

International Comparison of Retail Food Prices to Guide Agriculture and Food Systems

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Food Prices for Nutrition

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Agenda

- 1. Introduction**
- 2. Methods and Datasets**
- 3. Results in Mexico, South Africa, China, Vietnam, and the Philippines**
- 4. Confidence Interval Analysis in Mexico**
- 5. Conclusions**

A world map composed of a grid of small dots, with the text "1. Introduction" centered over it.

1. Introduction

Research Question

- Food Prices for Nutrition project has estimated to date the cost of a healthy diet in the world using ICP 2017 data, but these global datasets have limitations.
- **Research question: *What would the cost of a healthy diet be if we were to use national price datasets from the Consumer Price Index (CPI)?***
- In this presentation, we explore using comprehensive CPI datasets for the cost of a healthy diet estimation in Mexico, South Africa, China, Vietnam, and the Philippines



2. Methods and Datasets

Methods

The Cost of a Healthy Diet

- The cost of the least expensive locally-available foods to meet requirements for energy and food-based dietary guidelines.

Following the Healthy Diet Basket method

- A diet pattern comprised of the median amounts of each food group across 10 national food-based dietary guidelines that sums to a total of 2330 kcal (Herforth et. al., 2022).

Food Group	Number of food items selected	Energy content (kcal)	Typical weights of example foods (g)
Starchy Staples	2	1,160	322 g dry rice
Vegetables	3	110	270-400 g
Fruits	2	160	230-300 g
Animal-source Foods	2	300	210 g egg
Legumes, Nuts & Seeds	1	300	85 g dry bean
Oils & Fats	1	300	34 g oil
Total	11	2,330	

Datasets – Mexico and South Africa, publicly available NSO data

Mexico: monthly average prices of 122 items from **46 cities** in 2017

- 75 items: 12SS+6LNS+23AF+10V+18F+6FT
- High-quality data with multiple observations for each food item in each city/month
- Possibility to calculate confidence intervals

South Africa: monthly average prices of 152 items from **9 provinces** in 2017

- 86 items: 18SS +3LNS+43AF+12V+6F+4FT
- Food item variation across provinces: from 61-83

Legend: *Starchy Staples – SS ; Legumes, Nuts & Seeds – LNS; Foods from Animals – AF; Vegetables – V; Fruits – F; Oils and Fats – FT*

Datasets – Vietnam and Philippines, FPN through NSO

Vietnam: monthly average prices of 176 items from **25 provinces** in 2017

- 107 items: 18SS +9LNS+43AF+18V+16F+3FT
- Food item variation across provinces: 107

Philippines: monthly average prices from **83 provinces (17 regions)** in 2017

- Starting from over **1500 items!** - data cleaning and preparation with (at least) 3 rounds of food identification and matching work
- 180 items = 35SS+8LNS+46AF+45V+34F+12FT
- Food item variation across provinces: from 33-87

Legend: *Starchy Staples – SS ; Legumes, Nuts & Seeds – LNS; Foods from Animals – AF; Vegetables – V; Fruits – F; Oils and Fats – FT*

Datasets – China, FPN through quasi-official data source

China: monthly average prices of 62 items from **100 cities/counties (31 provinces)** in 2017

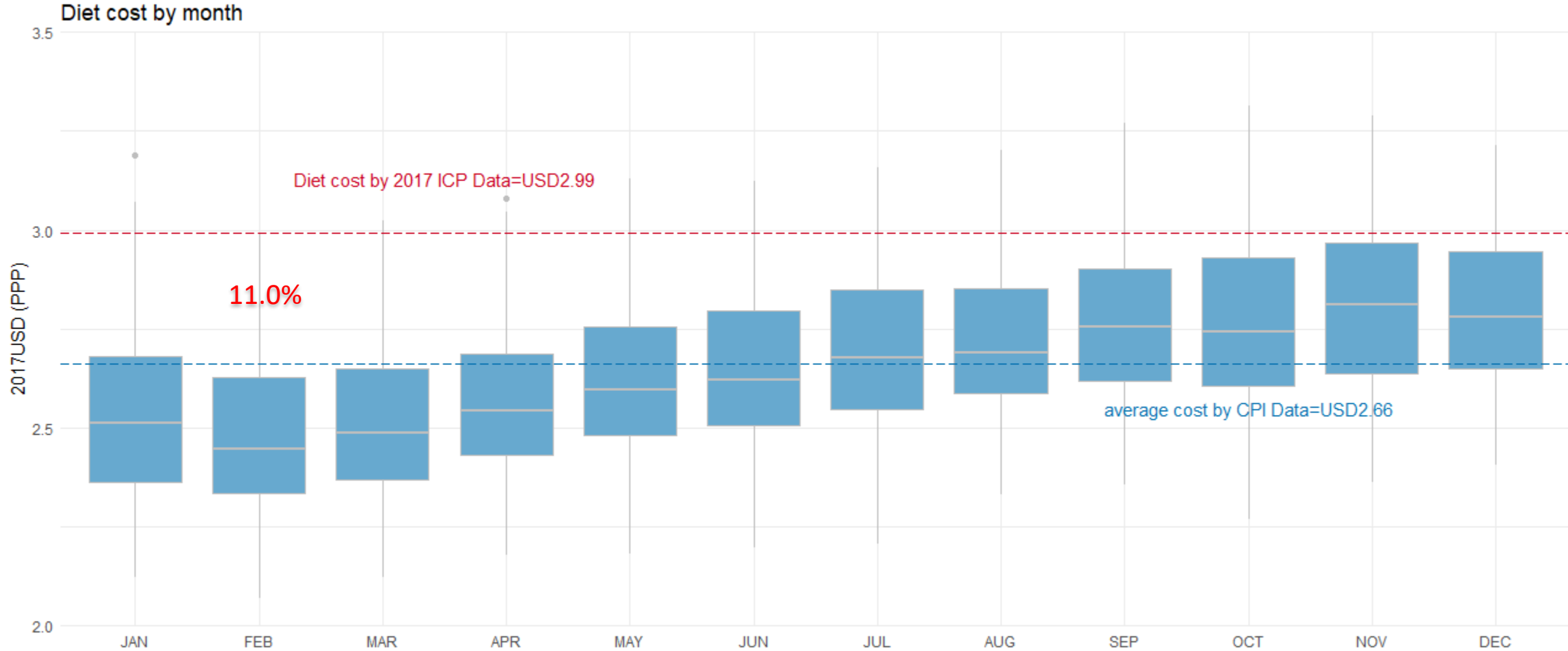
- 52items = 6SS+1LNS+22AF+14V+5F+4FT
- Food item variation across provinces: from 45-51
- Quasi-official food price datasets, in the purpose of cross-checking inflation data published by the NSO
- Covering all major food groups and common food items in China

Legend: *Starchy Staples – SS ; Legumes, Nuts & Seeds – LNS; Foods from Animals – AF; Vegetables – V; Fruits – F; Oils and Fats – FT*



3. Results in Mexico, South Africa, China, Vietnam and the Philippines

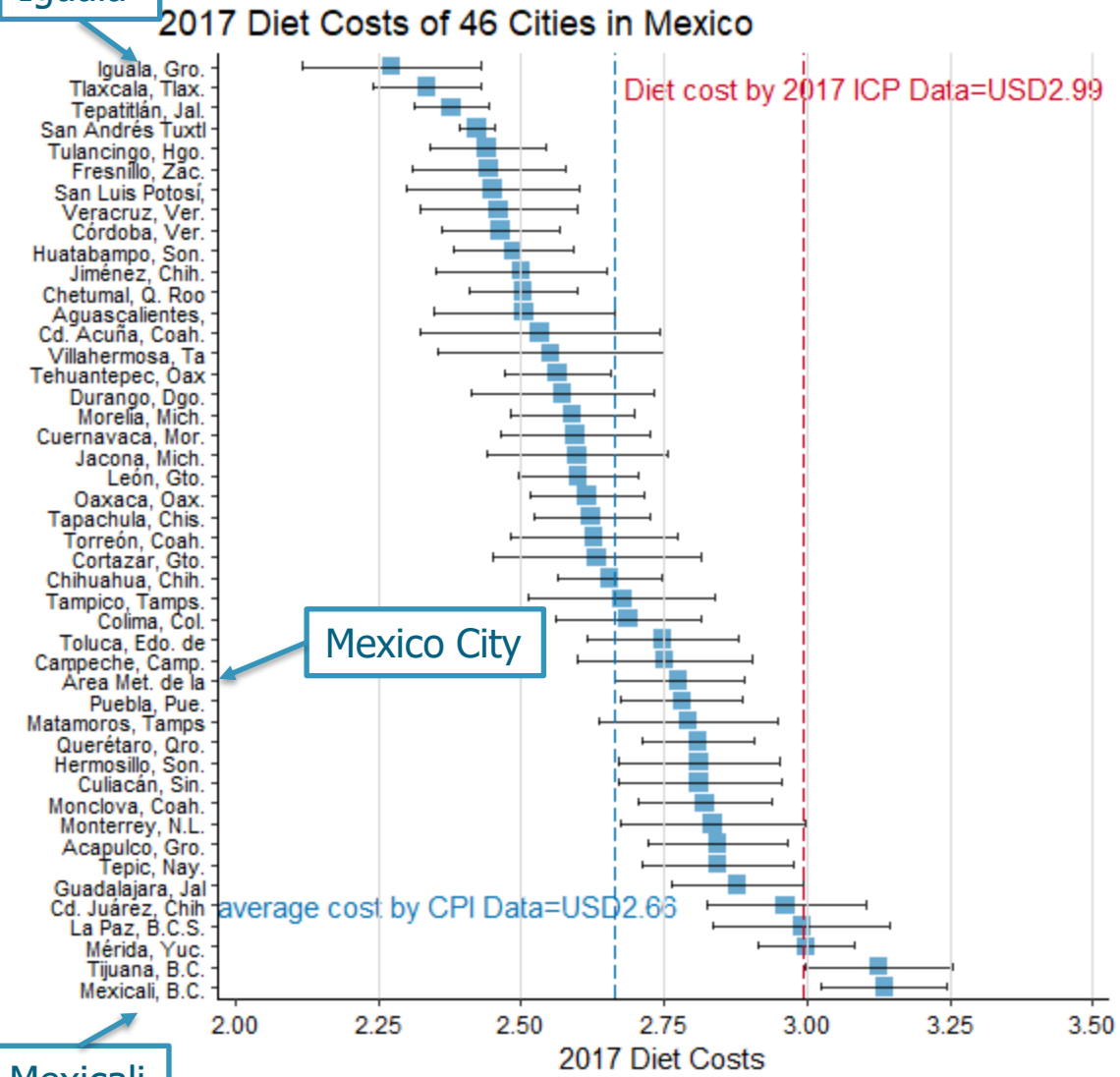
Mexico – Cost of a Healthy Diet in 2017, by month



Note: Box shows 25th-75th percentile of diet cost in each month of all 46 cities. Blue dashed line refers to average cost of all cities and months. Red dashed line is the single estimate of the diet cost by ICP 2017.

