
Household receives remittances[8]	−0.06	0.03	−1.78	0.080
Household has access to a safe source of drinking water[9]	0.04	0.04	1.07	0.287
Classes of severity level of food insecurity[10]				
Moderate or severely food insecure	−0.09*	0.04	−2.40	0.019
Constant	7.30	0.14	50.40	0.000

[1] Majuro is the reference,
[2] Male headed household is reference,
[3] No child is used as reference category,
[4] Head of the household less than 39 years is used as reference category,
[5] Head of the household not married is used as reference category,
[6] Preschool or primary school is used as reference category
[7] Household not involved in these activities is used as reference,
[8] Household does not receive remittances is used as reference,
[9] Household with lack of access to a safe source of drinking water is used as reference,
[10] Food secure or mildly food insecure household is the reference category.

Number of observations = 785, Population size = 49 793.

*** p value < 0.001, * p value < 0.05.

SOURCE: Marshall Islands 2019/20 HIES.

ANNEX 5
Food consumption statistics by products

Food product	Average edible quantity (g/capita/day)	Average food consumption in monetary value (USD/capita/day)	Average dietary energy consumption (kcal/capita/day)	Median dietary energy unit value (USD/1 000 kcal)	Median price (USD/100 g)	Contribution to total DEC (%)	Contribution to total food expenditure (%)	Percentage of households that consume the food
Rice, brown, uncooked	0.32	0.00	1.05	0.06	0.021	0	0.0	0
Rice, not further specified	218.07	0.25	737.73	0.31	0.106	26	4.8	97
Flour, not further specified	75.93	0.10	267.88	0.38	0.132	9	1.9	41
Bread, loaf, all others	17.58	0.07	43.01	1.92	0.472	2	1.3	33
Bread, loaf, not further specified	3.35	0.02	7.89	2.23	0.524	0	0.3	12
Crackers, not further specified	4.77	0.04	20.64	2.58	1.120	1	0.7	18
Biscuits, sweet, all others	0.54	0.01	2.51	3.11	1.371	0	0.2	5
Cake, not further specified	2.02	0.01	7.18	1.62	0.579	0	0.2	9
Pastry, not further specified	2.10	0.02	9.30	4.55	2.667	0	0.4	9
Doughnut, not further specified	7.52	0.02	30.19	0.95	0.385	1	0.4	15
Breakfast cereal, flakes of corn, added nuts and/or sugar coated added vitamin	0.05	0.00	0.19	1.67	0.640	0	0.0	0
Oats, porridge, dry	0.67	0.00	2.45	2.17	0.800	0	0.1	2
Breakfast cereal, not further specified	7.77	0.06	28.60	2.33	0.852	1	1.2	23
Noodles, not further specified	23.00	0.17	90.63	1.89	0.750	3	3.3	69
Cake mix	3.45	0.02	13.06	1.52	0.579	0	0.4	10
Beef, regular, cut not specified	5.81	0.06	9.97	6.30	1.034	0	1.2	20
Pork, regular, cuts not specified	6.00	0.03	10.60	3.13	0.481	0	0.7	12
Lamb and mutton, regular, cuts not specified	0.39	0.00	0.82	5.54	1.057	0	0.1	2
Chicken, not further specified	82.71	0.25	170.96	1.35	0.200	6	4.8	66
Bird, all others, e.g. pigeon, noddy bird	0.70	0.01	1.40	7.85	2.000	0	0.2	1
Bacon, not further specified	6.77	0.06	11.29	4.42	0.687	0	1.2	25
Beef, canned, corned	7.28	0.10	16.73	6.09	1.380	1	2.0	39
Canned meat, not further specified	9.98	0.08	19.82	4.41	0.824	1	1.6	38
Paté, not further specified	0.11	0.00	0.36	1.90	0.643	0	0.0	0
Devon/fritz, processed luncheon meat, beef and pork	0.93	0.01	2.25	2.43	0.580	0	0.1	2
Luncheon meat, chicken	9.54	0.08	14.97	5.22	0.809	1	1.6	45
Tuna, not further specified	12.27	0.07	21.04	4.94	0.500	1	1.3	19
Fish, pelagic/ocean, not further specified	2.29	0.01	3.43	1.61	0.117	0	0.1	1
Shark	0.38	0.00	0.36	0.53	0.025	0	0.0	0
Fish, reef, not further specified	145.49	0.19	158.44	1.32	0.104	6	3.7	43
Fish, not further specified	0.72	0.01	0.94	15.24	1.311	0	0.2	2
Mackerel, canned, not further specified	8.85	0.06	16.09	3.33	0.486	1	1.2	47
Fish, canned in oil, not further specified	5.74	0.09	11.70	6.96	1.058	0	1.7	64
Fish, canned, not further specified	1.45	0.01	2.62	2.16	0.278	0	0.1	3
Crab, land	0.47	0.01	0.34	21.84	0.042	0	0.1	2
Crayfish/lobster, not further specified	0.94	0.02	0.83	16.65	0.500	0	0.3	2
Scallop	0.02	0.00	0.02	12.69	2.778	0	0.0	0
Oyster	0.22	0.01	0.14	68.30	1.101	0	0.2	2
Sea snail	0.05	0.00	0.05	12.57	0.500	0	0.0	0

