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UNIVERSITI MALAYSIA SABAH

# Severe malnutrition surrounded by marine proteins

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# Severe **malnutrition** surrounded by marine proteins

- Background
- Methods
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- Examples of islander foods
- Observations
- Discussion
- Conclusion
- Take home message



# Background

- Mantanani Besar is the largest of three islands which form the Mantanani Islands off the northwest coast of Sabah, Malaysia.
- The island has two villages, Kampung Siring Bukit and Kampung Padang, a primary school, several homestays and several hotels/resorts.
- The nearest town is Kota Belud, which is 45 minutes away by speedboat costing USD25 for a round trip, which is 4.5 percent of the poverty line income of USD552/month for Sabah in 2019.
- The inhabitants were of the Bajau Ubian ethnic group and identify as Muslims.



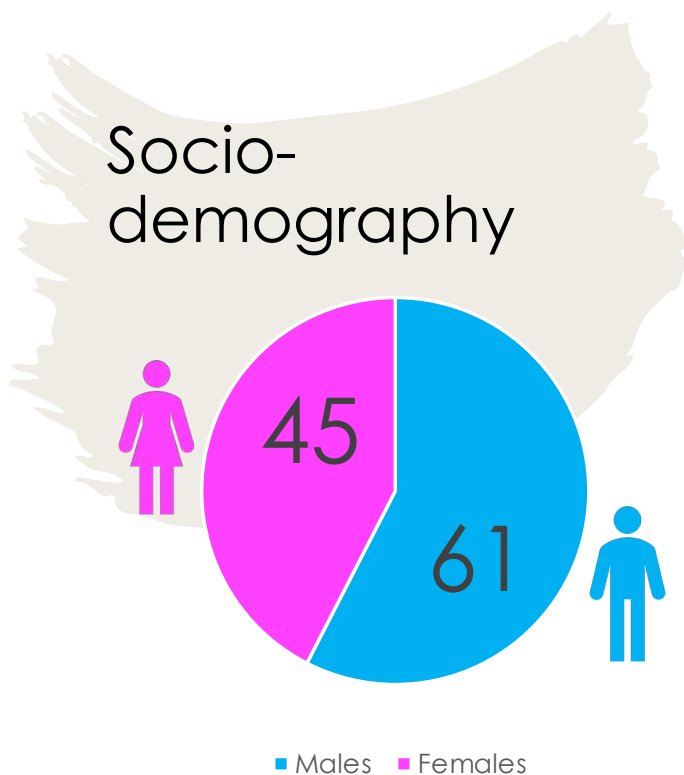


## Methods

- All primary school children were measured for their height, weight, and mid-upper arm circumference (MUAC).
- Participants were asked whether they consumed daily, 20 items usually consumed by coastal Bajaus. This list was then categorized into 10 food groups to get dietary diversity score (DDS). The food groups were cereals, tubers, fish and seafood, seaweed, vegetables, fruits, milk, egg, meat, and beverages.





