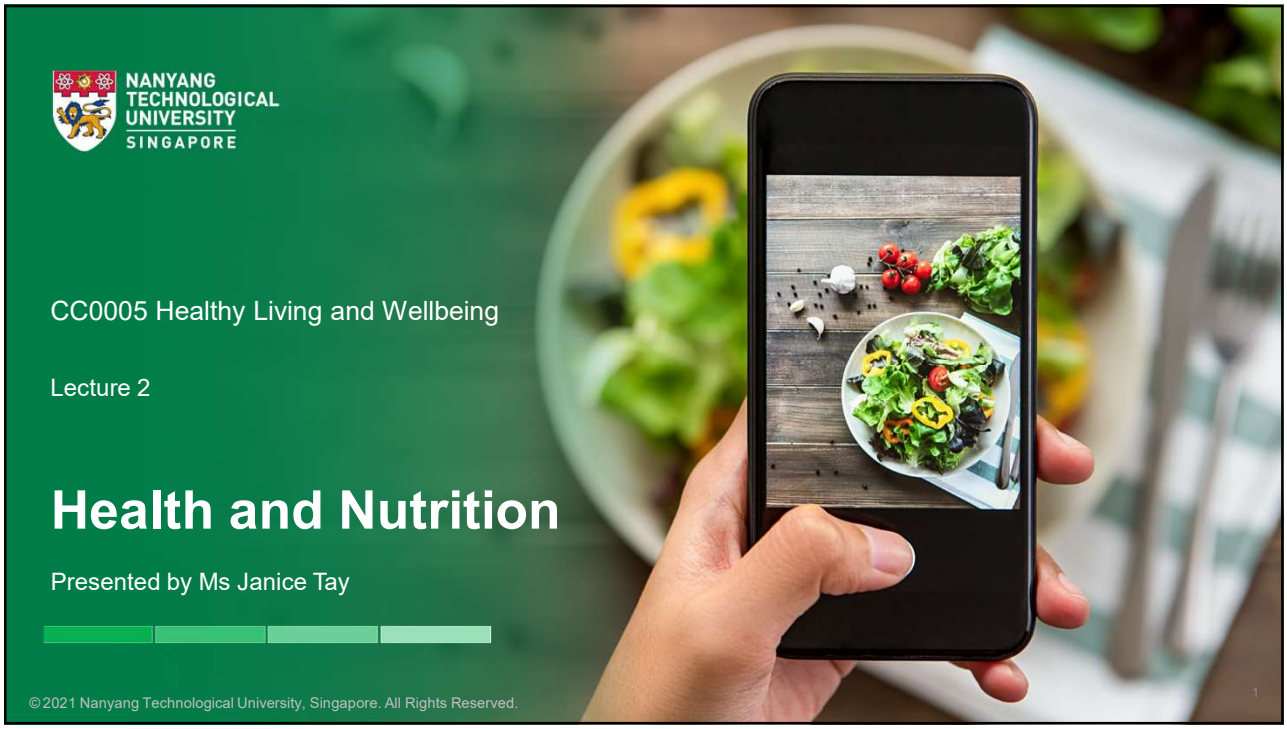
NANYANG
TECHNOLOGICAL
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SINGAPORE
CC0005 Healthy Living and Wellbeing
Lecture 2
Health and Nutrition
Presented by Ms Janice Tay
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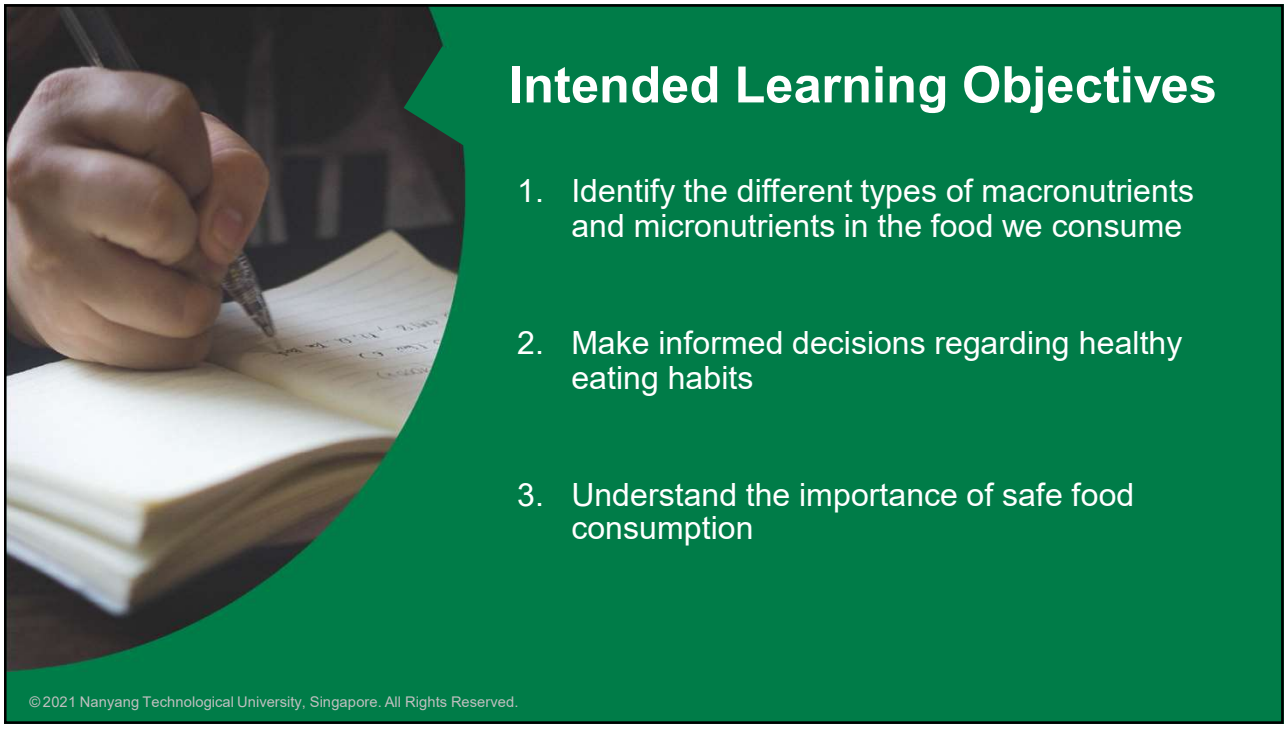
Intended Learning Objectives