SOURCE: Marshall Islands 2019/20 HIES.

Food product	Average edible quantity (g/capita/day)	Average food consumption in monetary value (USD/capita/day)	Average dietary energy consumption (kcal/capita/day)	Median dietary energy unit value (USD/1 000 kcal)	Median price (USD/100 g)	Contribution to total DEC (%)	Contribution to total food expenditure (%)	Percentage of households that consume the food
Sea-hare, not further specified	1.95	0.01	1.48	4.33	0.331	0	0.1	1
Milk, long life, shelf stable (UHT), not further specified	14.32	0.04	7.26	4.76	0.243	0	0.7	26
Milk, condensed, whole, sweetened	1.91	0.01	6.46	1.45	0.495	0	0.2	8
Milk, powdered, not further specified	0.35	0.00	1.39	2.93	1.148	0	0.1	2
Cream, coconut, canned/UHT	6.39	0.01	10.51	0.85	0.211	0	0.2	8
Milk, soy	1.45	0.01	0.90	7.47	0.464	0	0.1	4
Cheese, block, e.g. Cheddar, Edam, Swiss	0.31	0.00	1.15	4.08	1.453	0	0.1	4
Yoghurt, not further specified	0.43	0.00	0.42	8.06	0.833	0	0.1	2
Pudding (dairy based)	0.04	0.00	0.10	4.19	0.954	0	0.0	0
Egg, chicken, fresh	8.29	0.06	10.62	5.11	0.568	0	1.1	59
Oil, cooking	10.19	0.06	91.72	0.62	0.561	3	1.1	63
Oil, not further specified	0.12	0.00	1.04	1.03	0.928	0	0.0	1
Butter, not further specified	1.56	0.01	11.48	1.05	0.661	0	0.2	22
Margarine, not further specified	5.09	0.00	30.76	0.13	0.079	1	0.1	8
Avocado	0.07	0.00	0.16	8.68	1.355	0	0.0	0
Banana, common, e.g. Cavendish	21.61	0.06	22.65	1.79	0.111	1	1.2	35
Mango	1.05	0.01	0.68	10.29	0.438	0	0.1	4
Papaya	3.48	0.02	1.21	12.44	0.294	0	0.3	10
Pineapple	0.47	0.00	0.19	15.26	0.459	0	0.1	2
Coconut, green	9.22	0.03	3.16	8.76	0.117	0	0.6	20
Coconut, brown	15.42	0.01	62.39	0.19	0.036	2	0.2	10
Breadfruit	29.96	0.08	32.65	2.19	0.187	1	1.5	28
Pandanus	38.84	0.05	33.91	4.26	0.073	1	0.9	16
Lime	1.03	0.01	0.19	25.58	0.324	0	0.1	9
Orange	8.76	0.04	3.55	12.78	0.400	0	0.9	33
Mandarin	0.00	0.00	0.00	18.21	0.617	0	0.0	0
Apple, not further specified	10.10	0.05	5.43	9.38	0.465	0	1.0	34
Pear, Packham's	0.10	0.00	0.06	19.38	1.406	0	0.0	1
Peach	0.56	0.00	0.18	20.27	0.592	0	0.1	1
Strawberry	0.02	0.00	0.00	130.65	0.958	0	0.0	1
Grapes	0.73	0.01	0.50	13.71	0.879	0	0.1	3
Kiwi fruit, with skin	0.08	0.00	0.04	26.59	1.049	0	0.0	1
Melon, not further specified	0.77	0.00	0.22	35.40	0.650	0	0.1	2
Watermelon	1.14	0.01	0.28	34.55	0.439	0	0.1	3
Fruit, not further specified	0.04	0.00	0.03	8.69	0.636	0	0.0	0
Mixed dried fruit, not further specified	0.08	0.00	0.24	2.30	0.833	0	0.0	0
Fruit, canned, not further specified	2.18	0.01	1.25	7.46	0.412	0	0.2	6
Cabbage, Chinese	0.84	0.00	0.16	26.39	0.450	0	0.1	4
Cabbage, European, white	1.11	0.01	0.25	29.62	0.522	0	0.1	5
Broccoli	0.94	0.01	0.32	32.54	0.661	0	0.2	8
Lettuce, not further specified	0.67	0.01	0.08	86.13	0.665	0	0.1	4
Leaves, watercress	0.04	0.00	0.01	15.12	0.110	0	0.0	0
Cucumber, unpeeled	0.36	0.00	0.04	65.66	0.750	0	0.1	2
Eggplant	0.06	0.00	0.02	18.06	0.385	0	0.0	0