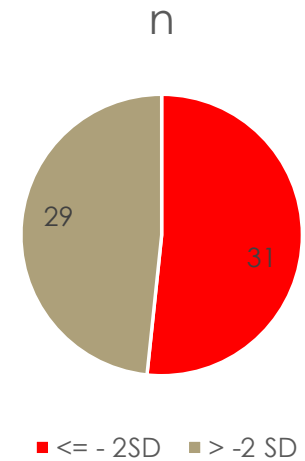
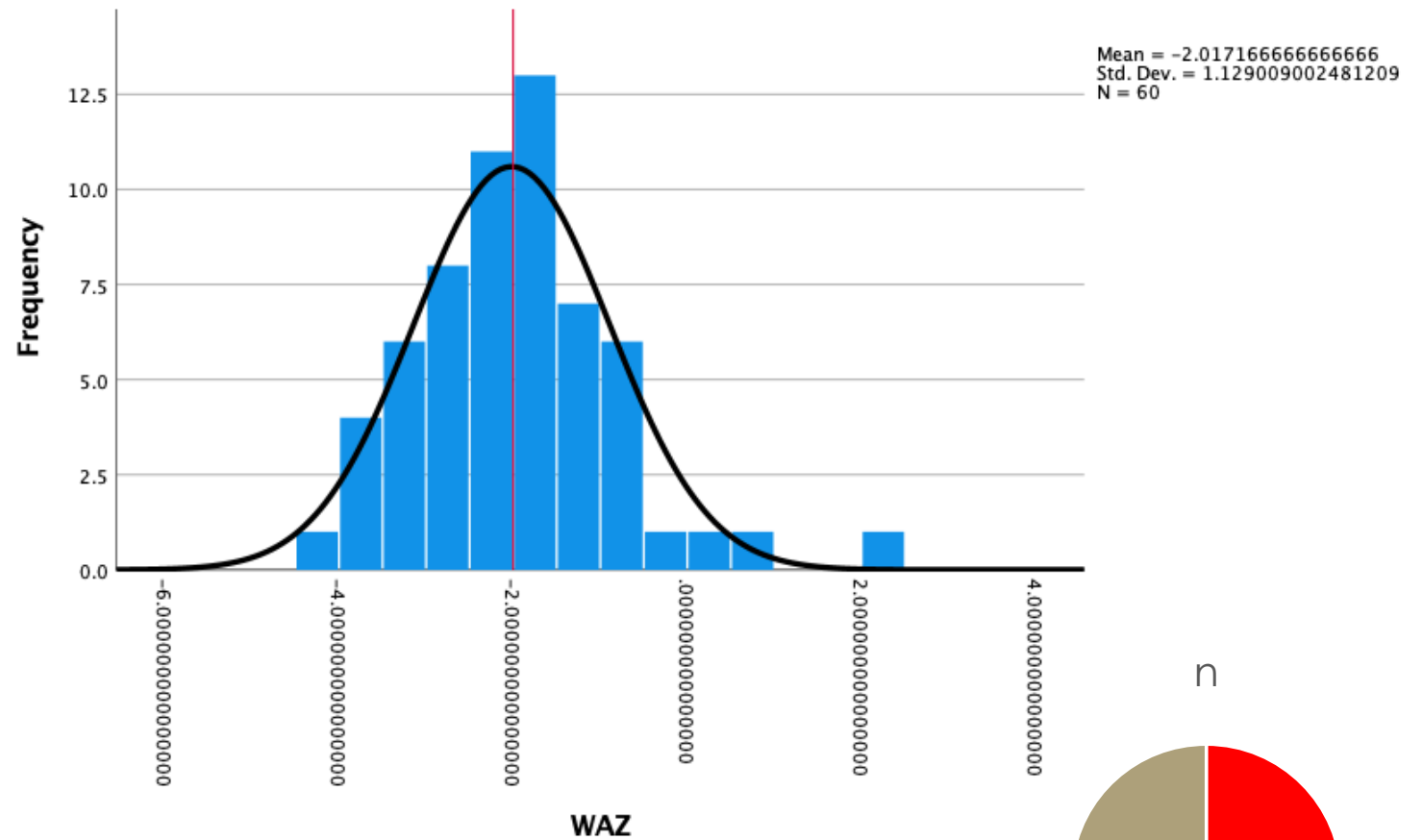