1. Identify the different types of macronutrients and micronutrients in the food we consume
2. Make informed decisions regarding healthy eating habits
3. Understand the importance of safe food consumption
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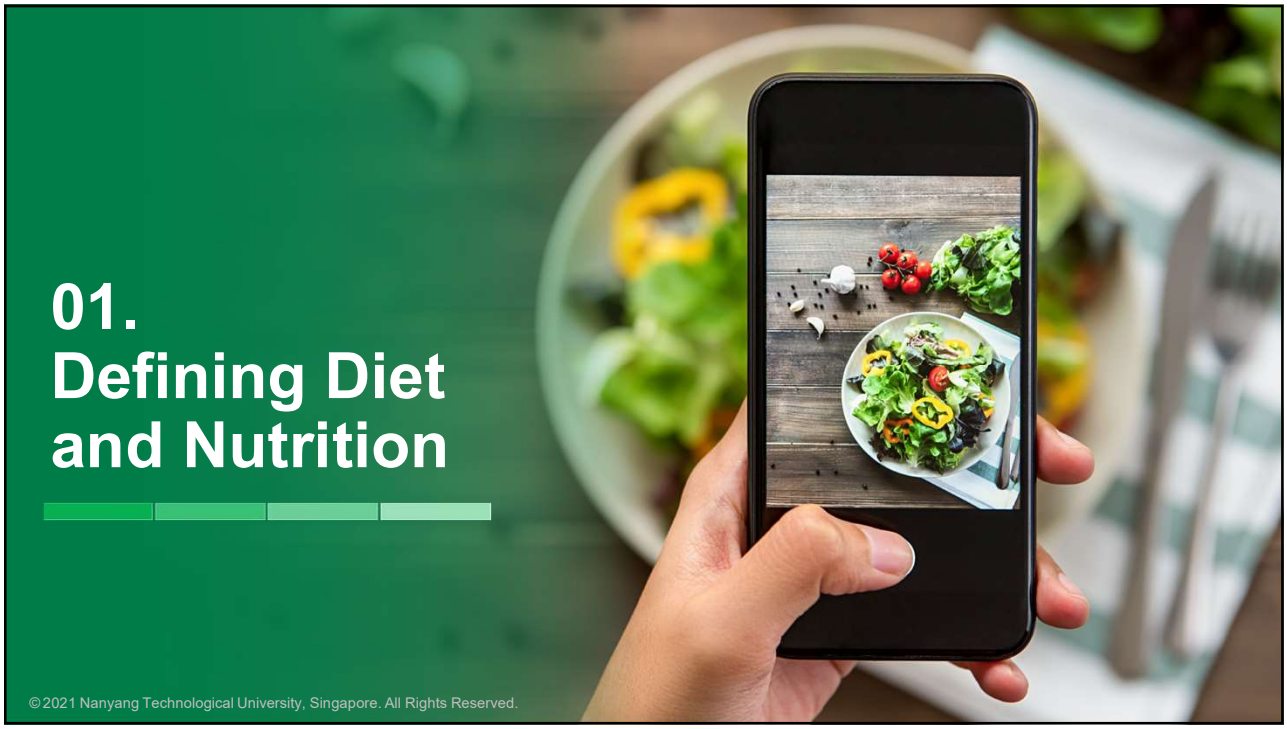
01.
Defining Diet
and Nutrition
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3


