

# Energy And Nutrient Composition of Meals One Month After the Kumamoto Earthquake and Comparison Results by Region

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## Background and Objectives

The Kumamoto earthquake, which occurred in April 2016, registered a magnitude of 7 on the Japanese seismic intensity scale. When a disaster occurs, the shutdown of lifelines forces residents to relocate to evacuation centers and other locations. In Japan, emergency relief efforts include providing drinking water and food to disaster victims. However, previous reports have indicated that the food provided often lacks adequate nutritional value. Therefore, we calculated the energy and nutritional content of meals served one month after the Kumamoto earthquake and examined nutritional deficiencies.

## Subjects and Methods

Energy and nutritional content were calculated for meals served for one day at 35 evacuation centers in Kumamoto Prefecture in May 2016, one month after the Kumamoto earthquake. The dietary survey was based on records kept by dietitians, including names of ingredients, approximate portion sizes and photographic records of meals. Evacuation centers were divided into two areas and compared for energy and nutrient content; the energy and nutritional content provided in the two areas was assessed for excess and deficiency according to the Dietary Reference Intakes for Japanese (2020). This work was supported by JSPS KAKENHI Grant Number 24K05582.

## Results

Significant differences were observed in the median values of saturated fatty acid, dietary fiber, sodium, potassium, calcium, vitamins A and B2, and other nutrients between the two regions (Figure 3).

Based on the Dietary Reference Intakes for the Japanese (2020), nutritional deficiencies were identified. We found that calcium, magnesium, and vitamin B1 and C levels were below the estimated average requirements in all evacuation centers. (Figure 4)

Regional comparisons revealed differences in nutritional deficiencies in the two areas.

## Conclusion

Meals served after the disaster were deficient in certain nutrients. Differences in nutritional deficiencies were observed between the two areas. Addressing these nutritional deficiencies is crucial, especially in the event of prolonged evacuation. Stockpiling should take into account the nutritional content of the meals provided by the government's emergency relief efforts. The public also needs to be educated to stockpile their own food.