100 percent of school children in SK Mantanani were measured, n=106

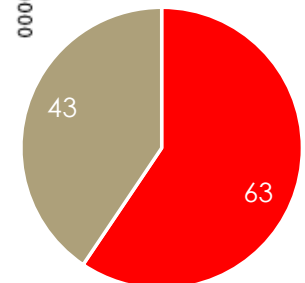
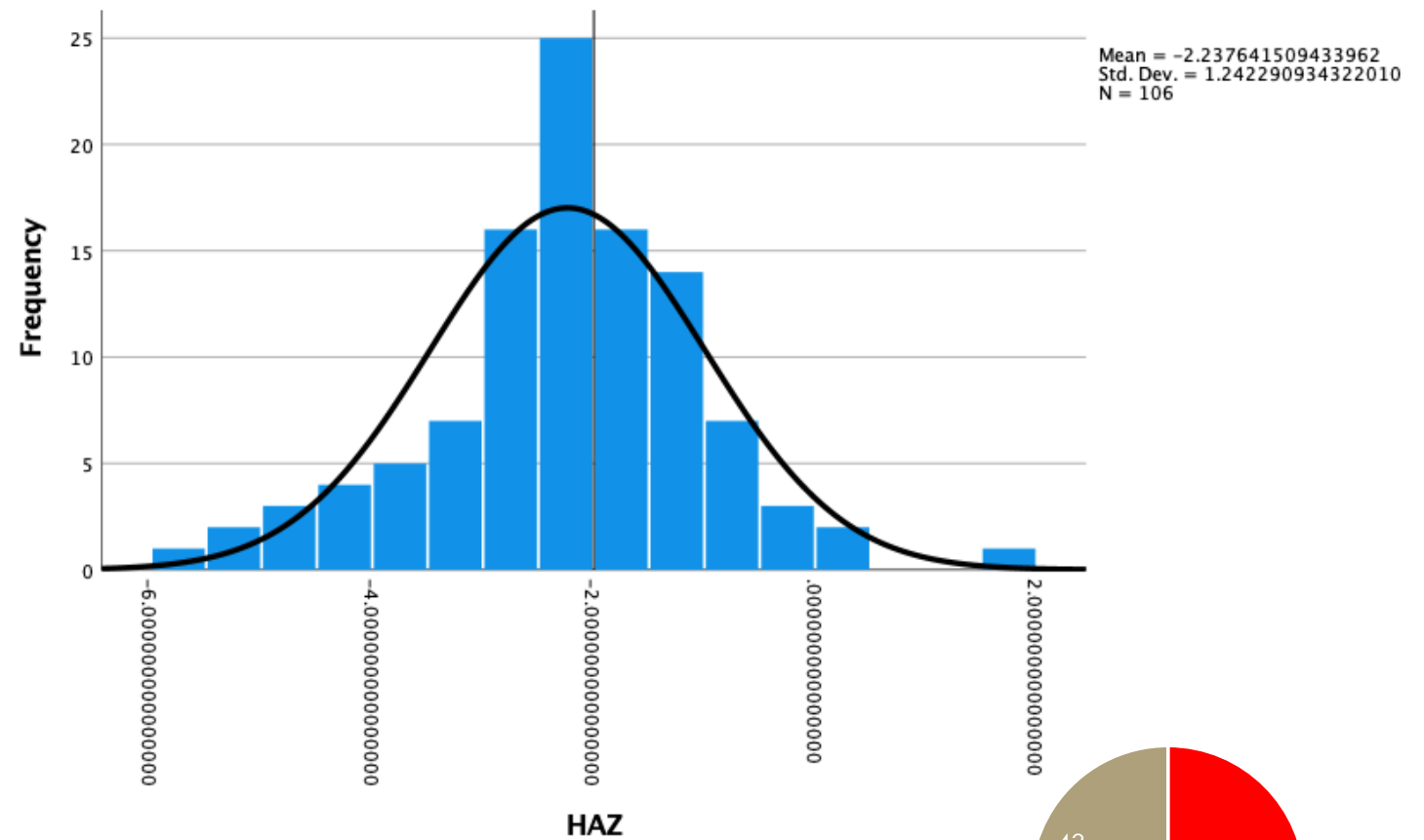
Age:  $9.4 \pm 1.9$  years  
[95%CI: 9.0 – 9.8]