Difference Between Diet and Nutrition
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4

# Definition of Diet

**Noun**

1. The kinds of food that a person, animal, or community habitually eats

   "a vegetarian diet"

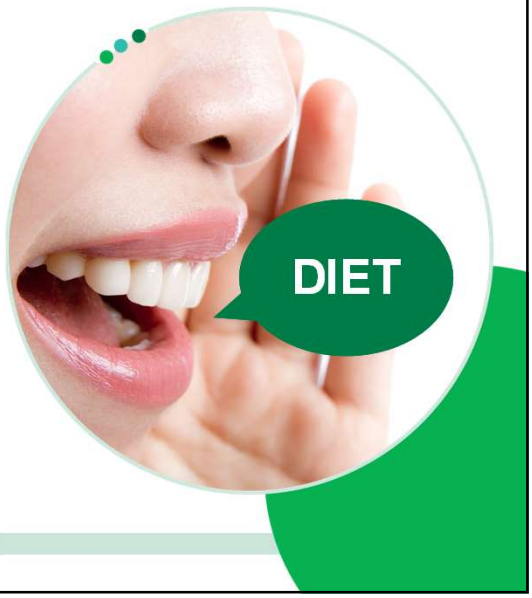
2. A special course of food to which a person restricts themselves, either to lose weight or for medical reasons

   "I'm **going on a diet**"

**Verb**

Restrict oneself to small amounts or special kinds of food in order to lose weight

"I began dieting again"




Oxford Languages. (n.d.). Diet. In *Google's English dictionary*. Retrieved July 6, 2021, from https://www.lexico.com/definition/diet



5

# Definition of Nutrition

**Noun**

The process of providing or obtaining the food necessary for health and growth

"a guide to good nutrition"

- Food or nourishment

  "a feeding tube gives her nutrition and water"

- The branch of science that deals with nutrients and nutrition, particularly in humans

  "New and innovative genetic information will advance the science of human nutrition"


Oxford Languages. (n.d.). Nutrition. In *Google's English dictionary*. Retrieved July 6, 2021, from https://www.lexico.com/definition/nutrition



6

# What is Good Nutrition?

- **Quality of the food itself**
- Need to consume daily for our bodies to function optimally
- In a balanced quantity and ideally, from the cleanest sources possible
- Consists of vitamins, minerals, phytonutrients, and antioxidants
- Improves the immune system, helps build muscle, assists in weight loss, and enhances vitality.
- Balanced nutrition is critical at all stages of life.
  - From a young age, nutrition is crucial for growth and development.
  - As a person gets older, proper nutrition is required for energy, detoxification, and anti ageing.



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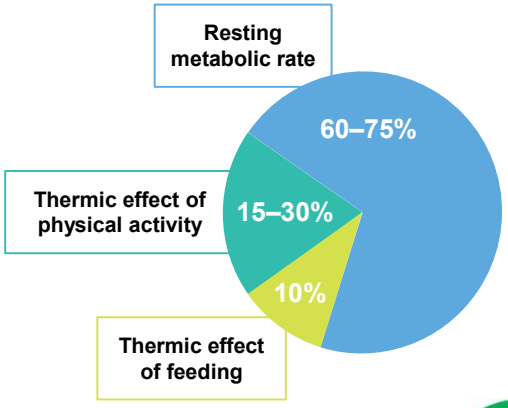
# How Much Nutrition Do I Need?