Mexico – Cost of a Healthy Diet in 2017, by city

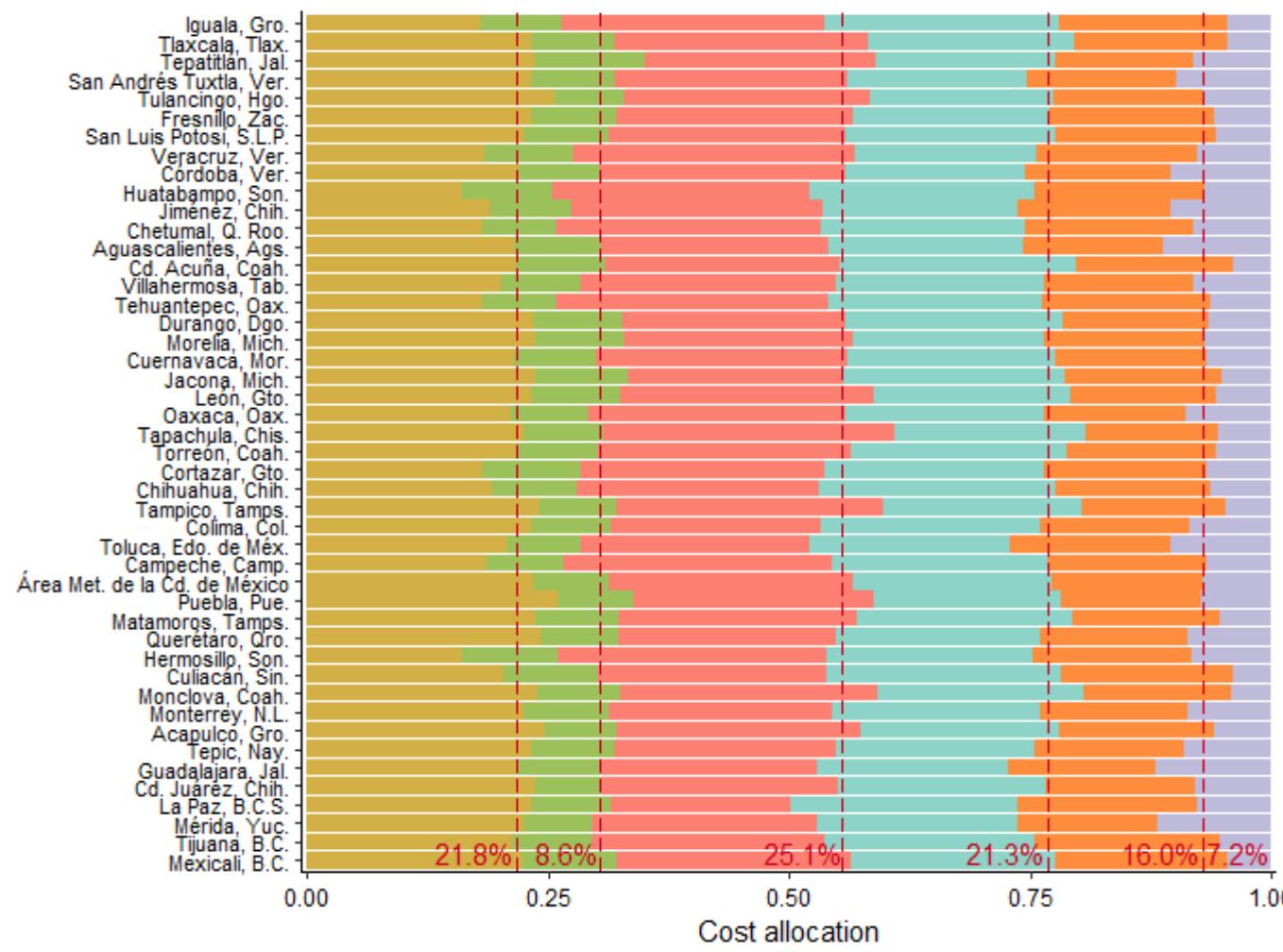
Iguala



Mexico City

Mexicali

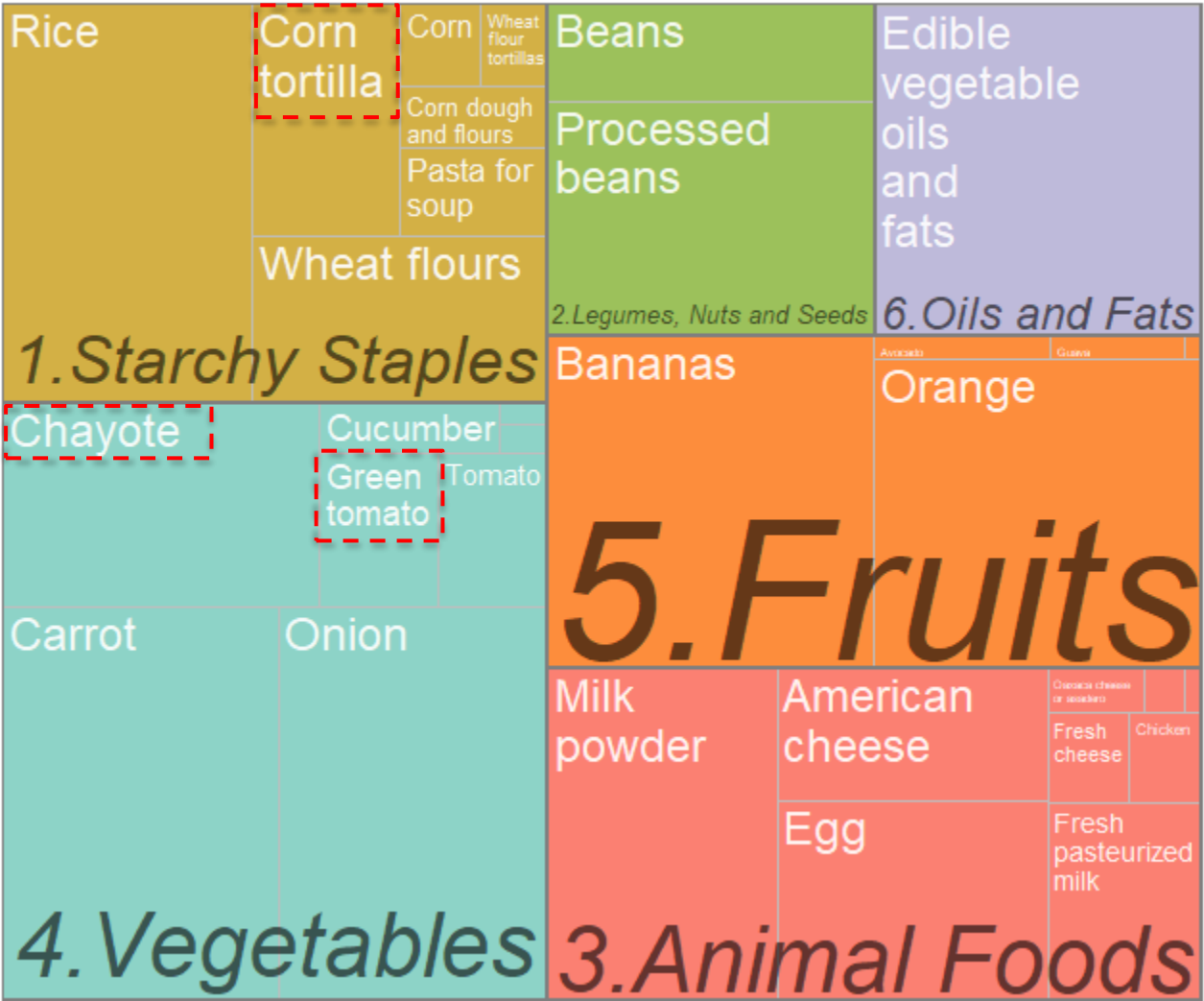
Cost allocation of 46 Cities in Mexico



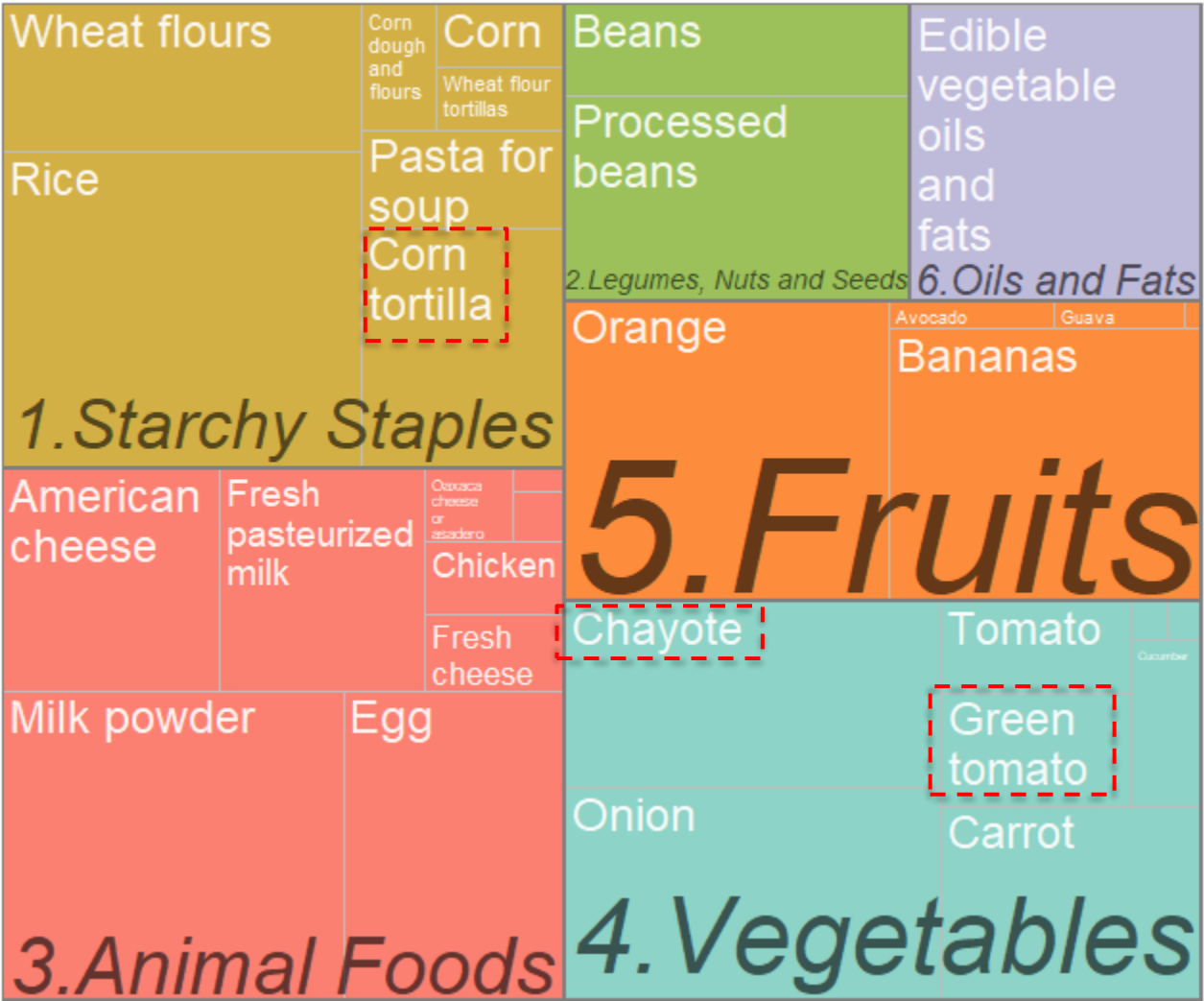
Note: The dot is the average diet cost over 12 months in each city. Error bar refers to the standard deviation.