measurements carried out in 2019

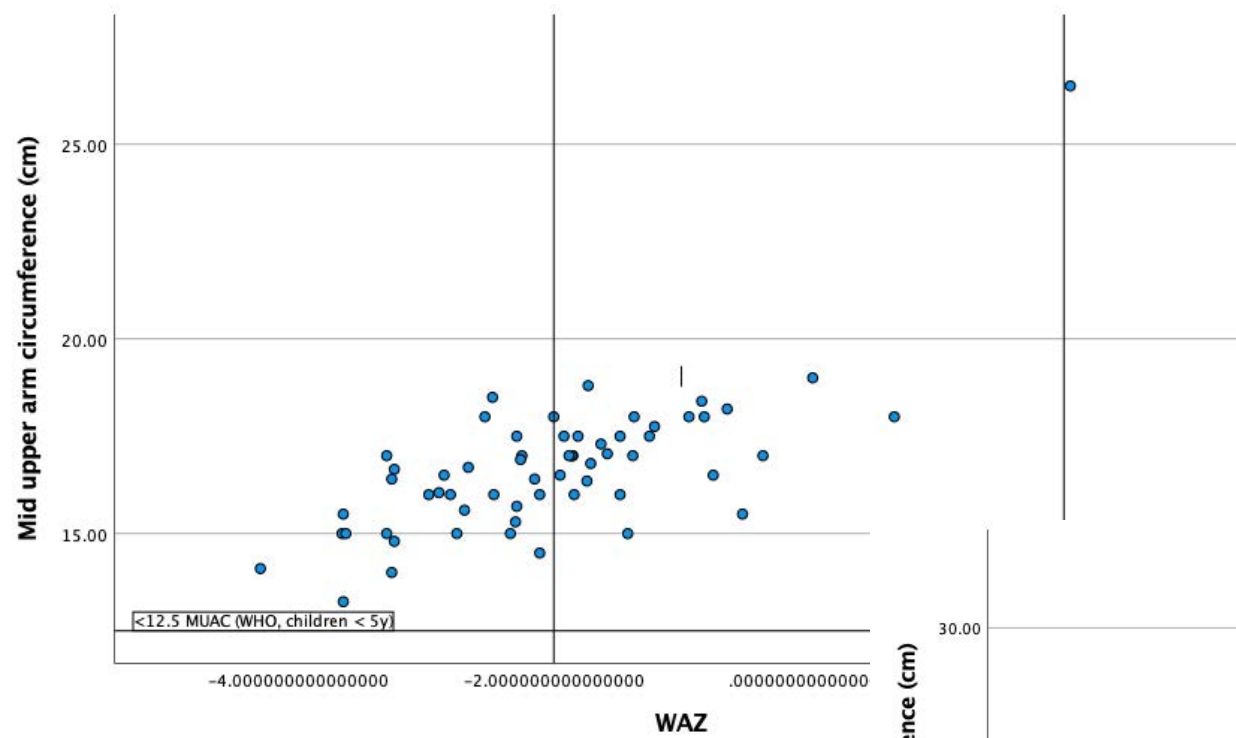
# Findings on WAZ



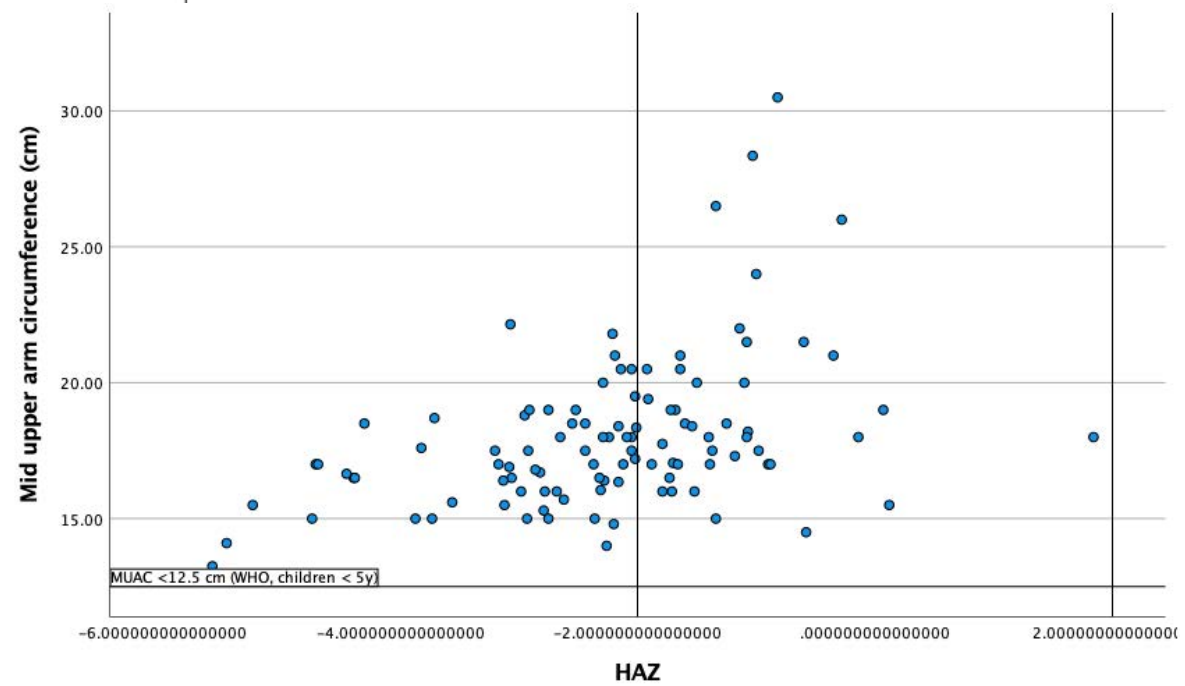
## Findings on HAZ



■  $\leq -2SD$  ■  $> -2SD$



*Findings on  
MUAC*





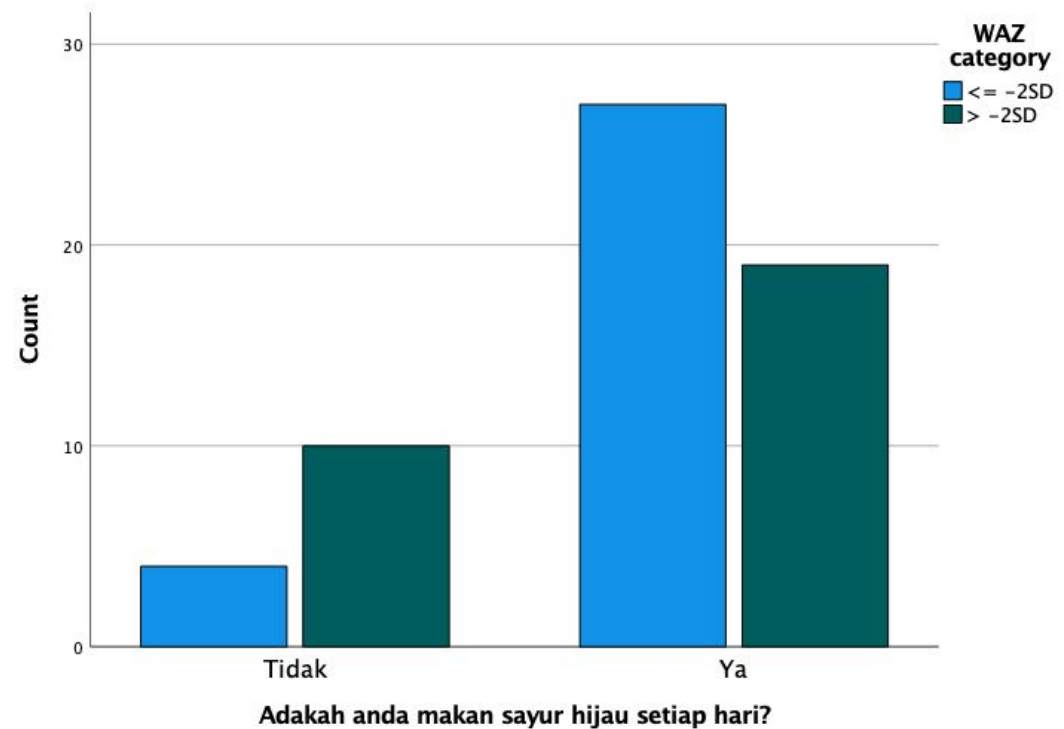
# Dietary intake

- Mean DDS for all food groups was  $6.21 \pm 1.83$  [95% CI: 5.86 – 6.56].
- Every participant ate rice every day.
- Islander food intake were different from most Malaysians' food intake:
  - 102 participants (96.2%) ate fish daily,
  - 30 (28.3%) consumed stingray, shark or puffer fish daily,
  - 14 (13.2%) consumed sea urchins daily,
  - 21 (19.8%) consumed seaweed daily.
- Other than rice, tapioca consumed as putu and tinompe were consumed daily by 33 (33.1%) participants.
- However, 35 (33.0%) and 31 (29.2%) did not consume vegetables and fruits daily. All fruits and vegetables had to be purchased from Kota Belud.

Food intake All these were caught by their parents or picked from the sea by participants.

# Dietary intake

- There was an association between WAZ classification and daily consumption of vegetables ( $X^2$ ,  $p = 0.048$ ).



Adakah anda makan makanan ini setiap hari? Tanda ya atau tidak.