- You need to consume enough energy each day to cover your Total Energy Expenditure:
  - Resting metabolic rate (60–75%)
  - Thermic effect of physical activity (15–30%)
  - Thermic effect of feeding (10%)
- Your resting metabolic rate depends on:
  - Age
  - Gender
  - Body weight
  - Height
- We will be calculating your resting metabolic rate based on the above factors using the Harris-Benedict equation in tutorial class.




Adapted from McArdle W. D., Katch, F. I., & Katch V. L. (2015). Exercise physiology (8th ed.). Wolters Kluwer Health.



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# Essential Nutrients

- Macronutrients
  - Nutrients that our body need in relatively large amounts to support normal functions and health.
  - Carbohydrates, fats, and proteins are energy-yielding macronutrients.
- Micronutrients
  - Nutrients needed in relatively small amounts to support normal health and body functions.
  - Vitamins and minerals are micronutrients.
- Water




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# Macronutrients

Carbohydrates, fats and proteins



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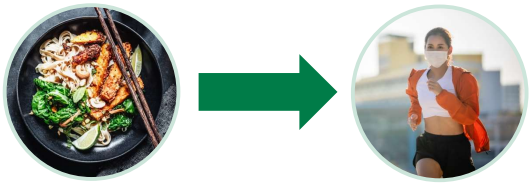
# How Does Food Become Energy Source in Our Bodies?

- Bioenergetics refers to the flow and exchange of energy within a living system.
  - Process of converting substrates into energy
- Energy currency
  - Adenosine triphosphate (ATP)
- Substrates
  - Fuel sources from which we make energy: Carbohydrates, fats, protein





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# How Do We Measure Energy in Food?

- The energy in foods is measured in units called kilocalories (kcal).
- A kilocalorie is the amount of heat required to raise the temperature of 1 kilogram (about 2.2 pounds) of water by 1 degree Celsius.
- Calories = kcal?



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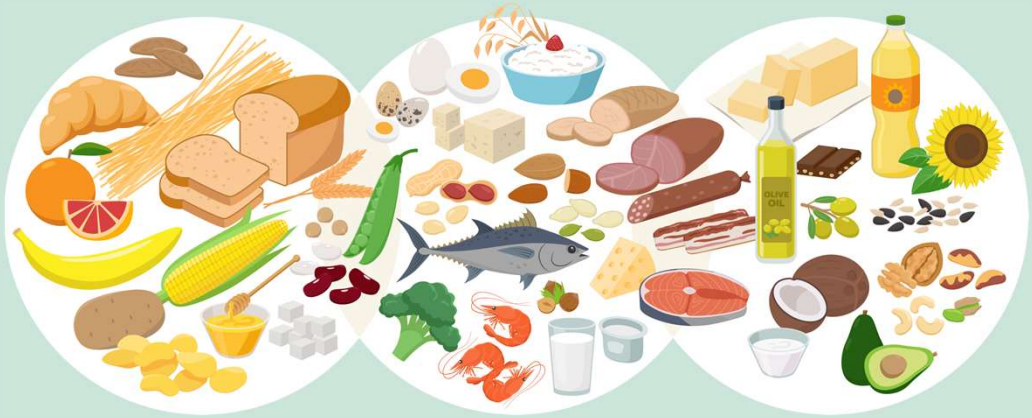
# What are the Foods that Provide Energy?

Macronutrients



Carbohydrates Fats Proteins



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# Carbohydrates

- All carbohydrates (include monosaccharides, disaccharides, polysaccharides)
  - Converted to glucose
  - **4 kcal/g**
  - Primary substrate for muscles, brain
  - Extra glucose stored as glycogen in liver, muscles
- Glycogen is converted back to glucose (in liver and muscle) when needed to make more ATP (glycogenolysis).
- Glycogen stored is limited (2,500 kcal) and relies on dietary carbohydrate to replenish.




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# Fats

- Efficient substrate, efficient storage
  - **9 kcal/g**
- Energy substrate for prolonged, less intense exercise
  - High net ATP yield but slow ATP production
  - Must be broken down into free fatty acids (FFAs) and glycerol
  - Only FFAs are used to make ATP




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# Proteins

- Energy substrate during starvation
  - 4.1 kcal/g
  - Must be converted into **glucose** (gluconeogenesis)
- Can also convert into FFAs (lipogenesis)
  - For energy storage
  - For cellular energy substrate




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# Don't Panic if You Miss a Meal or Two!