Mexico – Food selection and cost allocation

A. Food selection



B. Cost allocation



Mexico – Location-specific food



Chayote

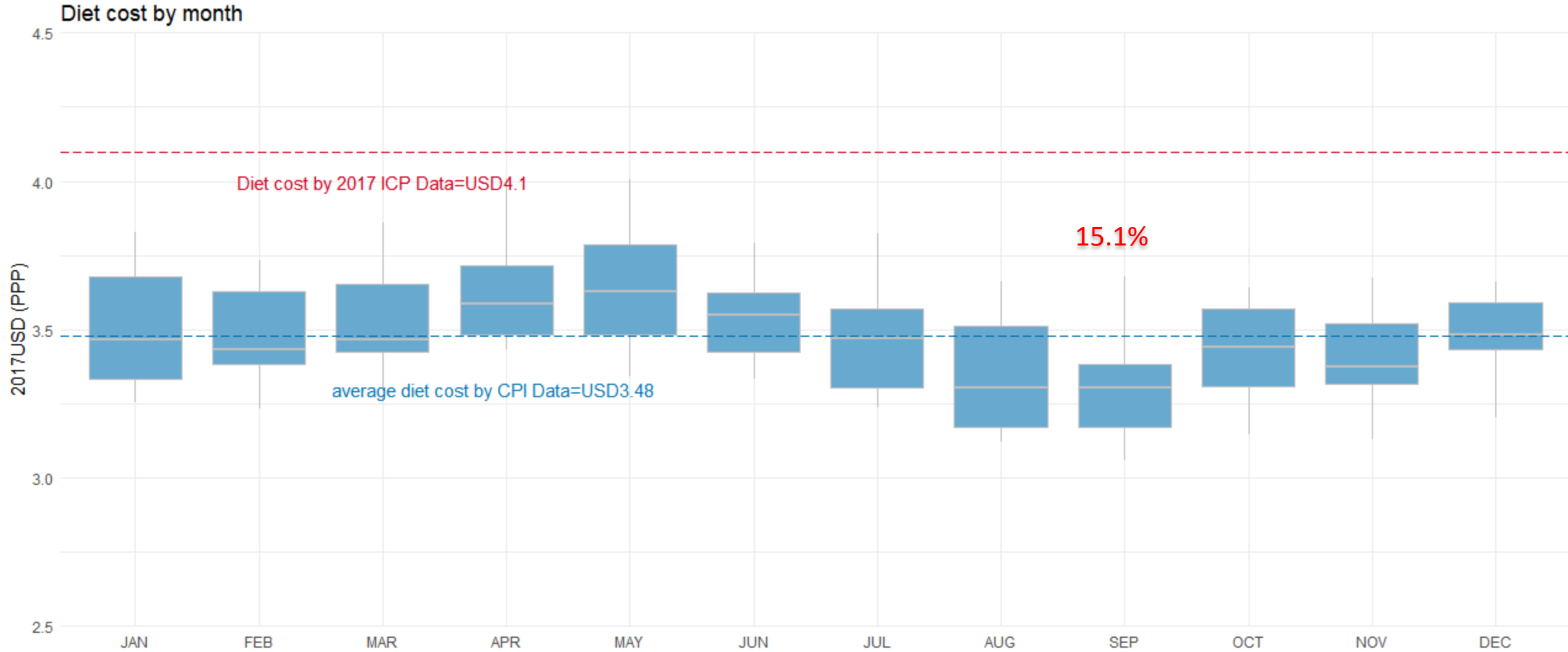


Green tomato



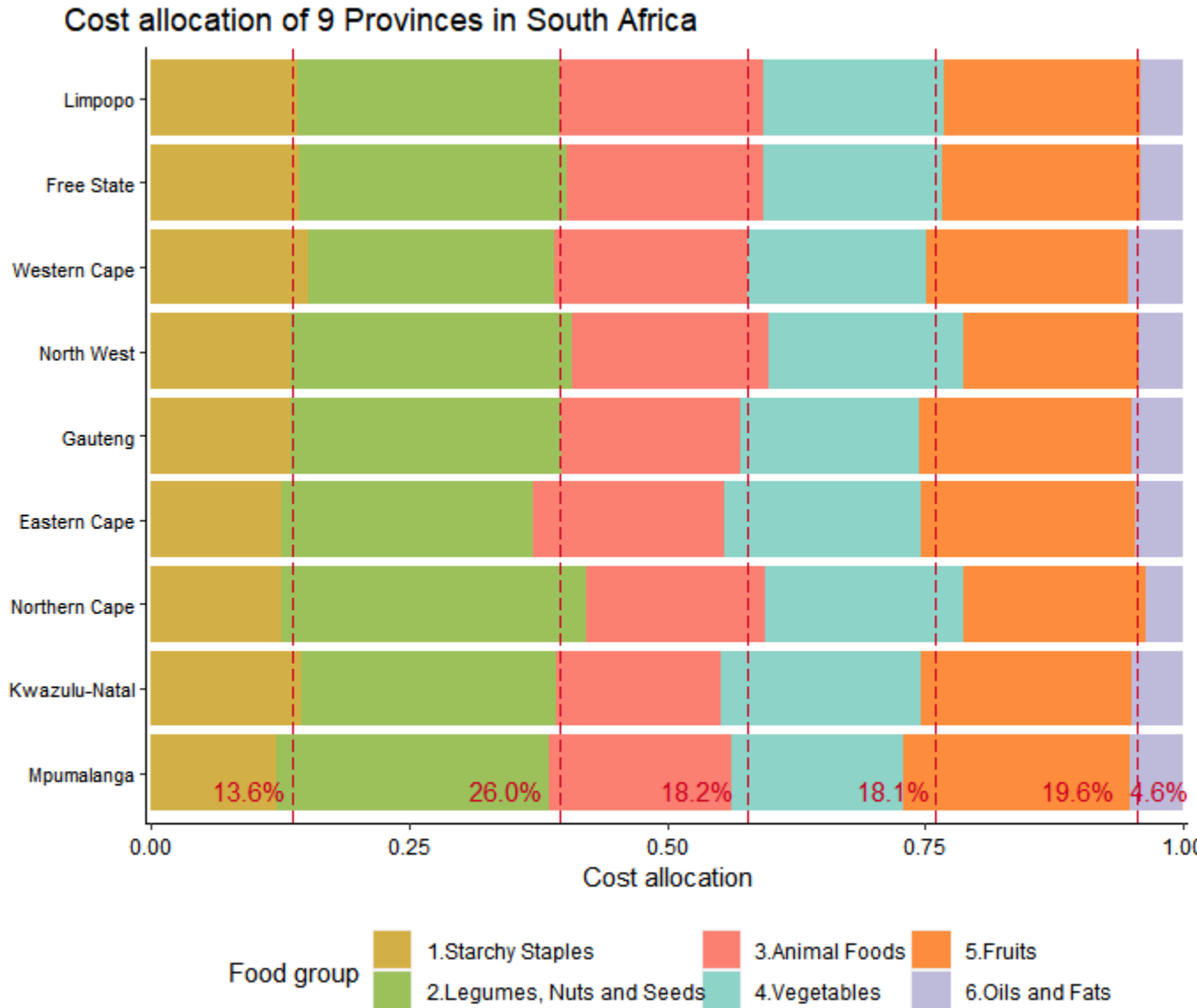
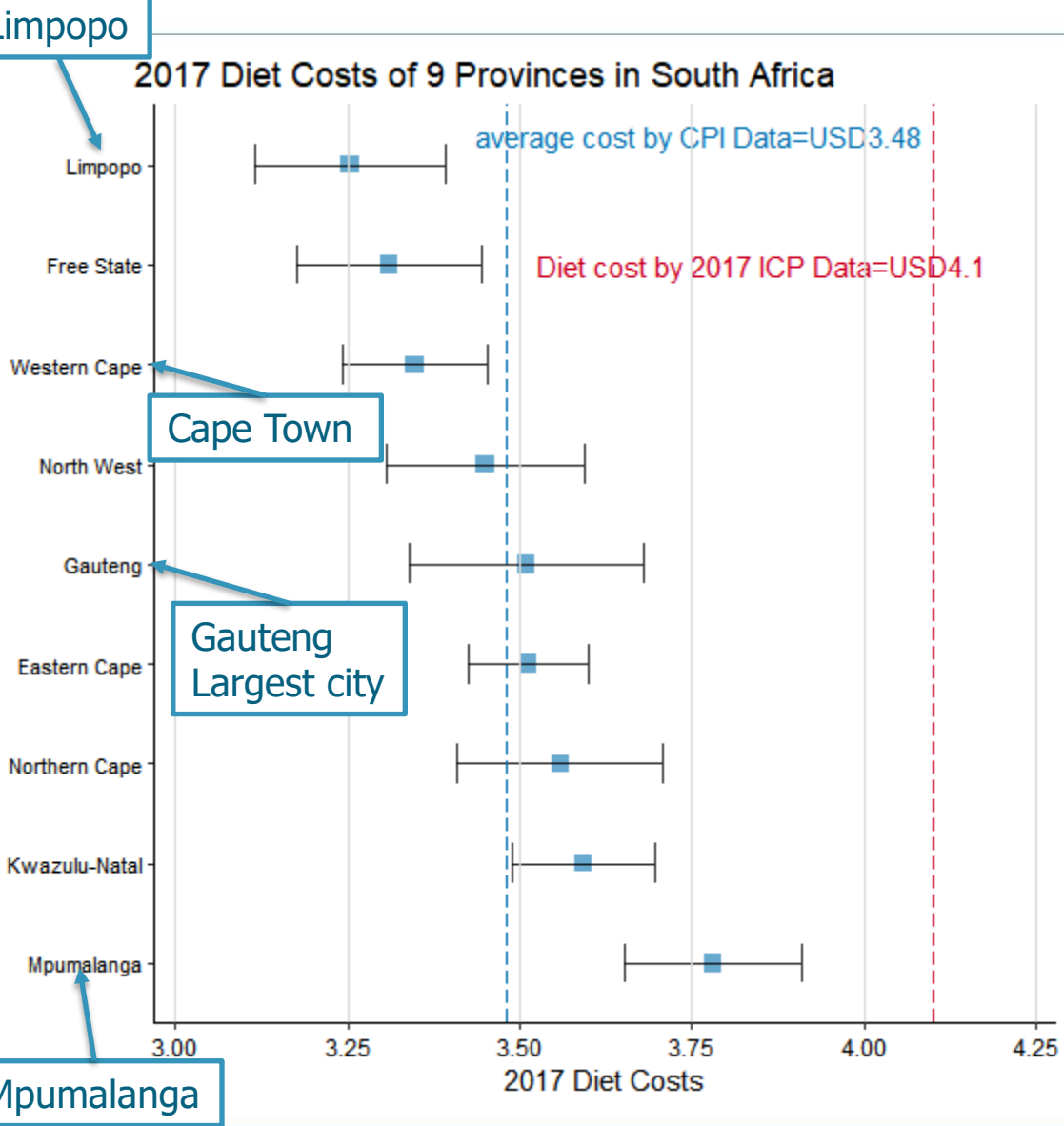
Corn tortilla

South Africa – Cost of a Healthy Diet in 2017, by month



Note: Box shows 25th-75th percentile of diet cost in each month of all 9 provinces. Blue dashed line refers to average cost of all provinces and months. Red dashed line is the single estimate of the diet cost by ICP 2017.

South Africa – Cost of a Healthy Diet in 2017, by province



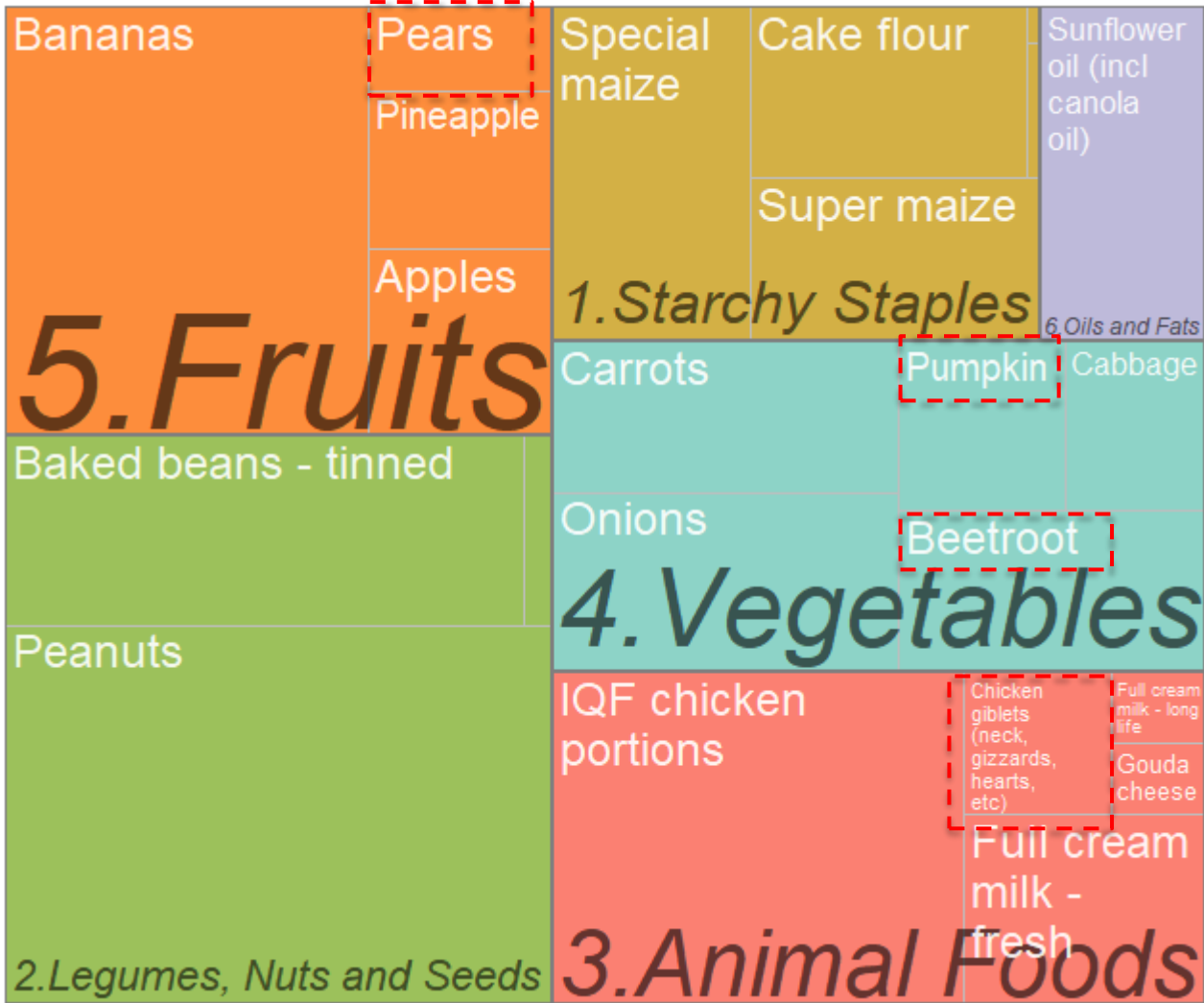
Note: The dot is the average diet cost over 12 months in each province. Error bar refers to the standard deviation.