Nasi	<input checked="" type="checkbox"/> Ya / <input type="checkbox"/> Tidak	Rumpai laut	<input checked="" type="checkbox"/> Ya / <input type="checkbox"/> Tidak	Lain-lain, sila nyatakan: <input type="text"/>
Ubi / Putu / Tinompe	<input checked="" type="checkbox"/> Ya / <input type="checkbox"/> Tidak	Sayur hijau	<input type="checkbox"/> Ya / <input checked="" type="checkbox"/> Tidak	
Binamban	<input type="checkbox"/> Ya / <input checked="" type="checkbox"/> Tidak	Buah-buahan	<input checked="" type="checkbox"/> Ya / <input type="checkbox"/> Tidak	
Ikan santan tuna/bakulan	<input checked="" type="checkbox"/> Ya / <input type="checkbox"/> Tidak	Susu lembu/sapi	<input checked="" type="checkbox"/> Ya / <input type="checkbox"/> Tidak	
Ikan goreng	<input checked="" type="checkbox"/> Ya / <input type="checkbox"/> Tidak	Telur ayam	<input type="checkbox"/> Ya / <input checked="" type="checkbox"/> Tidak	
Sinagol (pari/yu/buntal)	<input type="checkbox"/> Ya / <input checked="" type="checkbox"/> Tidak	Ayam	<input type="checkbox"/> Ya / <input checked="" type="checkbox"/> Tidak	
Tehe-tehe	<input checked="" type="checkbox"/> Ya / <input type="checkbox"/> Tidak	Daging / sapi	<input type="checkbox"/> Ya / <input checked="" type="checkbox"/> Tidak	
Udang / sotong	<input type="checkbox"/> Ya / <input checked="" type="checkbox"/> Tidak	Air kosong	<input checked="" type="checkbox"/> Ya / <input type="checkbox"/> Tidak	
Sirap/minuman tin/kotak	<input type="checkbox"/> Ya / <input checked="" type="checkbox"/> Tidak	Kopi / teh + gula / krimer pekat:	<input checked="" type="checkbox"/> Ya / <input type="checkbox"/> Tidak	

# Eating tapioca instead of rice

- Putu
  - Grated tapioca, water pressed out, steamed.
- Tinompe
  - Grated tapioca, water pressed out, fried without oil until golden.
- Eaten with sinagol, kima, tehe-tehe, tayum, etc.



# Eating sea urchins, e.g., *tehe tehe*

Landak laut yang dikenali sebagai 'tehe-tehe' dalam kalangan masyarakat pribumi Bajau hidup di persekitaran batu karang dan ia merupakan cengkerang yang keras dan berbentuk bulat.



Cara penyediaan hidangan itu amat mudah di mana anda perlu mencuci tehe-tehe tersebut, masukkan beras ke dalamnya dan rebus. Selepas nasi sudah masak, potong tehe-tehe tersebut dan boleh dihidangkan.



Sea Bajau Sea Tradition  
akuman999.blogspot.com



Seorang wanita sedang membelah 'tehe-tehe', sejenis hidangan laut ketika kami tiba di rumah Pakcik Mahamud bin Urugan di Pulau Selakan. – Gambar dari internet

<https://www.borneotoday.net/nasi-tehe-tehe-hidangan-istimewa-bajau-laut-terkenal-di-semporna/>

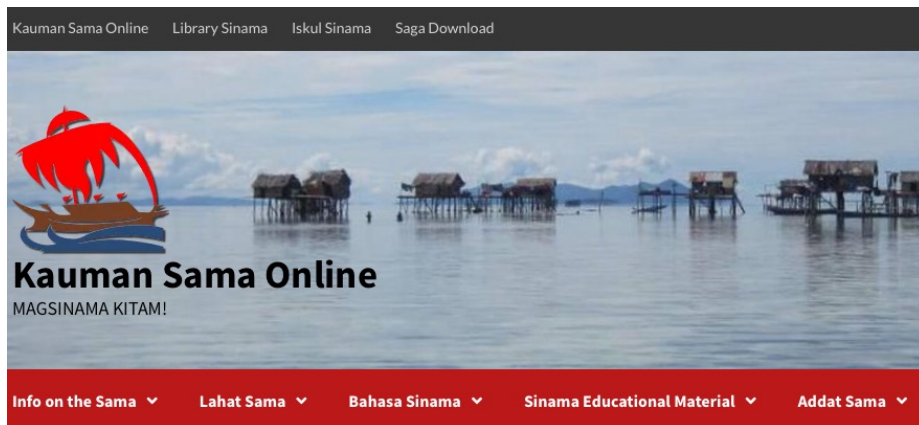


Science

## Sea Urchins | Mamuhuk, Singaling, Tayum, Tehe'-Tehe'

🕒 6 years ago Luke (Sehe ')