TABLE 2.1 **Body Stores of Fuels and Associated Energy Availability**

| Location | g | kcal |
|---|---|---|
| **Carbohydrate** | | |
| Liver glycogen | 110 | 451 |
| Muscle glycogen | 500 | 2,050 |
| Glucose in body fluids | 15 | 62 |
| **Fat** | | |
| Subcutaneous and visceral | 7,800 | 73,320 |
| Intramuscular | 161 | 1,513 |
| Total | 7,961 | 74,833 |

*Note.* These estimates are based on a body weight of 65 kg (143 lb) with 12% body fat.



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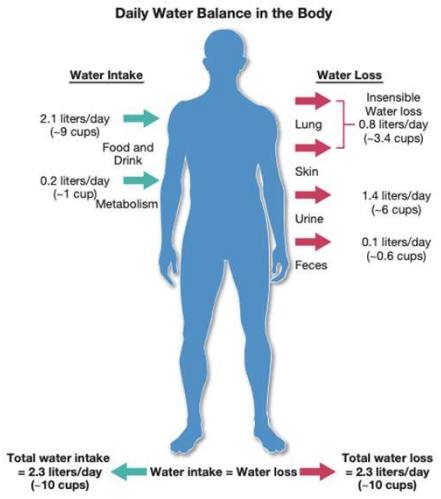
# Water is a Nutrient

- Macronutrient needed in the highest quantity (makes up 60–70% of total body weight)
- Excellent solvent
- Roles:
  - Temperature regulation
  - Digestion
  - Nutrient absorption
  - Blood formation
  - Waste elimination
- Requirement: Depends on size and activity



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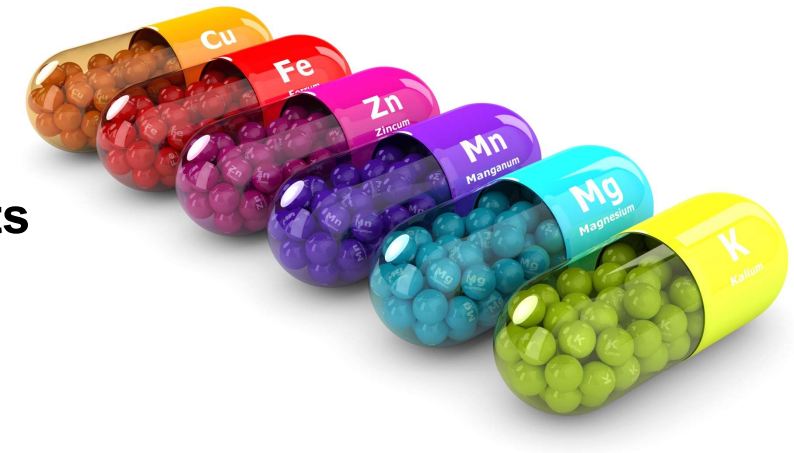
# Micronutrients

Vitamins and minerals



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# Micronutrients

## Vitamins

- Organic compounds that are required in small amounts for normal metabolic processes
- **Essential** nutrients
- Cannot be synthesised by body cells in adequate amounts

## Minerals

- Inorganic elements that are **essential** in metabolism
- Usually extracted from the soil by plants
- Obtained from plant foods or animals that have eaten plant
- Serves as constituents of enzymes, hormones, and vitamins
- Also called microminerals



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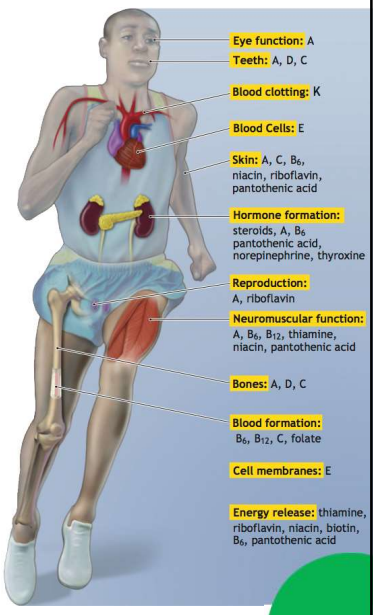
# Vitamins

- Organic compounds that regulate a wide range of body processes
- Body can only synthesise Vitamins D, K and niacin (a B vitamin); all other vitamins must be consumed from our diet
- Roles of vitamins:
  - Normal function, growth
  - Maintenance of body tissues
  - Essential links and regulators in metabolic reactions
- Vitamins are classified based on their solubility:
  - Fat-soluble vitamins: A, D, E, and K
  - Water-soluble vitamins: B vitamins and vitamin C