SOURCE: Marshall Islands 2019/20 HIES.

Food product	Average edible quantity (g/capita/day)	Average food consumption in monetary value (USD/capita/day)	Average dietary energy consumption (kcal/capita/day)	Median dietary energy unit value (USD/1 000 kcal)	Median price (USD/100 g)	Contribution to total DEC (%)	Contribution to total food expenditure (%)	Percentage of households that consume the food
Tomato, common	0.83	0.01	0.14	45.40	0.751	0	0.1	5
Pumpkin	1.83	0.00	0.73	3.49	0.110	0	0.0	2
Capsicum, not further specified	0.56	0.01	0.22	38.68	1.172	0	0.2	6
Beans, green	0.34	0.00	0.09	22.25	0.426	0	0.0	3
Beans, long	0.22	0.00	0.06	18.38	0.330	0	0.0	1
Carrot	1.61	0.01	0.53	21.85	0.551	0	0.2	9
Garlic, peeled	0.52	0.01	0.64	21.23	2.203	0	0.2	14
Onion, brown	4.74	0.02	1.25	17.92	0.373	0	0.4	35
Corn, cob, not further specified	0.99	0.01	1.02	8.35	0.521	0	0.2	7
Potato, not further specified	5.51	0.02	4.09	5.08	0.316	0	0.4	20
Kumara/sweet potato	0.69	0.00	0.69	3.37	0.310	0	0.1	2
Cassava/tapioca/manioc	0.61	0.00	0.90	1.17	0.200	0	0.0	0
Taro, common	0.70	0.01	0.77	10.23	1.002	0	0.2	2
Banana, cooking, raw	3.73	0.02	4.70	5.10	0.420	0	0.5	17
Flour, cassava	0.32	0.00	1.15	1.34	0.465	0	0.0	1
Mushrooms, canned	0.32	0.00	0.07	14.02	0.176	0	0.0	1
Beans, legumes canned, e.g. red kidney, chickpea, butter, lima	0.12	0.00	0.11	9.85	0.006	0	0.0	1
Savoury snacks, chips, e.g. twisties, Pringles, cheezeballs	1.80	0.02	9.07	2.21	1.124	0	0.4	17
Baked beans, canned, not further specified	2.71	0.01	2.23	4.75	0.385	0	0.2	8
Sugar, not further specified	28.66	0.05	112.92	0.38	0.150	4	0.9	54
Jam	0.17	0.00	0.47	4.32	1.162	0	0.0	2
Peanut butter, not further specified	2.76	0.02	17.17	1.32	0.851	1	0.4	21
Chocolate, not further specified	0.52	0.01	2.74	4.03	2.151	0	0.2	10
Nutella, or other chocolate spread	0.08	0.00	0.40	2.81	1.423	0	0.0	1
Ice blocks, flavoured ice, popsicles	2.31	0.01	1.60	3.44	0.227	0	0.1	8
Ice cream, cone or bar	0.38	0.01	0.84	12.96	2.872	0	0.2	9
Ice cream, vanilla	1.53	0.01	2.94	4.78	0.917	0	0.3	6
Sorbet, not further specified	0.01	0.00	0.02	13.61	1.543	0	0.0	0
Chewing gum, bubble gum	0.09	0.00	0.36	9.70	3.704	0	0.1	5
Sweets, jelly lollies	0.00	0.00	0.02	10.28	3.328	0	0.0	0
Beef, grilled/BBQ	0.66	0.01	1.35	5.81	1.087	0	0.2	3
Chicken, grilled/BBQ	6.06	0.05	13.77	2.98	0.416	0	0.9	17
Banana, cooking, boiled	0.89	0.00	1.00	2.30	0.130	0	0.0	2
Salt, iodised	8.86	0.02	0.00	0.00	0.197	0	0.4	79
Sauce, chilli, Asian, commercial	0.47	0.00	0.53	8.02	0.726	0	0.1	5
Sauce, soy/shoyu	10.50	0.06	3.40	17.55	0.564	0	1.1	76
Sauce, tomato, for pasta	0.23	0.00	0.12	8.81	0.461	0	0.0	2
Sauce, tomato, ketchup	10.13	0.04	11.70	3.52	0.404	0	0.8	54
Sauce, tabasco	0.67	0.01	0.13	98.90	2.033	0	0.3	19
Vinegar, not further specified	0.41	0.00	0.12	15.62	0.450	0	0.0	5
Ginger root, fresh	0.32	0.00	0.15	25.20	1.101	0	0.1	5
Spices, not further specified	0.42	0.01	1.47	7.65	2.689	0	0.2	17
Baking powder	1.86	0.00	2.99	0.25	0.028	0	0.0	1