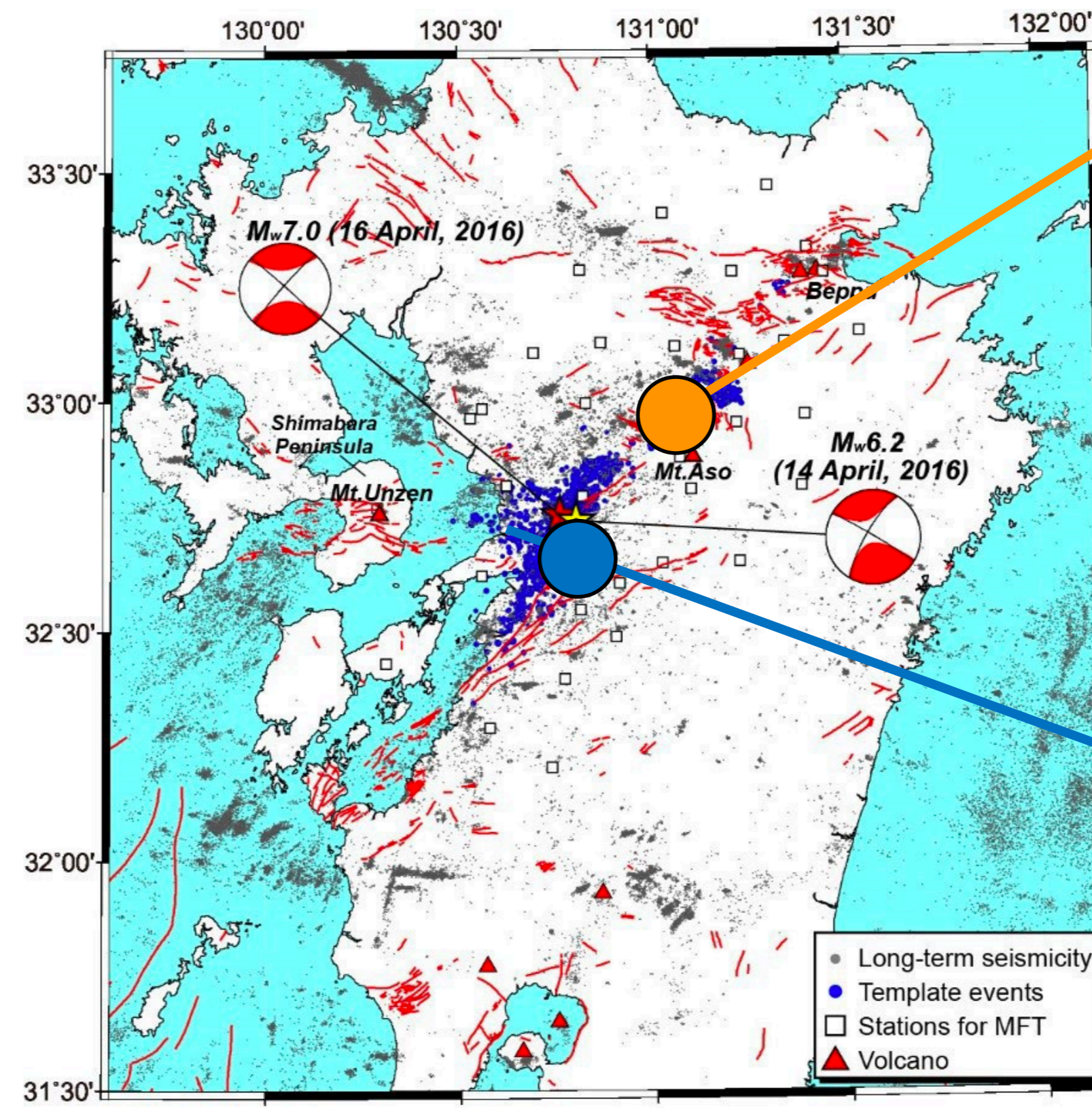


Figure 1. Seismic activity and dietary survey areas generated by the Kumamoto earthquake. Partially modified from material prepared by the Earthquake Research Institute, University of Tokyo.