South Africa – Food selection and cost allocation

A. Food selection



B. Cost allocation



South Africa – Location-specific food



Beetroot

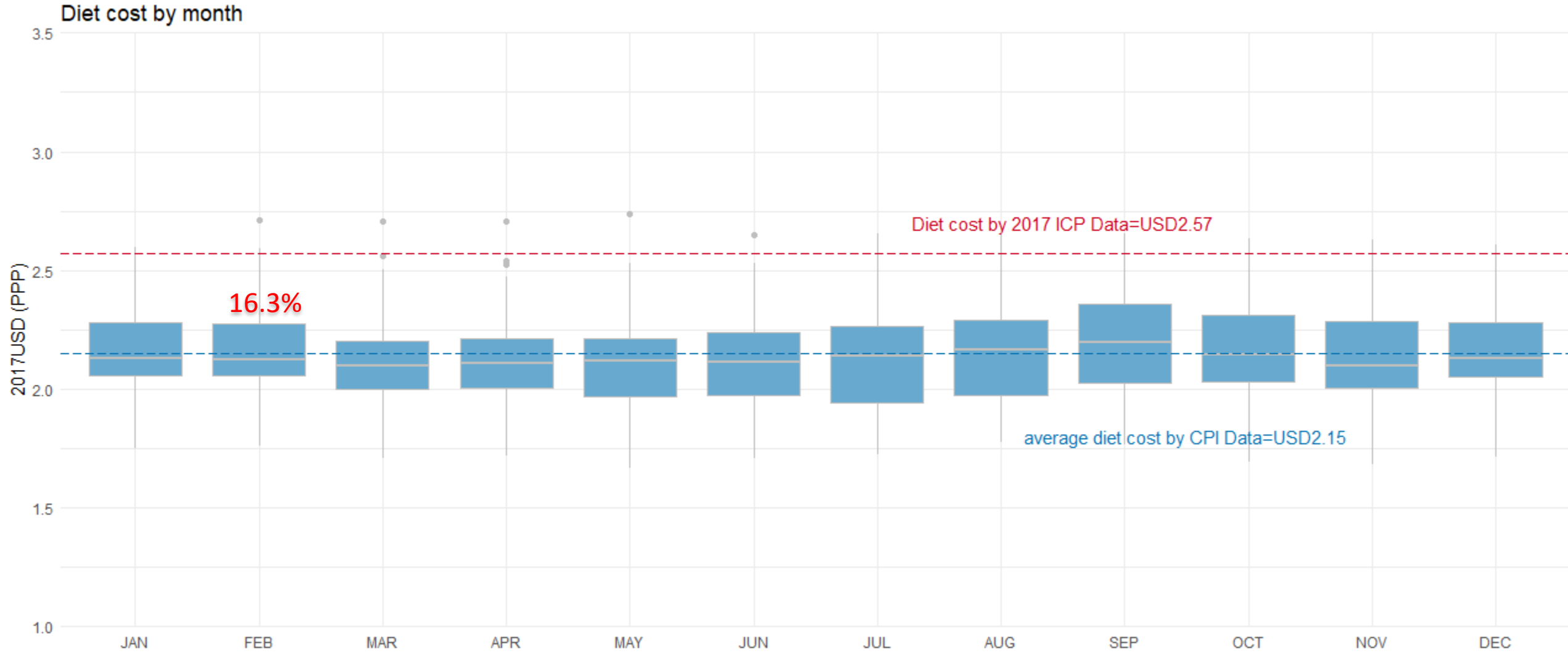


Pumpkin



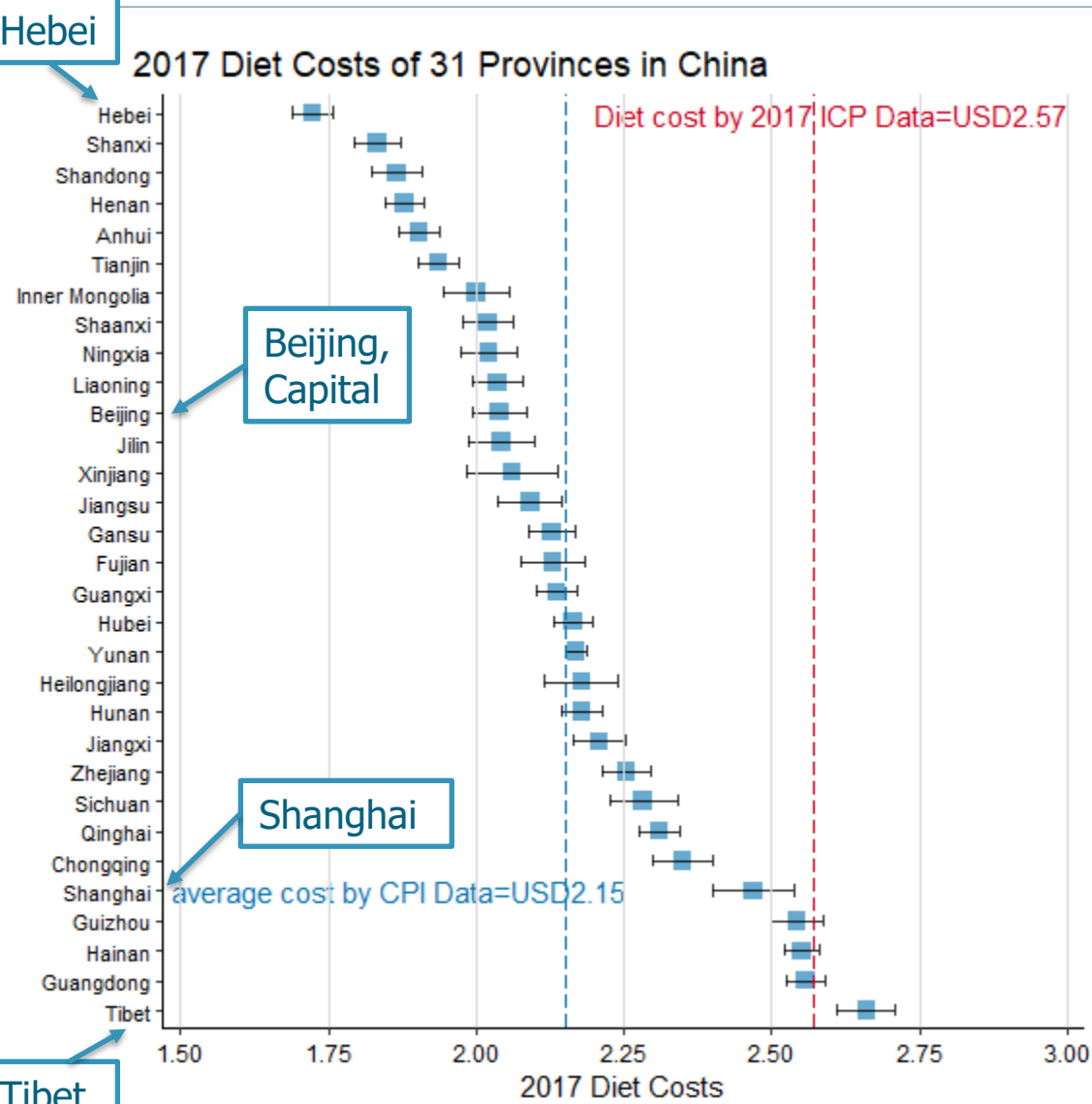
Chicken giblets

China – Cost of a Healthy Diet in 2017, by month

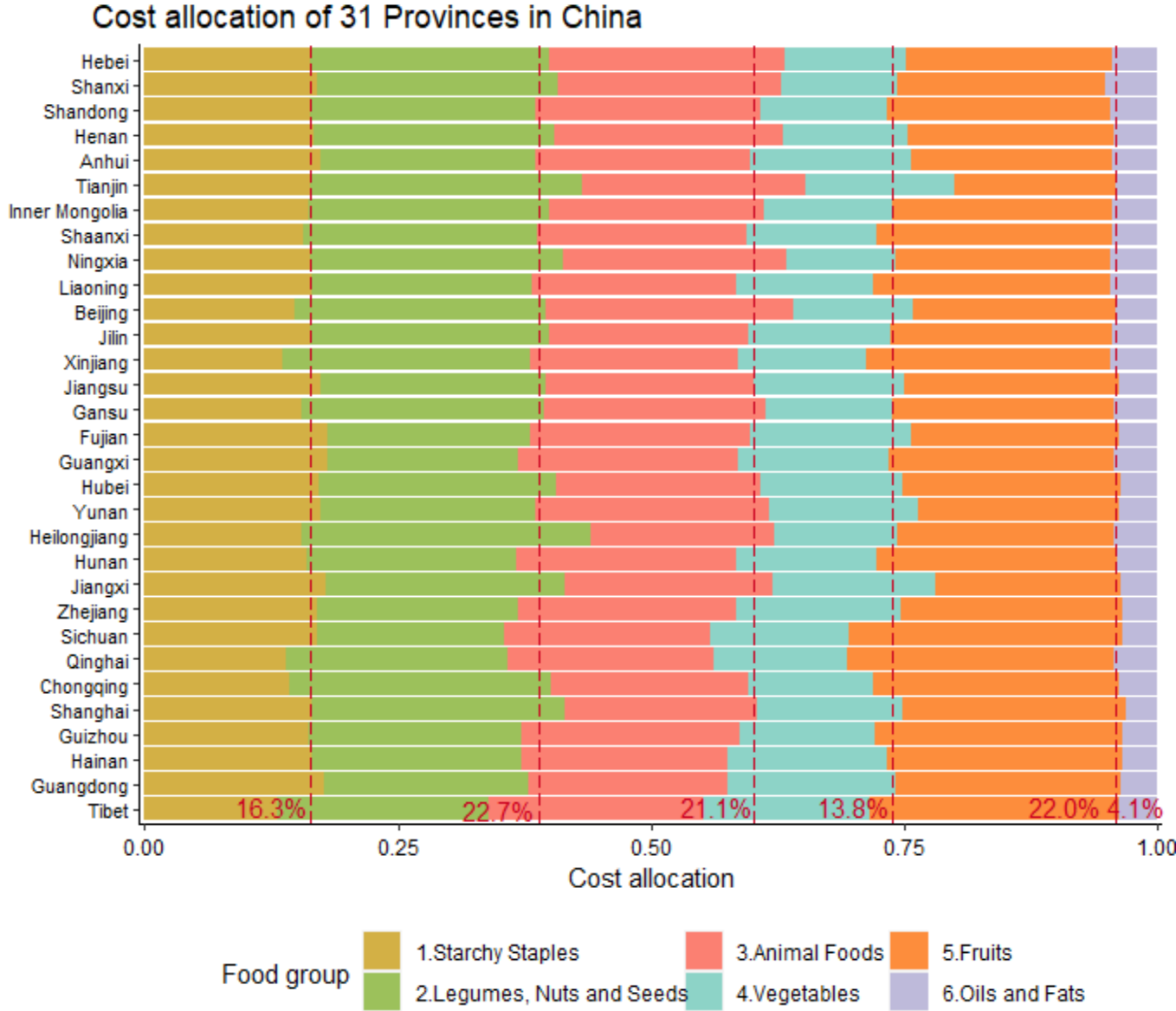


Note: Box shows 25th-75th percentile of diet cost in each month of all 31 provinces. Blue dashed line refers to average cost of all cities and months. Red dashed line is the single estimate of the diet cost by ICP 2017.