SOURCE: Marshall Islands 2019/20 HIES.

Food product	Average edible quantity (g/capita/day)	Average food consumption in monetary value (USD/capita/day)	Average dietary energy consumption (kcal/capita/day)	Median dietary energy unit value (USD/1 000 kcal)	Median price (USD/100 g)	Contribution to total DEC (%)	Contribution to total food expenditure (%)	Percentage of households that consuming the food
Baking soda	0.14	0.00	0.00	0.00	0.022	0	0.0	0
Yeast/baker's yeast	0.02	0.00	0.02	2.22	0.200	0	0.0	0
Coconut toddy, fresh	2.35	0.02	1.01	21.54	0.909	0	0.4	5
Coconut, water only	22.53	0.04	4.35	7.70	0.143	0	0.8	23
Juice, vegetable	0.05	0.00	0.01	15.11	0.811	0	0.0	0
Juice, fruit, not further specified	3.18	0.01	1.24	7.26	0.286	0	0.2	7
Coffee, ground	0.04	0.01	0.13	75.76	1.456	0	0.2	4
Coffee, instant, powder (e.g. Nescafé)	1.75	0.04	2.32	13.70	1.471	0	0.7	21
Coffee, mix (e.g. 3 in 1)	4.99	0.05	23.47	1.89	0.833	1	1.0	47
Tea, black, bag	0.01	0.01	0.03	291.47	4.167	0	0.2	11
Tea, not further specified	2.80	0.01	8.23	1.02	0.200	0	0.2	13
Iced chocolate, commercial	0.53	0.00	0.42	5.68	0.441	0	0.1	2
Beverage, chocolate flavour, from base (Milo)	0.10	0.00	0.45	3.28	1.248	0	0.0	1
Bottled water/spring water	30.64	0.03	0.00	0.00	0.097	0	0.7	25
Cola flavour, soft drink, e.g. Coca-Cola/Pepsi	20.47	0.06	6.47	8.82	0.273	0	1.2	40
Lemonade, soft drink, e.g. Sprite, 7 Up	6.92	0.02	2.74	7.00	0.273	0	0.4	13
Soft drink, not further specified	0.00	0.00	0.00	18.53	0.423	0	0.0	0
Coconut toddy, boiled	0.55	0.01	1.22	...	0.971	0	0.1	3
Powdered drink/flavouring, e.g. Kool Aid/Tang	3.60	0.02	14.07	2.14	0.918	0	0.5	19
Cordial, not further specified	0.03	0.00	0.05	2.43	0.462	0	0.0	0
Vodka	0.16	0.00	0.38	3.79	0.853	0	0.0	0
Whiskey	1.41	0.01	2.90	3.10	0.800	0	0.3	2
Wine, not further specified	2.49	0.03	1.85	16.78	1.300	0	0.6	5
Beer, homebrew	3.14	0.01	0.81	10.70	0.262	0	0.2	1
Beer, not further specified	30.15	0.18	7.60	22.98	0.582	0	3.4	20
Smoking and smokeless tobacco	1.18	0.16	0.00	0.00	14.000	0	3.2	41
Kava	0.94	0.08	0.00	0.00	10.400	0	1.5	6
Restaurants, cafés and the like – foods	40.13	0.08	40.13	1.76	NA	1	1.5	17
Pancake, without syrup from café or restaurant	8.89	0.02	19.50	1.33	0.222	1	0.5	11
Pasta, with cream sauce	0.36	0.00	0.77	4.07	0.867	0	0.1	0
Takeaway, Chinese, noodle dish	0.47	0.01	0.39	21.44	1.739	0	0.2	2
Takeaway, fish, fried, bbq	2.04	0.01	3.76	3.59	0.978	0	0.3	6
Takeaway, hamburger, bread roll, beef patty	0.31	0.01	0.72	22.64	3.103	0	0.2	5
Takeaway, pizza, not further specified	2.59	0.02	5.96	5.29	1.197	0	0.5	4
Breakfast away from home	40.36	0.08	40.36	1.72	2.000	1	1.6	15
Lunch away from home	239.61	0.46	239.61	1.71	2.000	8	9.0	60
Dinner away from home	55.86	0.11	55.86	1.76	5.000	2	2.2	15
Non-alcoholic drinks away from home	21.60	0.11	21.60	4.91	1.000	1	2.2	45
Bottled water away from home	170.72	0.10	0.00	0.00	0.050	0	1.9	44
Hot drinks away from home	46.04	0.11	14.96	6.33	0.500	1	2.2	58
Snacks away from home	50.99	0.14	50.99	3.01	1.000	2	2.8	47