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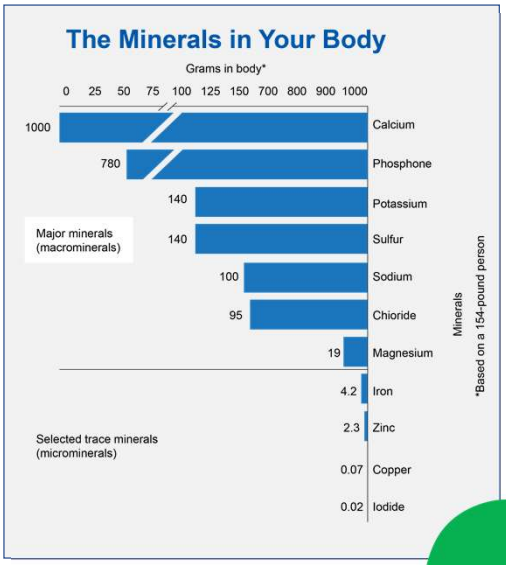
# Minerals

- Two mineral classifications:
  - Seven major minerals (required in amounts >100 mg/d)
  - Fourteen trace minerals (required in amounts <100 mg/d)
- Roles:
  - Fluid regulation and energy production
  - Health of our bones and blood
  - Help rid our body of the harmful by-products of metabolism
  - Provide structure in forming bones and teeth
  - Maintain normal bodily function
  - Regulate metabolism by becoming part of enzymes and hormones that modulate cellular activity



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# Symptoms of Micronutrient Deficiencies

**General symptoms can include**:

- Pallor, or pale skin
- Fatigue
- Weakness
- Trouble breathing
- Unusual food cravings
- Hair loss
- Periods of light-headedness/ feeling faint or fainting
- Constipation
- Sleepiness/poor concentration
- Heart palpitations
- Depression
- Tingling and numbness of the joints
- Menstrual issues, such as missed periods or very heavy cycles



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# Symptoms of Micronutrient Deficiencies

**Clinical diagnosis:**

- Routine blood tests
- Stool culture
- Urine samples
- Physical symptoms of deficiency-related diseases


Track your dietary intake of essential vitamins and minerals



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# Nutritional Challenges

- Excess macronutrients → Obesity
- Micronutrient deficiencies
  - Signs and symptoms
  - Will a multivitamin do the trick?
- Micronutrient excesses
  - How do I know that I have excess?



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# Is There an Optimal Diet to Follow?

Review of various popular diets



26

# Macronutrient-Based Diets

Examples of popular diets:

Vegetarian/vegan


Plant-based: Flexitarian, Mediterranean



Low-carbohydrate diets: Ketogenic, Paleo



Gluten-free


Intermittent fasting



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# Results of Different Diets

- Based on 121 randomised trials with 21,942 patients, using low carbohydrate (e.g., Atkins, Zone), low fat (e.g., Ornish), and moderate macronutrient (e.g., DASH, Mediterranean) diets had, compared with usual diet
- **CONCLUSIONS**
  - Moderate certainty evidence shows that most macronutrient diets, over six months, result in modest weight loss and substantial improvements in cardiovascular risk factors, particularly blood pressure.
  - At 12 months, the effects on weight reduction and improvements in cardiovascular risk factors largely disappear.

**Diets work if you can sustain them!**

RESEARCH

OPEN ACCESS

Comparison of dietary macronutrient patterns of 14 popular named dietary programmes for weight and cardiovascular risk factor reduction in adults: systematic review and network meta-analysis of randomised trials

Long Ge,[1,2,3] Behnam Sadeghirad,[3,4] Geoff D C Ball,[5] Bruno R da Costa,[6,7,8] Christine L Hitchcock,[3,9] Anton Svendrovski,[3] Ruhi Kiflen,[3] Kalimullah Quadri,[10] Henry Y Kwon,[11] Mohammad Karamouzian,[12,13] Thomasin Adams-Webber,[14] Waleed Ahmed,[15] Samah Damanhoury,[16] Dena Zeraatkar,[3] Adriani Nikolakopoulou,[17] Ross T Tsuyuki,[18] Jinhui Tian,[19] Kehu Yang,[1,19] Gordon H Guyatt,[3] Bradley C Johnston[3,20]