China – Cost of a Healthy Diet in 2017, by province

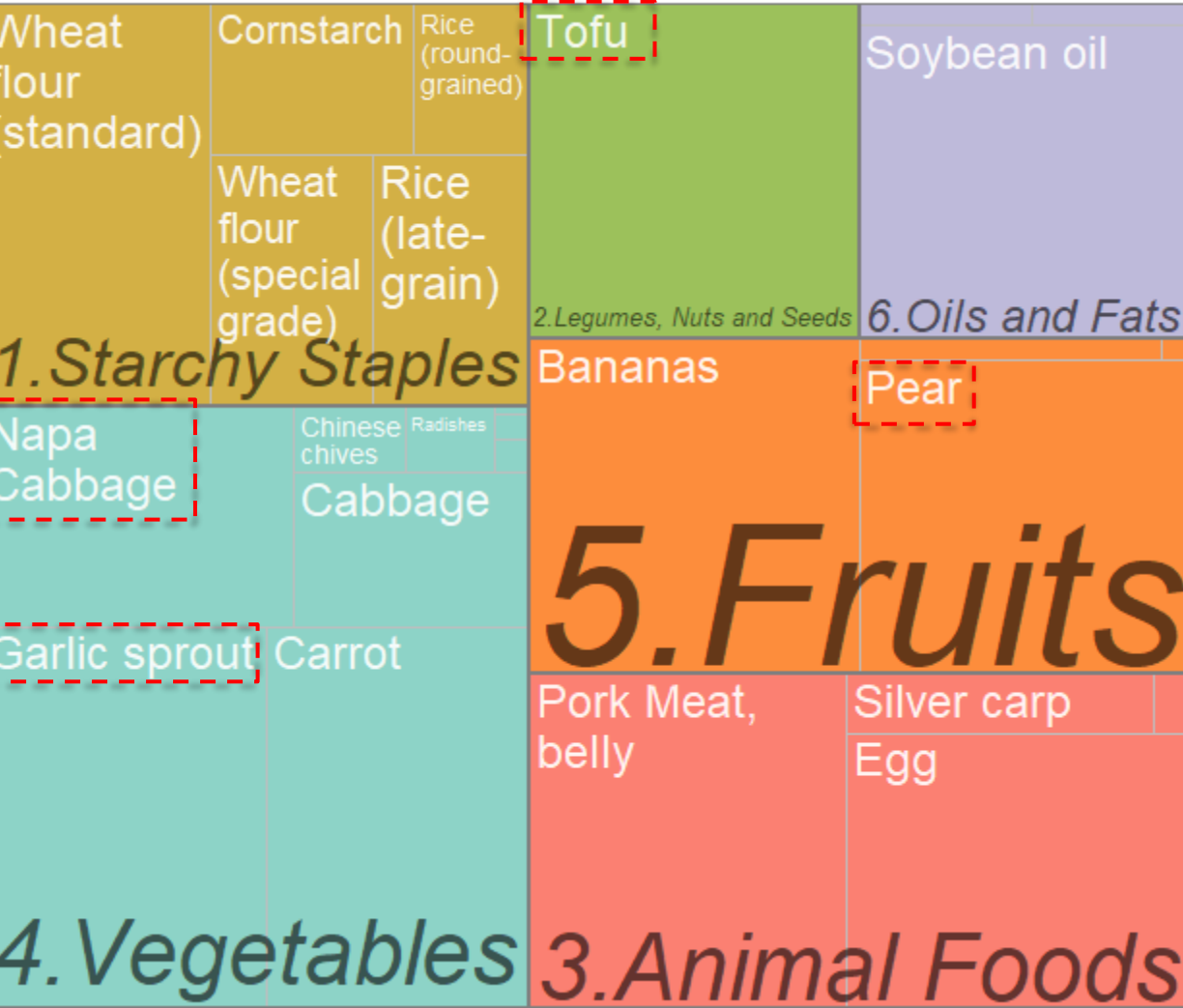


Note: The dot is the average diet cost over 12 months in each province. Error bar refers to the standard deviation.

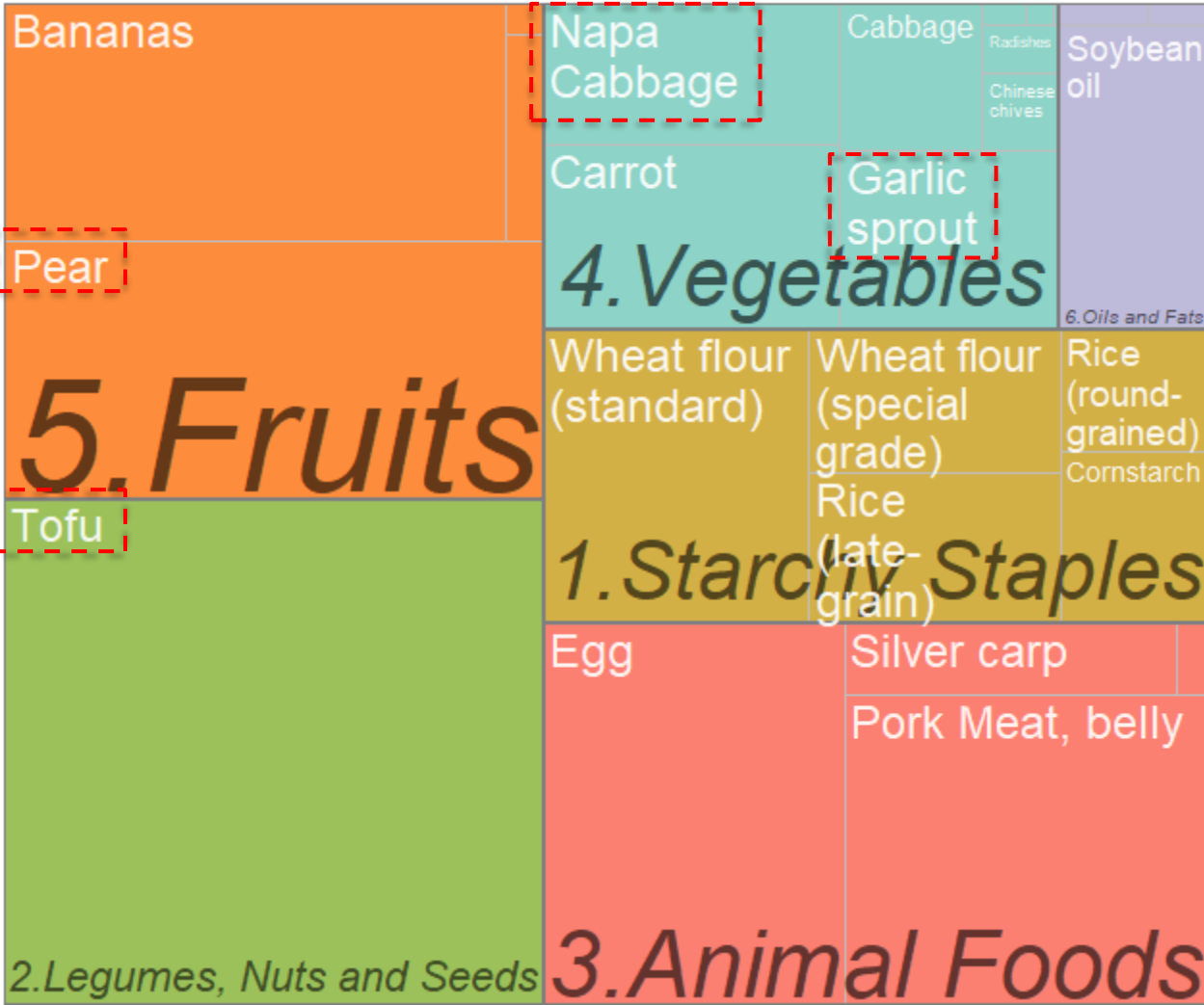


China – Food selection and cost allocation

A. Food selection



B. Cost allocation



China – Location-specific food



Tofu

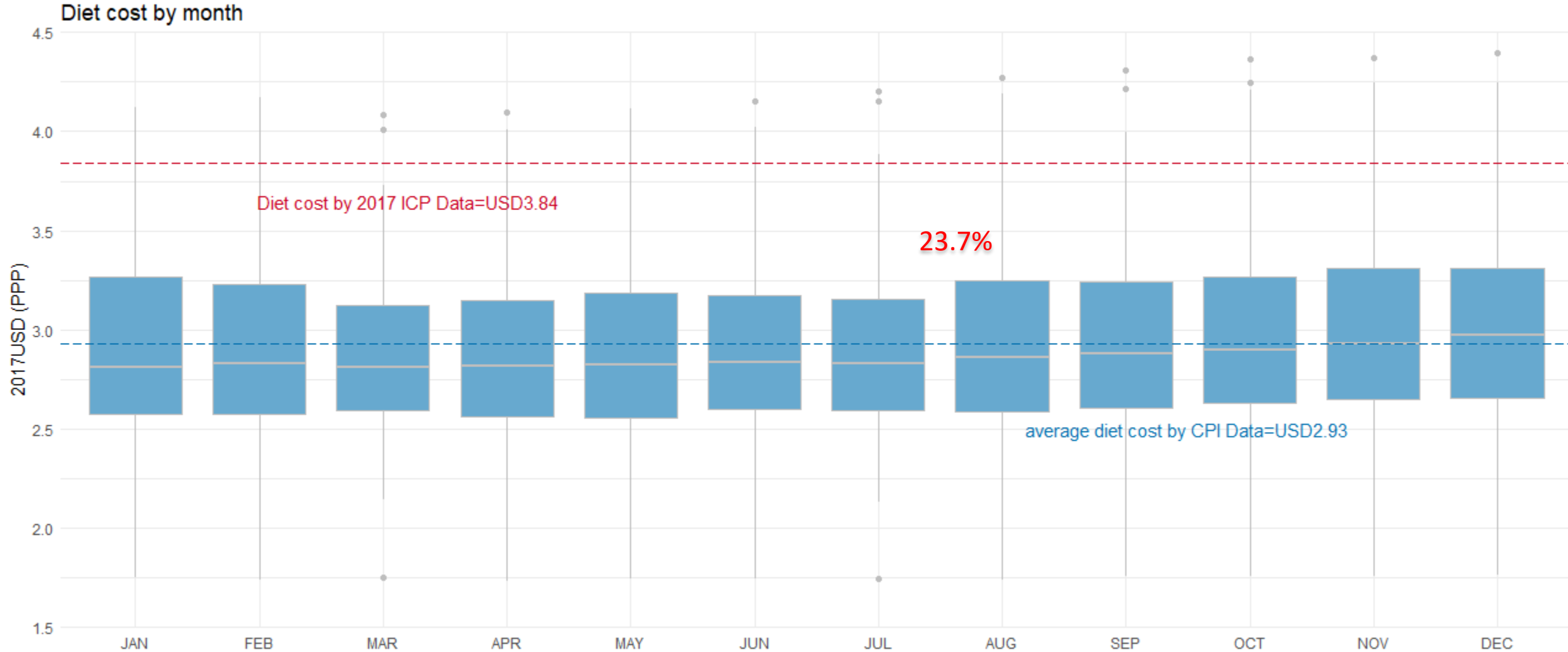


Garlic sprout



Napa Cabbage

Philippines – Cost of a Healthy Diet in 2017, by month

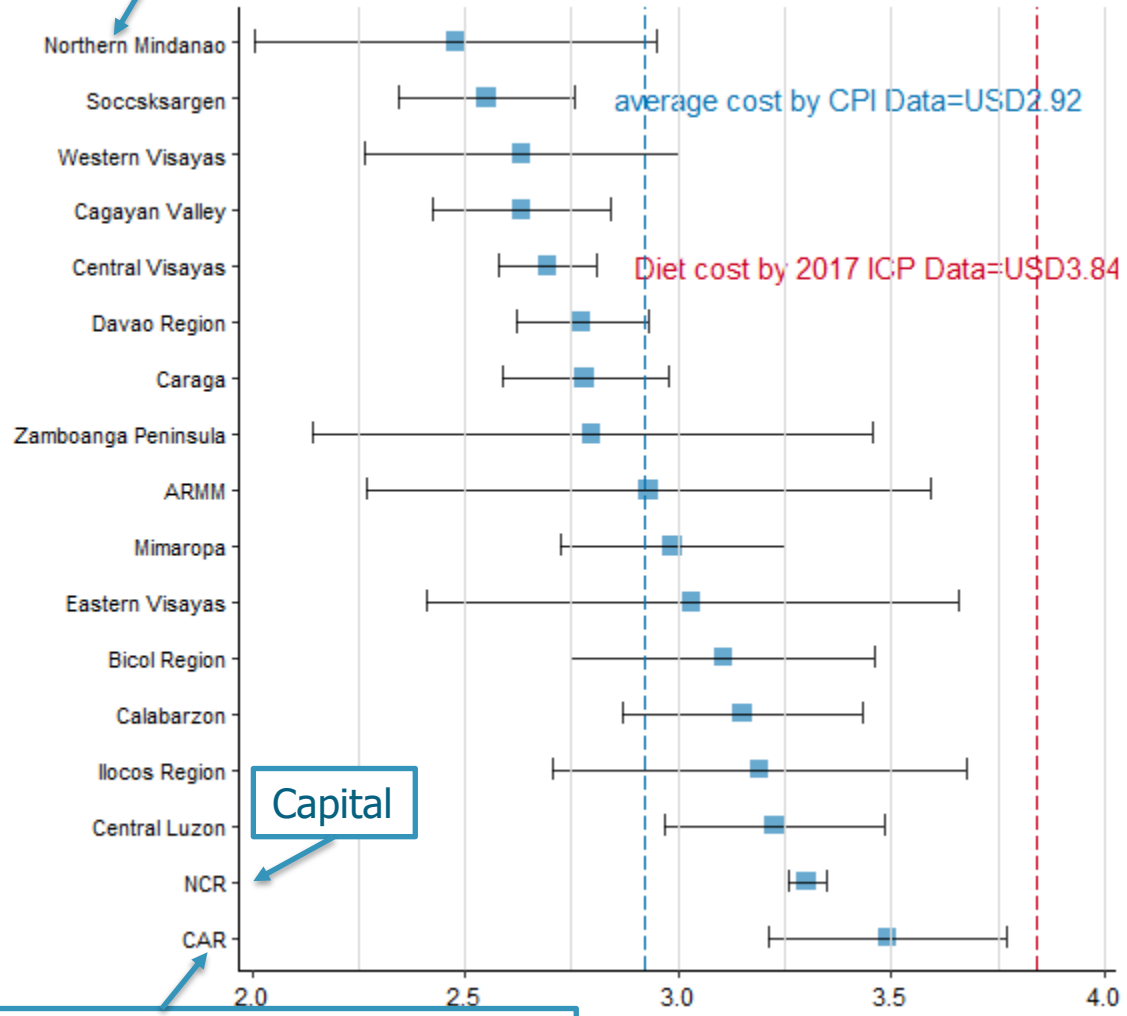


Note: Box shows 25th-75th percentile of diet cost in each month of all 83 provinces. Blue dashed line refers to average cost of all provinces and months. Red dashed line is the single estimate of the diet cost by ICP 2017.