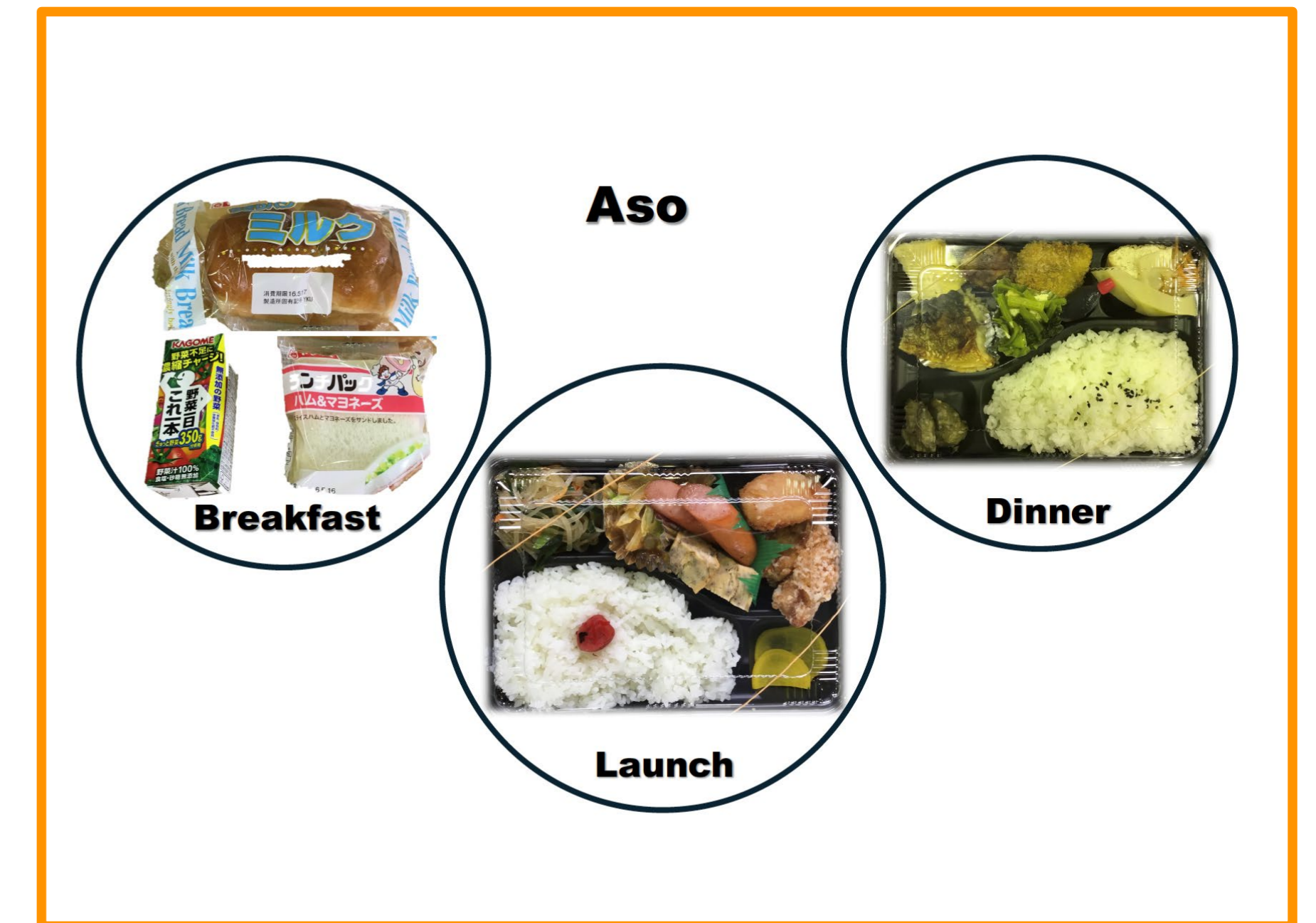


Figure 2. Examples of meals provided by municipalities in the two regions.