ABSTRACT

OBJECTIVE

DESIGN

DATA SOURCES

STUDY SELECTION

OUTCOMES AND MEASURES

REVIEW METHODS

RESULTS

WHAT IS ALREADY KNOWN ON THIS TOPIC

WHAT THIS STUDY ADDS

Ge, L., Sadeghirad, B., Ball, G. D. C., da Costa, B. R., Hitchcock, C. L., Svendrovski, A., Kiflen, R., Quadri, K., Kwon, H. Y., Karamouzian, M., Adams-Webber, T., Ahmed, W., Damanhoury, S., Zeraatkar, D., Nikolakopoulou, A., Tsuyuki, R. T., Tian, J., Yang, K., Guyatt, G. H. & Johnston, B. C. (2020). Comparison of dietary macronutrient patterns of 14 popular named dietary programmes for weight and cardiovascular risk factor reduction in adults: systematic review and network meta-analysis of randomised trials. *BMJ*, 369, m696. http://dx.doi.org/10.1136/bmj.m696



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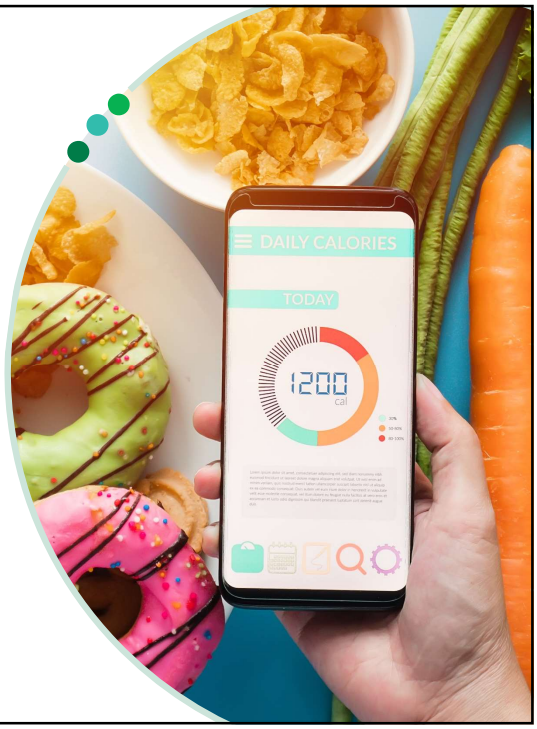
# A Calorie is a Calorie…Right?

Does the quality of the food itself matter?



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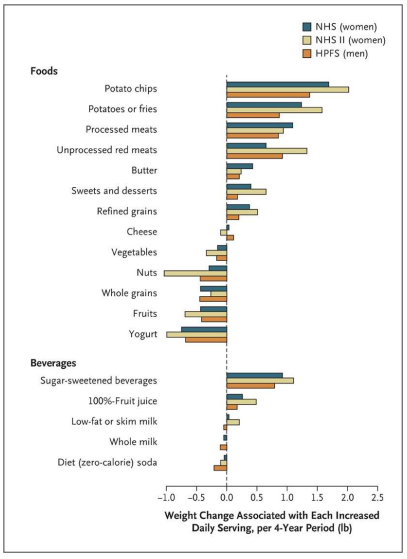
# Research on Food Quality

- In a study of over 120,000 healthy women and men spanning 20 years, researchers determined that:
  - Weight change was most strongly associated with the intake of potato chips, potatoes, sugar-sweetened beverages, and both processed and unprocessed red meats.
  - Foods shown to be associated with weight loss were vegetables, whole grains, fruits, nuts, and yogurt.
- **Choosing high-quality foods** (and decreasing consumption of lower-quality foods) **is an important factor in helping individuals consume fewer calories**.




Mozaffarian, D., Hao, T., Rimm, E. B., Willett, W. C., & Hu, F. B. (2011). Changes in diet and lifestyle and long-term weight gain in women and men. *The New England Journal of Medicine*, *364*(25), 2392–2404. https://doi.org/10.1056/NEJMoa1014296



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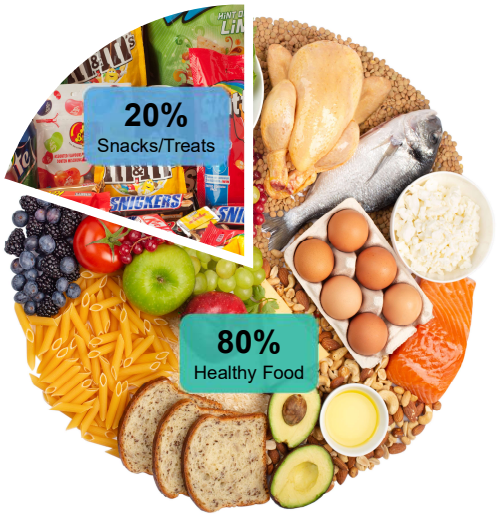
# Healthy Diet = Restrictive Nutrition (i.e., No Junk?)