Philippines – Cost of a Healthy Diet in 2017, by region

Northern Mindanao

2017 Diet Costs of 17 Regions in Philippines

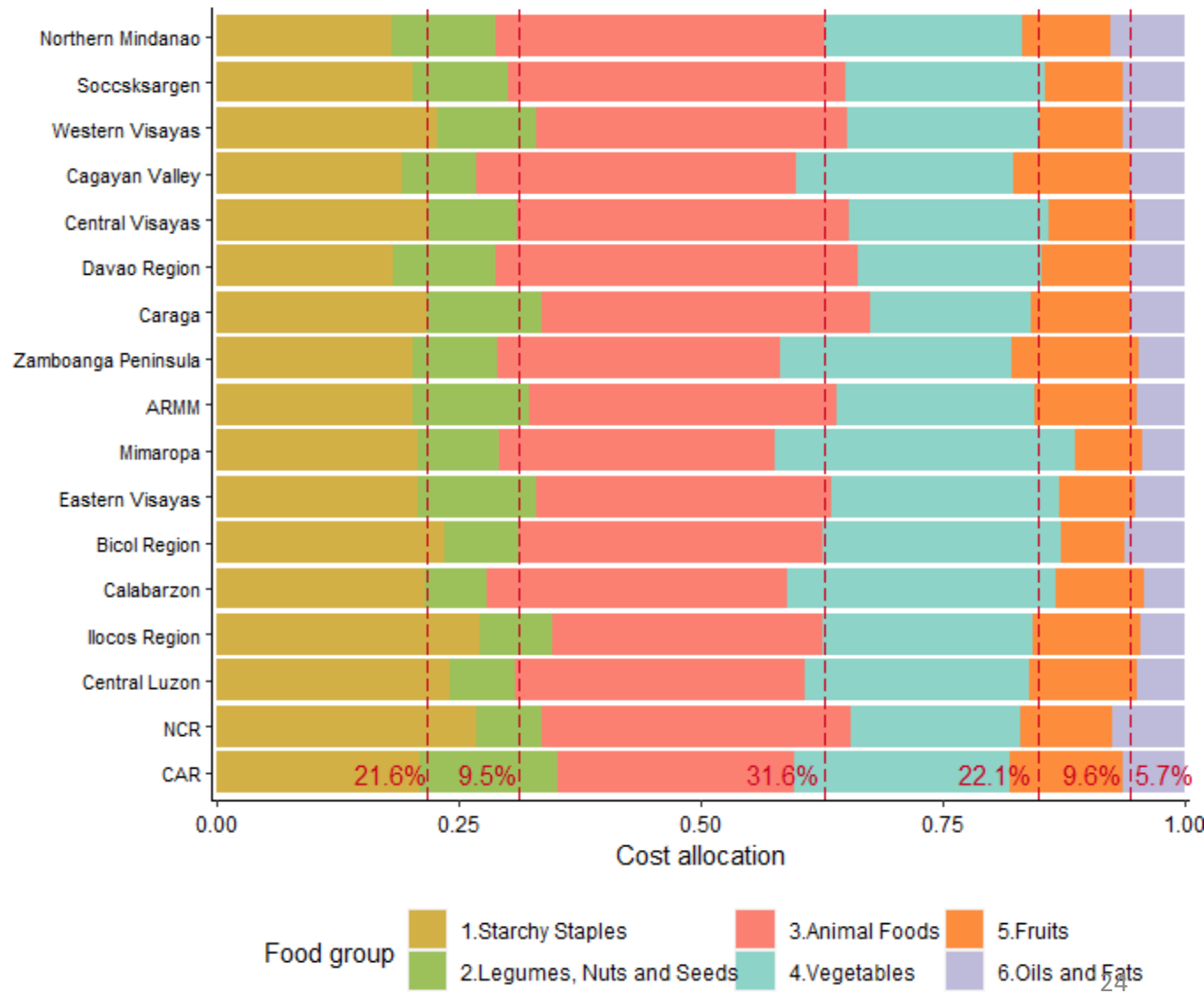


Capital

Cordillera Administrative Region

Note: The dot is the average diet cost over 12 months in each region. Error bar refers to the standard deviation.

Cost allocation of 17 Regions in Philippines

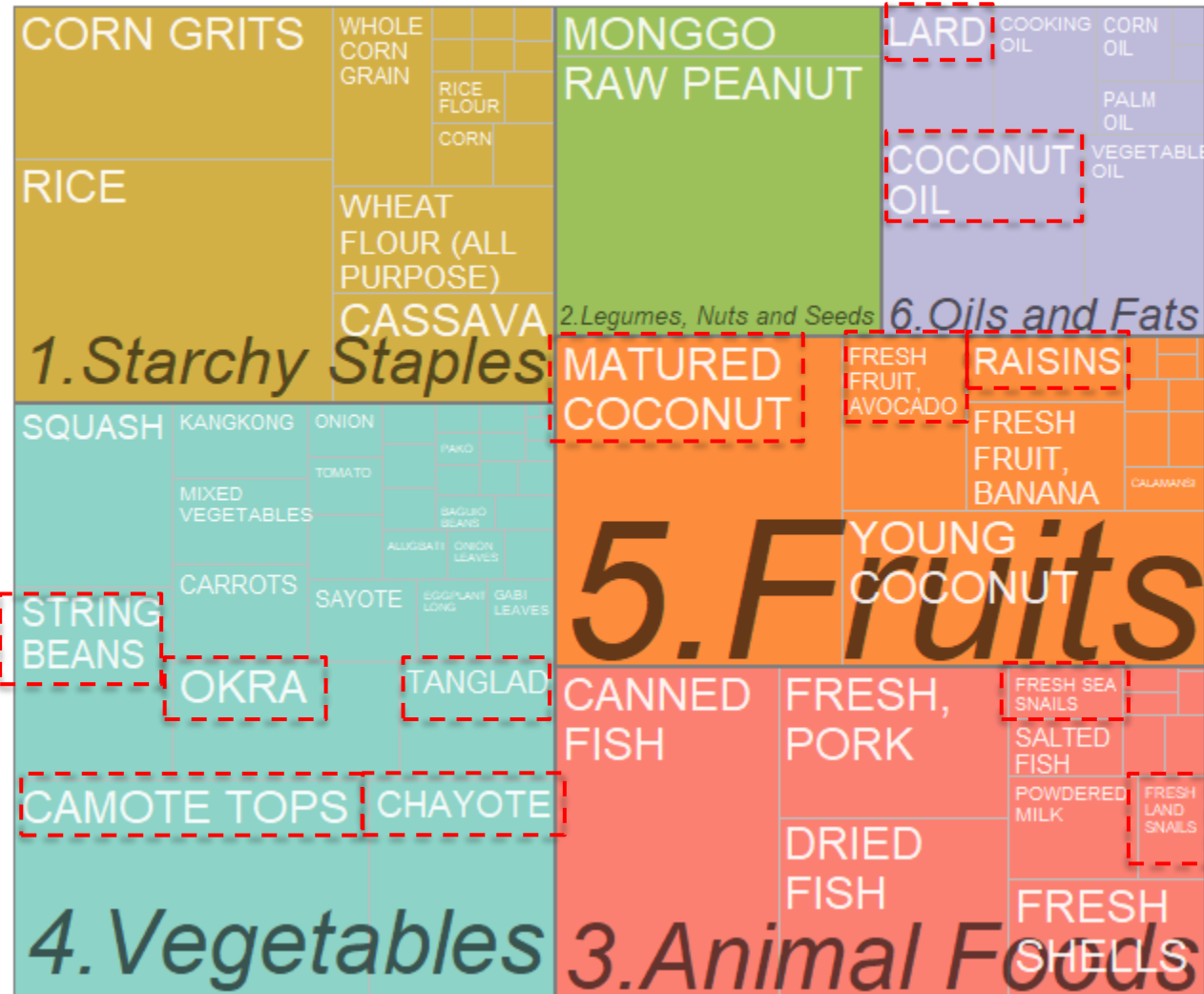


Food group

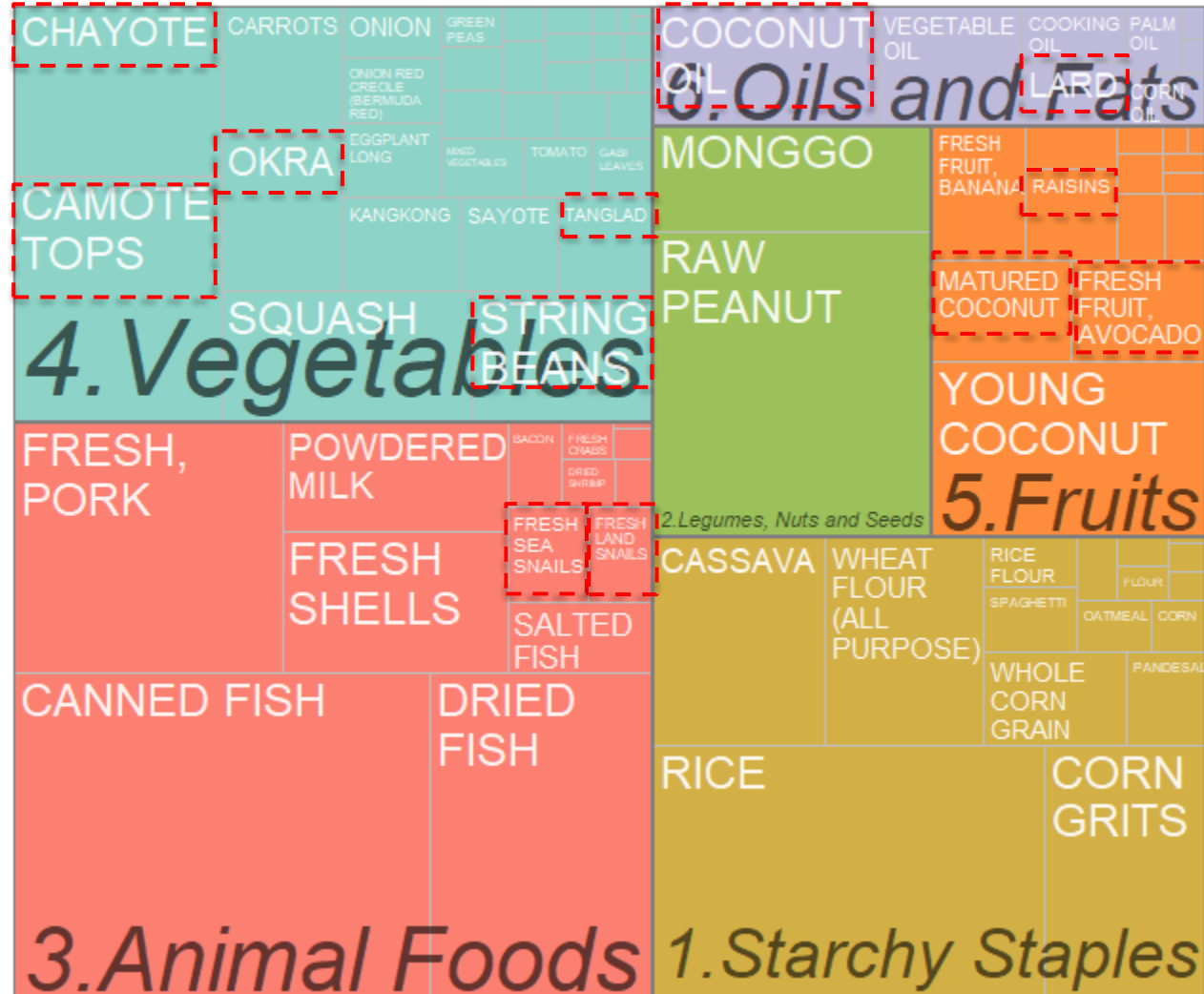
- 1. Starchy Staples
- 2. Legumes, Nuts and Seeds
- 3. Animal Foods
- 4. Vegetables
- 5. Fruits
- 6. Oils and Fats