SOURCE: Marshall Islands 2019/20 HIES.

ANNEX 6
Profile of the food insecure

To analyse the main factors that characterize the food insecure, a simple logistic regression is performed linking the categorical variable on the level of severity of food insecurity (classes for severity level of food insecurity, which takes the value of 0 for "food secure or mildly food insecure" and 1 for "moderately or severely food insecure") to the characteristics of the household:

$$logit\ (P) = In\ [P/(1-P)] = \beta_0 + \beta_1\ \ ln(inc_i) + \sum_j^n \beta_j HHchar_{ij}$$

where

P is the probability of belonging to class k of food insecurity

$P/(1-P)$ are the odds of belonging to class k of food insecurity versus the probability of belonging to lowest classes of food insecurity

inc_i is the total expenditures of household i

$HHchar_{ij}$ is the socioeconomic or demographic characteristic j of the household i.

In the output table below the coefficients represent the log odds (logit).

	Coefficient	Std. Err.	z	P>z
Logarithm of the total expenditure	-1.40***	0.048	-28.920	0.000
Urban[1]	1.15***	0.079	14.550	0.000
Gender of the head of the household[2]				
Female	0.03	0.049	0.650	0.514
Marital status of the head of the household[3]				
Married	-0.23***	0.052	-4.410	0.000
Class of age for the head of the household[4]				
age 40 to 49	-0.37***	0.056	-6.660	0.000
age 50 to 59	-0.44***	0.058	-7.510	0.000
age 60 and above	-0.45***	0.059	-7.600	0.000
Total number of kids less than 14 years old in the household[5]				
1 child	0.23***	0.055	4.150	0.000
2 children	0.35***	0.059	6.020	0.000
3 children	0.51***	0.078	6.540	0.000
4 children and more	0.88***	0.098	9.010	0.000
Access to a safe source of drinking water[6]	-0.07*	0.151	−0.17	0.03
Level of education of the head of the household[7]				
Lower secondary school	-0.63***	0.048	-13.150	0.000
Higher/post/tertiary school	-1.13***	0.063	-17.980	0.000
Household is selling copra[8]	0.38***	0.079	4.810	0.000
Household involved in livestock activity[8]	0.74***	0.065	11.340	0.000
Any household member involves in fishing or hunting[8]	0.24***	0.066	3.550	0.000
Any household member involves in handicraft[8]	-0.43***	0.069	-6.230	0.000
Household receives remittances[8]	-0.37***	0.042	-8.780	0.000
Constant	4.17***	0.167	24.940	0.000

[1] Rural households are the reference
[2] Households whose head is a male are the reference
[3] Households whose head is not married are the reference
[4] Households whose head is younger than 39 years are the reference
[5] Households with no child are the reference
[6] Households with no access to a safe source of drinking water are the reference
[7] Households with a primary level of education are the reference
[8] All households not involved in these activities are the reference

Number of weighted households=13,864.

*** p-value<0.001; ** p-value<0.01; * p-value<0.05.

SOURCE: Marshall Islands 2019/20 HIES.

FAO Subregional Office for the Pacific Islands
SAP-SRC@fao.org
Food and Agriculture Organization of the United Nations
Apia, Samoa

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