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# What Does a Good Diet Do for You?

- Improves health
- Enhances vitality
- Increases energy
- Maintains ideal weight
- Combats many diseases and health issues
- Protects against certain diseases like Type 2 diabetes, cognitive decline and heart disease



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# What is a Healthy Diet?

- A healthy diet is made up of foods that are nutritious.
- What is considered nutritious?
  - Locally grown foods (nutrient loss reduced from being harvested too soon or loss over time taken to transport the foods)
  - Simple natural ingredients
  - Minimal processing that contain high amounts of vitamins, minerals, and antioxidants
  - Optimal cooking methods
  - Organic (optional if cost is not an issue)



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# Nutrient Density - How to Make Good Nutritional Choices?




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# Getting Sick From Eating

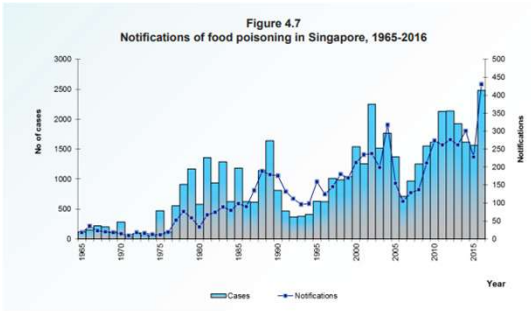
Food-borne diseases—how common is it?




35

# Incidences of Food Poisoning in Singapore

- Food-borne diseases are a result of ingestion of food or water contaminated with microorganisms (bacteria, virus or parasite), toxins produced by harmful algal and bacterial species or present in specific fish species, or chemicals.
- Affected individuals commonly present with gastrointestinal symptoms.
- Contamination of food may occur at any stage in the process, from food production to consumption.
- Why are there still so many cases of food-related illnesses?
  - Food poisoning: What are the chances of getting it from catered food?




Ministry of Health. (n.d.). *Food-borne diseases*. https://www.moh.gov.sg/docs/librariesprovider5/resources-statistics/reports/food-borne-diseases.pdf



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# Incidences of Food Poisoning by Type of Food Establishments

- Tips to avoid food poisoning when eating out:
  - Inspect surroundings and cleanliness.
  - Check inspection scores.
  - Look for safe handling practices.
  - Order food that is properly cooked. Do not be afraid to send food back to kitchen.
  - Avoid lukewarm food.
  - Order local foods and house specials (most popular dishes).

Table 4.36
Food poisoning notifications by type of food establishments, 2016

| Type of food establishments | No. of notifications | Notification classified as outbreak* | No. of food establishments involved | No. of cases |
|---|---|---|---|---|
| General outlets | | | | |
| Bakery | 15 | 0 | 15 | 45 |
| Canteens | | | | |
| School | 4 | 1 | 4 | 89 |
| Tertiary Institution | 1 | 1 | 1 | 13 |
| Others | 5 | 2 | 4 | 89 |
| Caterer (licensed) | 28 | 17 | 15 | 685 |
| Eating house | 36 | 4 | 35 | 106 |
| Fair(food fair) | 0 | 0 | 0 | 0 |
| Fair (others) | 0 | 0 | 0 | 0 |
| Food court | 32 | 4 | 31 | 71 |
| Foodshop (takeaway) | 7 | 0 | 7 | 19 |
| Hawker centre | 13 | 3 | 13 | 60 |
| Other licensed premises | 1 | 0 | 1 | 4 |
| Restaurants | | | | |
| In Hotel | 52 | 41 | 17 | 369 |
| Fast Food | 15 | 6 | 15 | 52 |
| Others | 199 | 104 | 131 | 617 |
| Supermarket | 6 | 0 | 6 | 26 |
| Snackbar | 7 | 2 | 7 | 33 |
| Food factory | 0 | 0 | 0 | 0 |
| **Sub-total (General outlets)** | **421** | **186** | **302** | **2,278** |



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# Nutrition Q and A

Ask Prof William Chen



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**How long will food be safe for consumption after it has been prepared?**



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**How long will food be safe for consumption after it has been delivered?**



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**My leftover meal e.g., from two days ago does not smell bad, can I still eat it?**



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**How safe is it to consume food that are kept out for quite a while e.g., economy rice (Cai Fan)?**



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