Philippines – Food selection and cost allocation

A. Food selection



B. Cost allocation



Philippines – Location-specific food



Okra

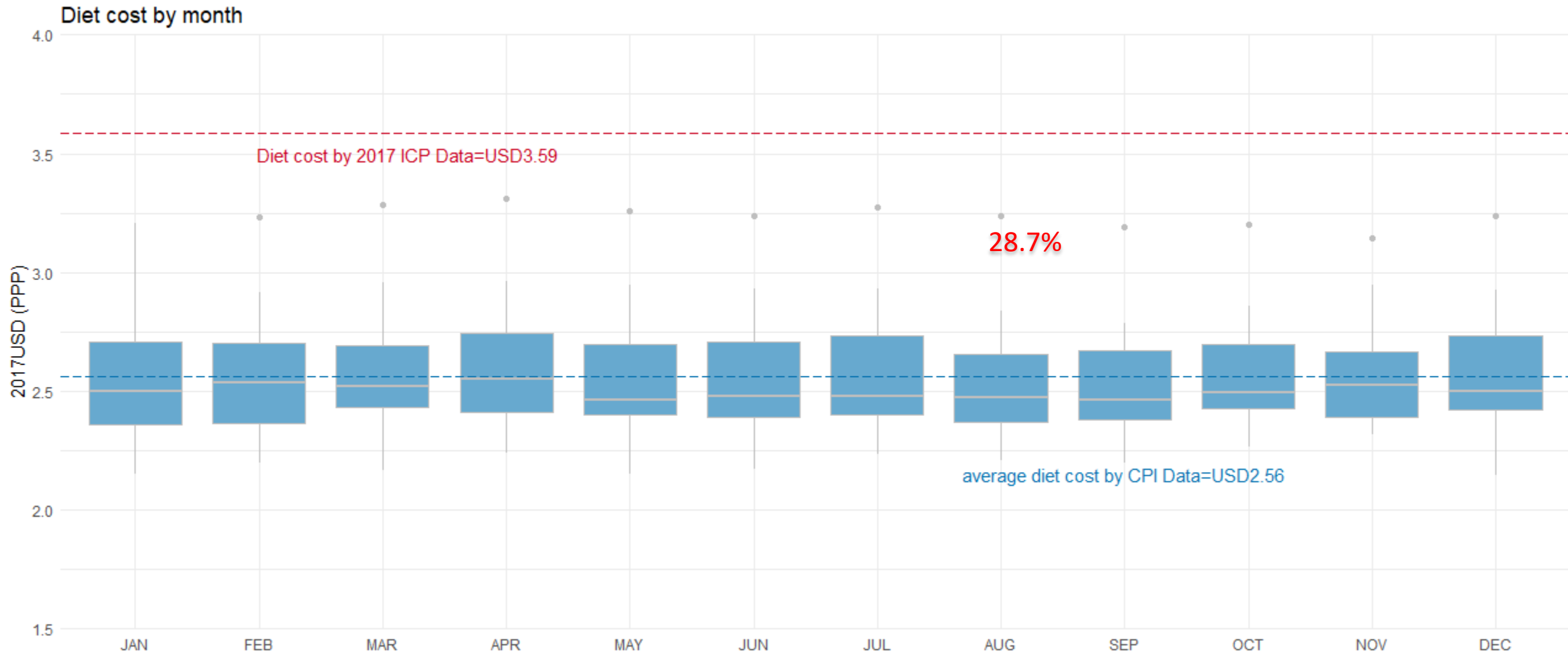


Camote tops



Fresh avocado

Vietnam – Cost of a Healthy Diet in 2017, by month

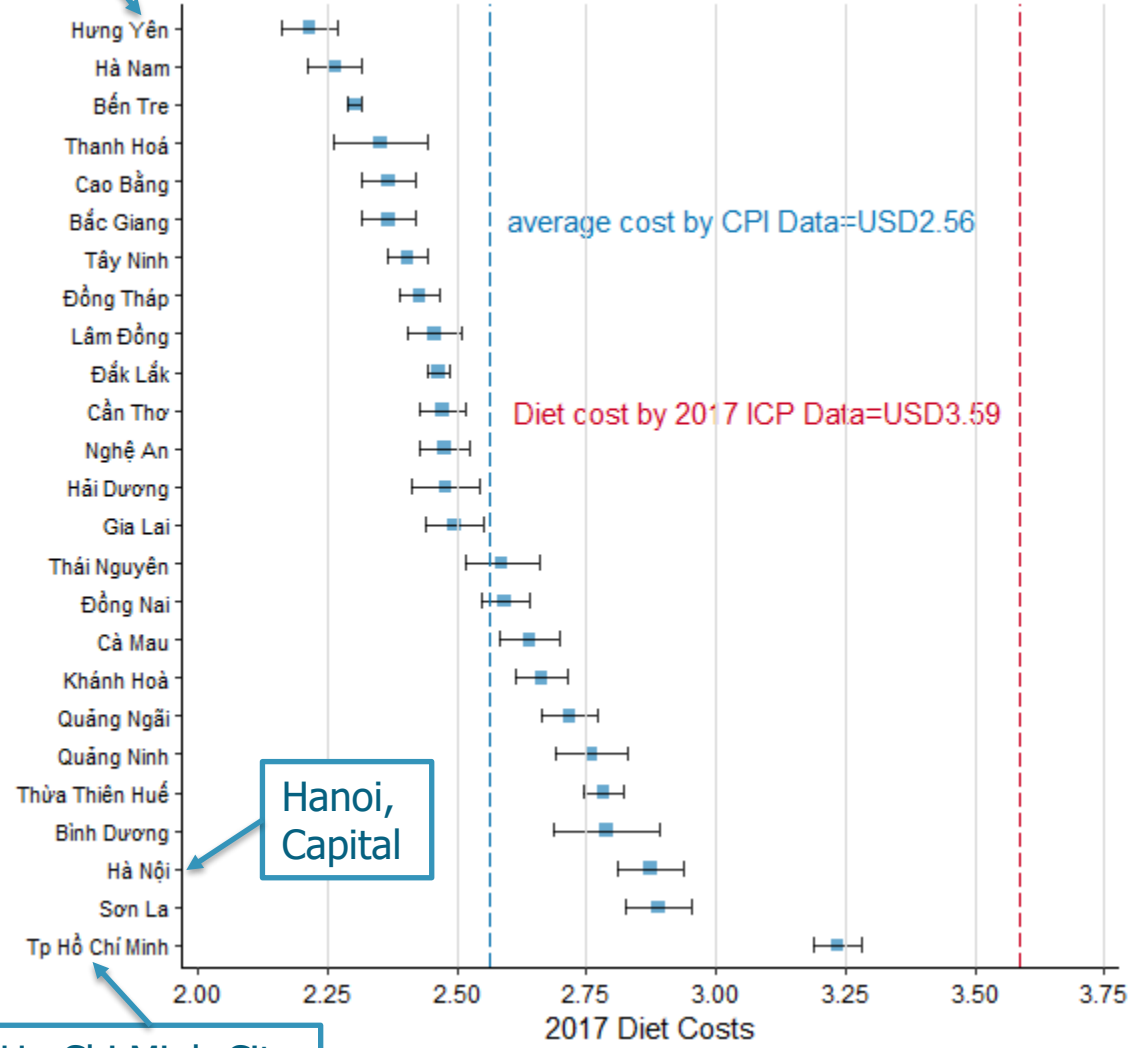


Note: Box shows 25th-75th percentile of diet cost in each month of all 25 provinces. Blue dashed line refers to average cost of all cities and months. Red dashed line is the single estimate of the diet cost by ICP 2017.

Vietnam – Cost of a Healthy Diet in 2017, by province

Hung Yen

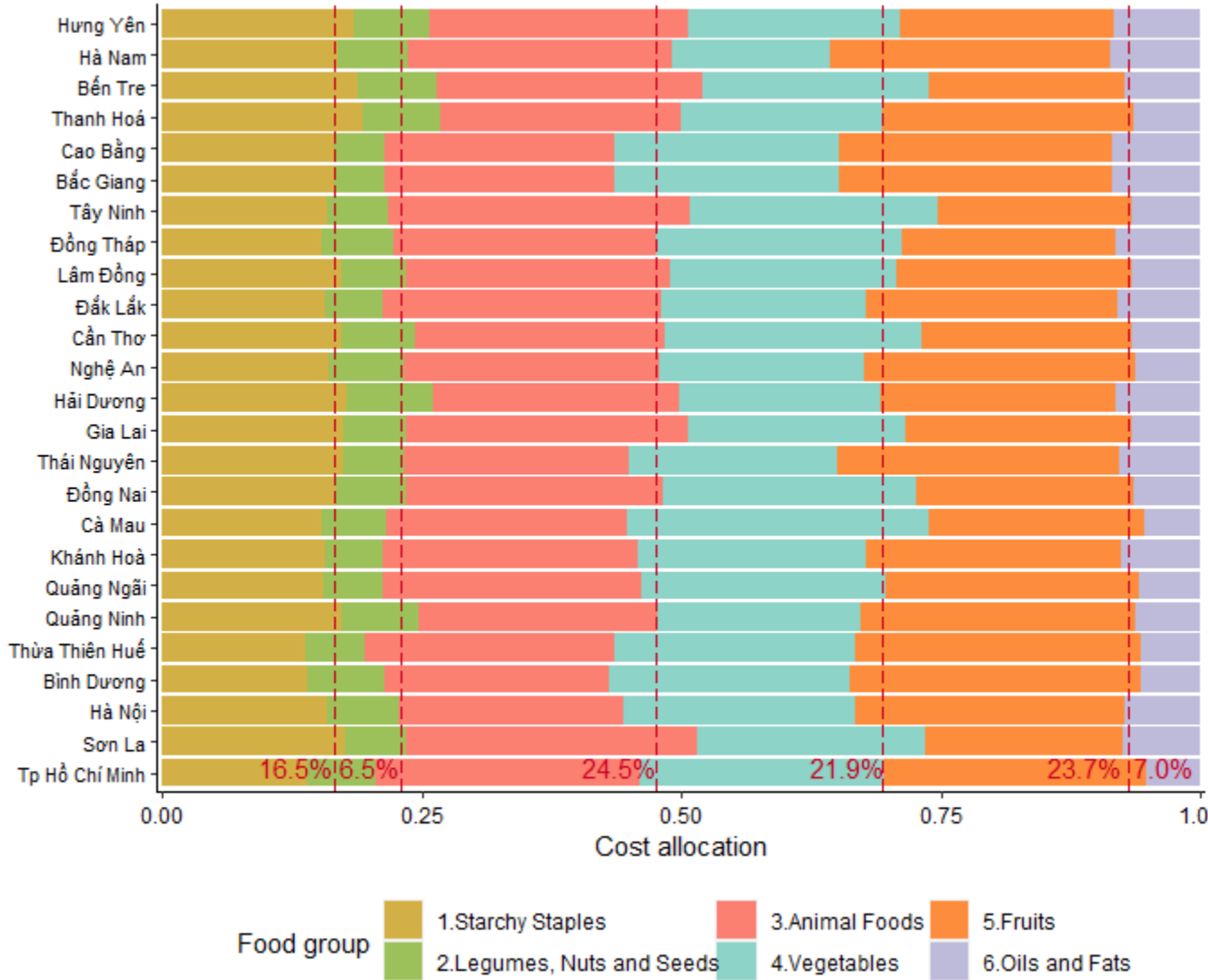
2017 Diet Costs of 25 Provinces in Vietnam