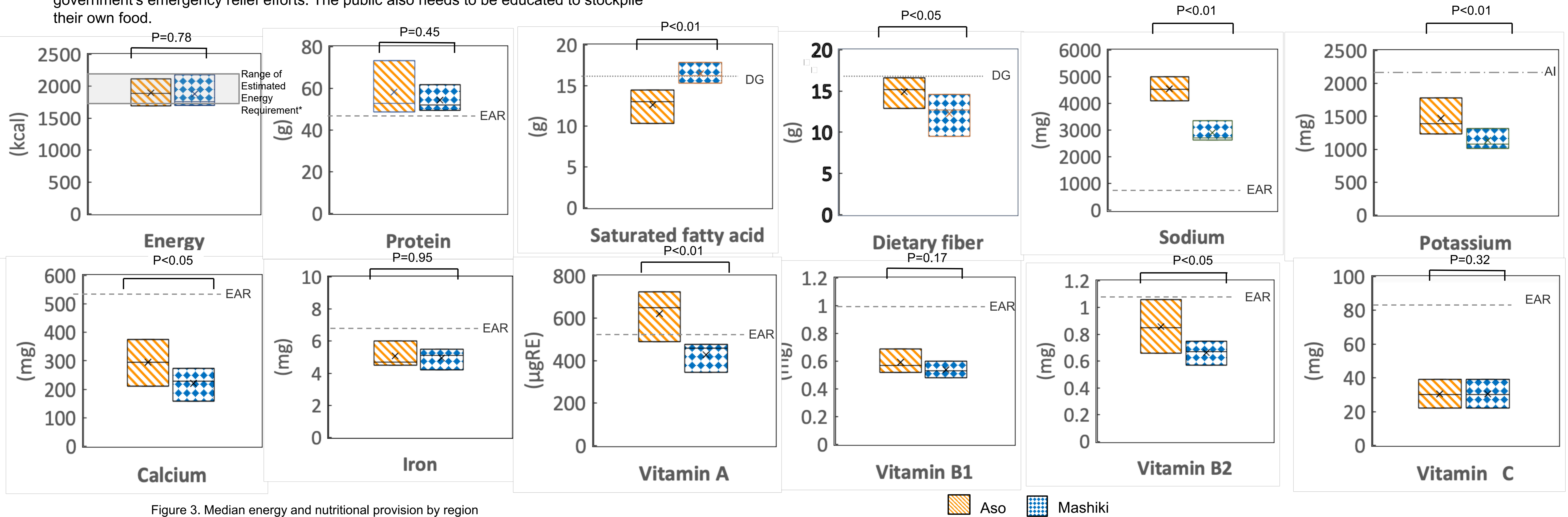


Figure 3. Median energy and nutritional provision by region  
 • Estimated energy requirement for physical activity level I (kcal/day)  
 - - - The Dietary Reference Intakes for Japanese (2020) the Estimated Average Requirement (EAR)  
 - - - Adequate Intake (AI)  
 ..... tentative dietary goal for preventing life-style related disease (DG)  
 was determined to avoid deficiencies and is the amount that meets the nutritional needs of 50% of the population.  
 Kruskal-Wallis test (5% both sides significance level)

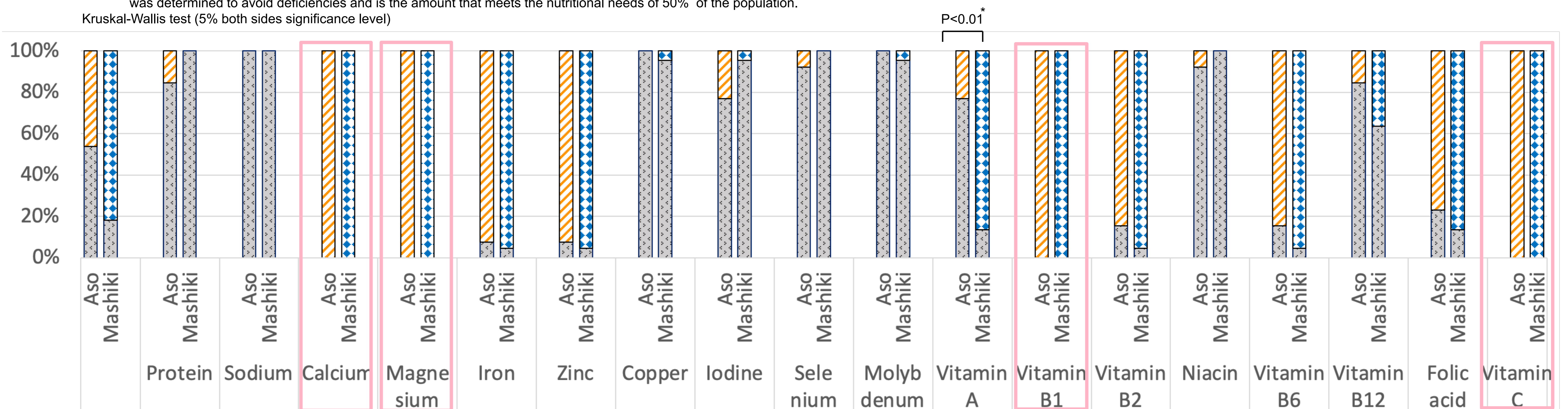


Figure 4. Assessment of energy and nutrient deficiencies provided  
 The numbers indicate the number of evacuation centers.  
 Based on the values of energy and each nutrient indicated in the Dietary Reference Intakes for Japanese (2020) and calculated by weighted average using the population composition by sex and age group obtained from the 2010 census results (Kumamoto).  
 The Aso area is the result of 13 evacuation centers in Aso City, Minamiaso Village, and Nishihara Village, the Mashiki area is the result of 22 evacuation centers in Mashiki, Mifune, and Kashima towns  
 \* chi-square test (5% both sides significance level)  
 \*\* each nutrient contents were within the range of the Dietary Reference Intakes for Japanese (2020).  
 below the estimated average requirements in all evacuation centers.