A trip to the beach provided the opportunity to learn some of the species of sea urchins. This is less science and more curiosity. 4 to 5 species of sea urchins were found in a small area of ocean near a coral island (kalang). Pictured below are tayum, singaling, mamuhuk, and tehe'-tehe':



<https://sinama.org/2016/11/sea-urchins-mamuhuk-singaling-tayum-tehe-tehe/>

# Ray, shark, puffer fish *sinagol*



## BAHAN BAHAN

- Ikan Pari/ Buntal atau ikan Yu berat dalam ½ - 1kg
- 2atau 3 ulas bawang merah, ditumbuk.
- 2 ulas bawang putih, ditumbuk.
- 1 inci halia, ditumbuk.
- 1 inci kunyit. ditumbuk
- 2 batang serai, dititik.
- 3-4 biji cili merah besar di hiris
- Cili Padi secukupnya
- Air asam jawa 1 cawan.
- minyak untuk menumis.
- Sedikit air. Ikan sudah mempunyai air
- Garam , ajinomoto dan sedikit gula

<https://duniamakananbaru.blogspot.com/2020/11/resepi-sinagol-siagol-ikan-pari-ikan-yu.html>



# Observations

- Parents prioritise childhood vaccinations.
- Will visit doctors / clinics (including private clinics) on the mainland when children are ill.
- Most households have no problem providing rice and fish to their children.
- Vegetables cannot be grown on island soil. All vegetables and fruits must be purchased from the mainland. Before covid-19 pandemic, they took boat rides costing RM30 to the mainland to stock up on food provisions.





## Observations

- All school children received RMT from school canteens.
- Most school children were given about RM2/day pocket money – purchase instant noodles (eaten from the packet) and carbonated drinks on the way to school on foot.
- Educational performance was poor to average.
- No oedema was observed.



## **MENU RMT SEKOLAH 2019 (MINGGU 1)**

Isnin :

**NASI AYAM / BUAH BETIK / SUSU TEPUNG PENUH KRIM**

Selasa :

**MEE GORENG / BUAH OREN / SERBUK MALTA**

Rabu :

**NASI GORENG CINA / BUAH EPAL /  
SUSU TEPUNG PENUH KRIM**

Khamis :

**BIHUN SUP / BUAH EPAL / SERBUK MALTA**

Jumaat :

**BIJIRIN SARAPAN PAGI (EMPING JAGUNG & KOKO KRUNCH)  
/ BUAH OREN / SUSU TEPUNG PENUH KRIM**

## **MENU RMT SEKOLAH 2**

Isnin :

**NASI + KARI AYAM/IKAN / BUAH**

Selasa :

**NASI LEMAK / BUAH PISANG  
SUSU TEPUNG PENUH KRIM**

Rabu :

**BIHUN GORENG PUTIH / BUAH**

Khamis :

**NASI GORENG KAMPUNG  
SUSU TEPUNG PENUH KRIM**

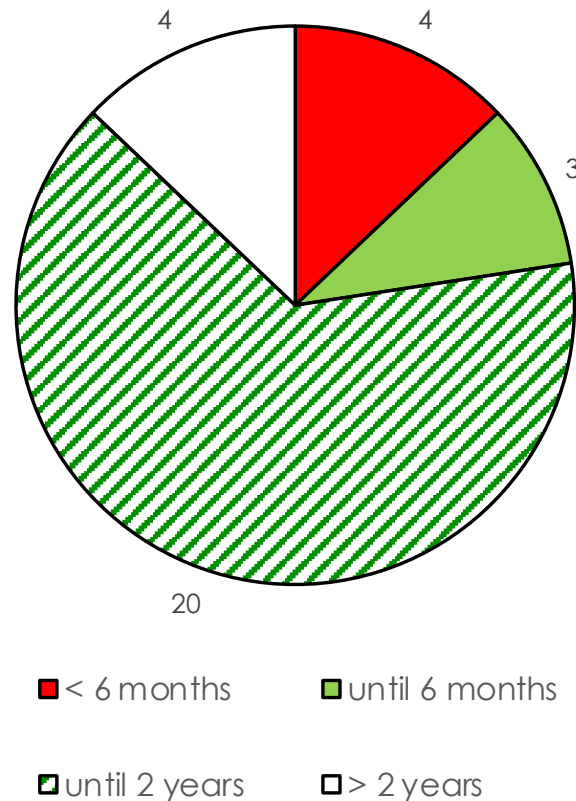
Jumaat :