Ho Chi Minh City, economic center

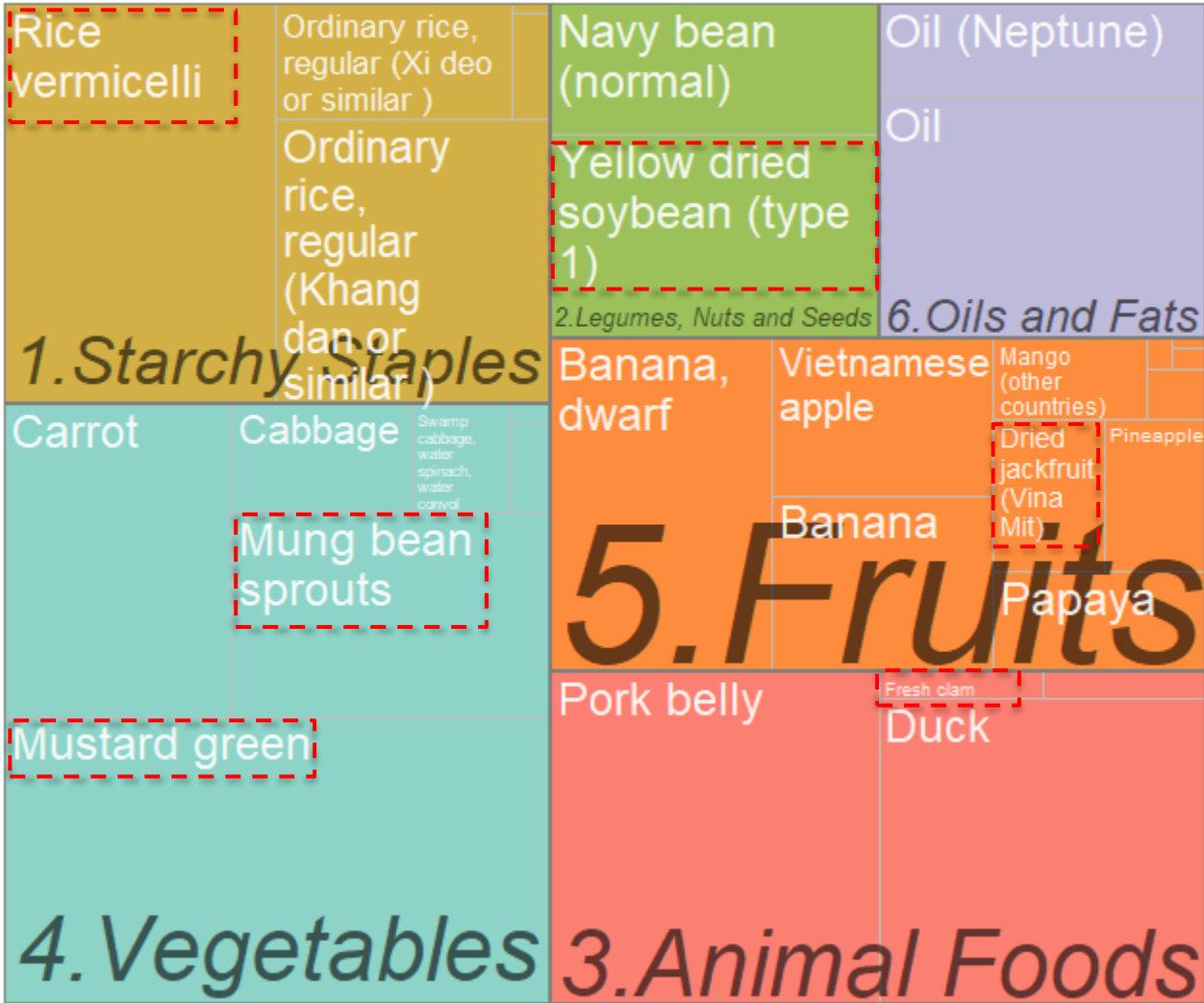
Note: The dot is the average diet cost over 12 months in each province. Error bar refers to the standard deviation.

Cost allocation of 25 Provinces in Vietnam

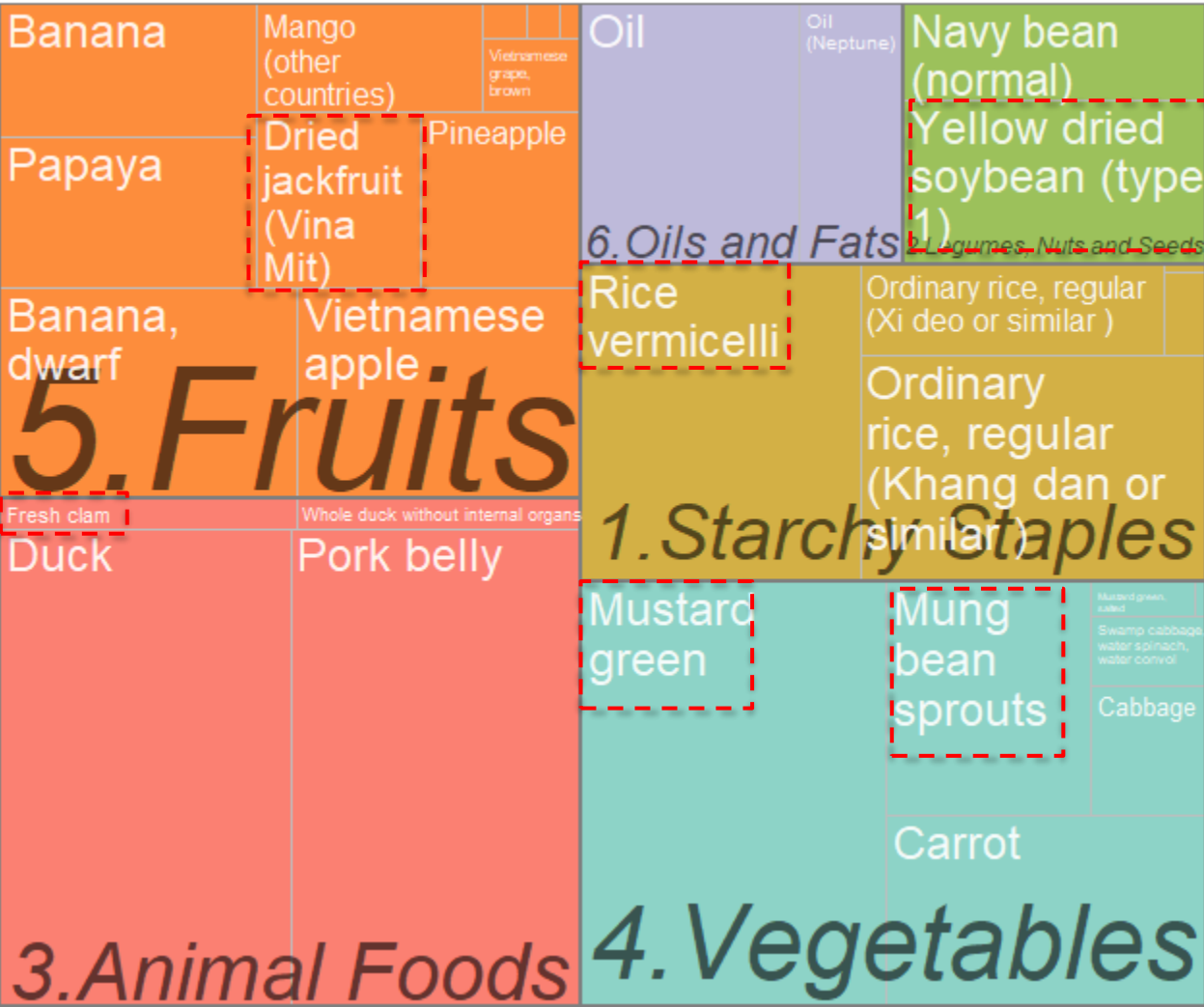


Vietnam – Food Selection and Cost allocation

A. Food selection



B. Cost allocation



Vietnam – Location Food



rice vermicelli



mung bean sprouts



mustard green

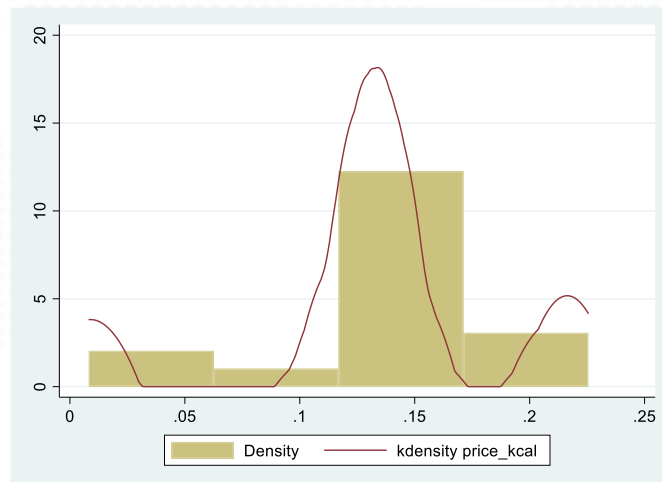


4. Confidence Interval Analysis in Mexico

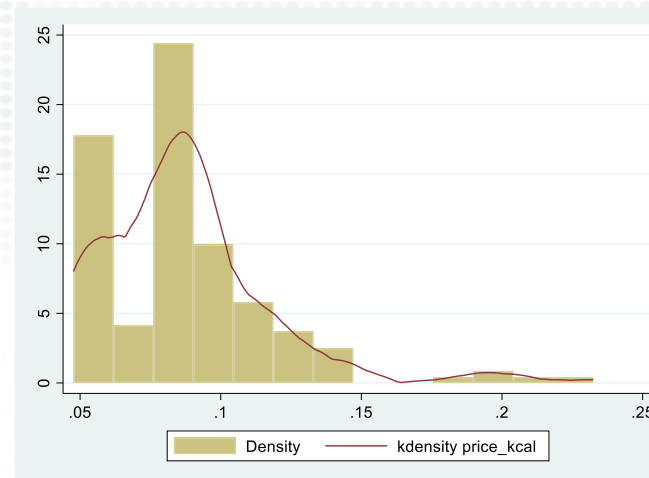
Data and method

- For each food item in each city/month, Mexico NSO published multiple observations
- Using Mexico City as an example, the observation numbers are from 18 (Nopales) -170 (Beef)

Nopales in January



Beef in June



- Monte Carlo simulation**, assuming the sample mean $\sim N(\mu, \frac{\sigma}{\sqrt{n}})$ – randomly generate 1,000 estimated sample mean for each city-item-month

Results based on synthetic data

- Similar trends with higher precision/confidence

Month	CoHD based on monthly average (2017 PPP USD)	CoHD based on synthetic data (2017 PPP USD with 95% CI)	Month	CoHD based on monthly average (2017 PPP USD)	CoHD based on synthetic data (2017 PPP USD with 95% CI)
January	2.64	2.62 (2.53, 2.71)	July	2.84	2.82 (2.72, 2.90)
February	2.64	2.62 (2.52, 2.70)	August	2.83	2.82 (2.72, 2.91)
March	2.63	2.61 (2.53, 2.70)	September	2.87	2.86 (2.76, 2.95)
April	2.67	2.65 (2.56, 2.74)	October	2.84	2.82 (2.72, 2.91)
May	2.73	2.72 (2.62, 2.80)	November	2.93	2.91 (2.82, 3.00)
June	2.74	2.72 (2.63, 2.80)	December	2.93	2.91 (2.82, 3.00)

A world map composed of a grid of small dots, with the text "5. Conclusions" centered over it.

5. Conclusions

Conclusions

- **Cost of a healthy diet using monthly subnational CPI data is lower than using the global ICP dataset, and reveals within-country variation**
 - Although different CPI data structures are given in the five countries covered in this study, lower estimates ranging from 10%-30% consistently found
 - Subnational variations display across countries
 - Temporal variations (seasonality patterns) display in certain countries (Mexico and South Africa)
 - Cost portions by food group vary across countries, but not much within countries
 - More granular data in Mexico may help to generate 95% confidence intervals for the CoHD estimations – consistent with results from monthly average price

Conclusions

- **Key factors leading to the differences are:**
 - **Item selection:** Locally available nutritious foods, not surveyed by the ICP, may help reduce diet costs substantially.
 - **Item quality:** ICP prices standardized items across countries.
 - **Survey frame:** Differences can be due to survey framework and outlet section differences.
 - **Averaging method:** ICP national annual average is weighted, while here we are using simple average of monthly subnational CPI data.
 - **Quality assurance:** Differences are more pronounced in certain countries than others – ICP has robust quality assurance and validation protocols that some countries may not have the capacity for.

Conclusions

- **The national CPI retail food price data could improve the precision of measuring and tracking the cost of a healthy diet**
 - Provide more locally available nutritious food items.
 - The bottom line, annual subnational data, although monthly may help to assess seasonality.
 - However, quality assurance, data standardization, and data validation are extremely important for global monitoring programs.
 - CPI data access may pose challenges in certain countries.



DISCUSSIONS AND QUESTIONS