**KUIH-MUIH / BUAH PISANG BEKUL**

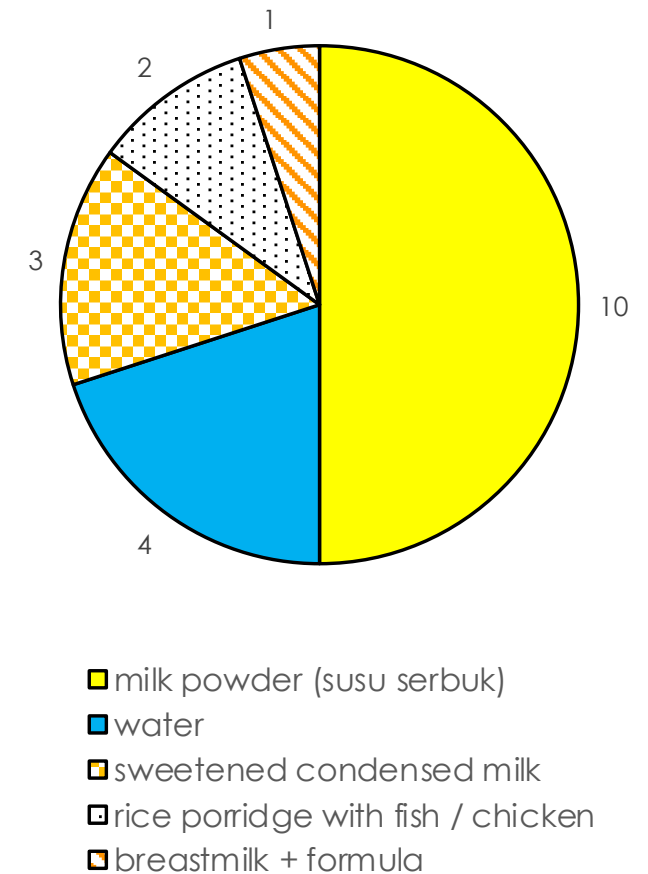
# Discussion

- Almost 2/3 (59.4%) Malaysian children on the island have chronic malnutrition and 1/3 (29.2%) have acute malnutrition.
- Possible causes?
  - Not due to early life malnutrition.
  - 31/33 adults with children breastfed their children (92.9%).

Duration of breastfeeding



What foods were provided to replace breastmilk?



# Discussion

- Possibility of developing a MUAC cut-off for children using local data?
  - In Vietnam, a combination of an optimal MUAC cutoff of 13.5 cm would allow the inclusion of 65% of children with WHZ < - 3 SD (Hai *et al.*, 2020).
  - Data from this study suggests a cut-off of 16 cm allows the inclusion of 60% of WAZ < -2 SD ( $X^2$ ,  $p < 0.001$ )
    - This will be explored using data from this study and other local data in the future.
  - No available MUAC cutoffs for children > 5 y. This has been tested in Cambodia for children >5 y by gender and age (Fiorentino *et al.*, 2016).



# Limitations

- Return visit in 2020 to conduct measurements and interview parents & teachers on food habits cannot be carried due to covid-19 pandemic.
- Covid-19 vaccination uptake is low (2022).





# Conclusion

- Majority of Malaysian children living on an island with free access to marine proteins are having chronic malnutrition.
- Intake of vegetables and fruits did not reach recommended amounts.

# Take home message



Need periodic visit from health workers including nutritionist to the island.



Need kitchen gardens on the island – need to work with nutritionist and agronomist – soil on the island was depleted.

# References

- Fiorentino M, Sophonneary P, Laillou A, Whitney S, de Groot R, Perignon M, Kuong K, Berger J, Wieringa FT (2016). Current MUAC Cut-offs to screen for acute malnutrition need to be adapted to gender and age: the example of Cambodia. *PLoS ONE* 11(2): e0146442  
<https://doi.org/10.1371/journal.pone.0146442>
- Hai TT, Bardosono S, Wiradnyani LAA, Hop LT, Ngan HTD, Phuong HY (2020). The optimal mid-upper arm circumference cutoffs to screen severe acute malnutrition in Vietnamese children. *AIMS Public Health* 7(1):188-196.

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