Nutrition: Evidence and Application update

Mary Spiers and Meredith Peddie, Department of Human Nutrition

Whaowhia te kete mātauranga

Fill the basket of knowledge.

Outline/Agenda

Plan for today's workshop

- Introductions
- What are New Zealand adolescents currently eating (Results from the SuNDiAL Study – Meredith)
- What should New Zealand adolescents be eating (and update on the MoH guidelines - Mary)
- Intermittent fasting – the current evidence (Meredith)

- Afternoon tea

Outline/Agenda

Plan for today's workshop

- Group Discussion/Exploration (pick your topic)
  1. Foods and recipes to help meet health and nutrition requirements
  2. Popular Dietary Trends
  3. Health Promotion Models

- Advice for students wanting to study Nutrition

- Feedback from groups, final discussions and take-home messages

Mary Spiers

- Originally from Taihape, came to Dunedin to attend Otago
  - BSc (Human Nutrition)
  - PG Diploma Dietetics (Distinction)
- Work History
  - Clinical Dietitian (Dunedin Hospital)
  - Private Practice/Clinical Locum
  - Public Health Nutrition (Heart Foundation Otago Branch)
  - Snr Professional Practice Fellow – MDiet Programme
  - Snr PPF – MAppSc – Advanced Nutrition Practice

- Passionate about Public Heath Nutrition

Meredith Peddie

- Grew up in Ōtepoti Dunedin
- Completed undergrad at Otago
  - BPhEd (Hons) Sport Science
  - BSc (Human Nutrition)
- Joined the workforce
  - Gym instructor
  - South Link Health
- MSc
- PhD
- Heart Foundation Research Fellow
- Started lecturing in 2020

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NEW ZEALAND

Background

- Last national nutrition survey conducted in 08/09
- Dietary patterns change over time
- Increasing interest in vegetarianism
  - Adolescent females may be at greatest risk of nutrients inadequacies/deficiencies due to increased requirements for iron etc

Objective

- To compare the dietary intakes, nutritional and health status, motivations, attitudes and lifestyles of a sample of vegetarian and non-vegetarian adolescent women in New Zealand

Methods

- Cross sectional data
- Recruitment of participants through high schools
- Data collection periods in Terms one and four

More detailed methodology: Peddie et al (2020) JMIR Research Protocols 9(5); e17310

Recruitment

Schools in data locations area, that had rolls of more than 400 were emailed an invitation to participate late in 2018 and 2019.

Participant recruitment

- Data collectors visited participating schools to initiate recruitment
  - Presentation to assemblies
  - Collected email addresses from interested students
- Interested students then sent a link to questionnaire, where they could complete online consent

Eligibility criteria

- 16 - 18 years of age
- Identify as female and not be pregnant (2019)
- Able to complete the online questionnaires and participate in data collection

Online Questionniare

- Basic demographic and health questions
- Dietary Habits
- Attitudes and motivations for food choice
- Weight loss/gain intentions

Usual Dietary intake

- Two 24 h recalls
  - Multiple pass technique
  - 1 conducted face to face during in school data collection visit
  - 1 conducted via zoom/facetime/phone
- Data entered into foodworks
- Estimation of 'usual intake' produced using MSM to adjust for the within person variation in intakes

24 h Activity

- Participants could consent separately to wear an accelerometer on their waist, 24 h a day for seven days
- Age appropriate cut-offs used to identify sleep, sedentary time, light and moderate-to-vigorous physical activity

Biological Specimens

- Non fasting blood sample collected by a phlebotomist, using trace element free equipment and then transported to a local laboratory for processing
- Urine sample collected and then transported to Department of Human Nutrition to be stored

Biological Analysis

- Complete blood count
- B12
- Folate

Measured immediately by contracted lab

- Serum ferritin
- Serum transferrin receptor
- retinol binding protein
- α-1-acid glycoprotein
- c-reactive protein

VitMin Laboratory
Dr J Erhardt
Germamy

- Zinc
- Selenium

Centre of Trace Element Analysis
Dept of Chemistry, UoO

Results

Table 1. Demographic characteristics of self-identified vegetarians and non-vegetarians (n = 254).

	Non-Vegetarians (n = 216)	Self-Identified Vegetarians (n = 38)	p-Value
Age, mean (SD) years	16.8 (0.9)	17.1 (0.8)	0.009
Ethnicity, n (%)			0.557
NZEO [a]	169 (78.2)	31 (81.6)	
Māori	32 (14.8)	7 (18.4)	
Pacific	6 (2.8)	0	
Asian	9 (4.2)	0	
Deprivation [b], n (%)			0.896
Low	83 (38.4)	16 (42.1)	
Medium	92 (42.6)	16 (42.1)	
High	41 (19.0)	6 (15.8)	
BMI z-score [c], mean (SD)	0.76 (0.97)	0.25 (0.81)	0.003
Weight status [c], n (%)			0.149
Healthy	138 (64.8)	31 (81.6)	
Overweight	51 (23.9)	5 (13.2)	
Obese	24 (11.3)	2 (5.3)	
Height, mean (SD) cm	166 (7)	166 (6)	0.912

[a] NZEO: New Zealand European and other. [b] Deprivation is determined by the New Zealand (NZ) Deprivation Index (2018) with low: 1–3; medium: 4–7; and high: 8–10. [c] BMI z-scores determined using the World Health Organization (WHO) growth charts; n = 3 non-vegetarians were missing body mass index (BMI) z-score. Overweight was defined as BMI z-score ≥ 1 & < 2, with obese defined as BMI z-score ≥ 2. SD: standard deviation.

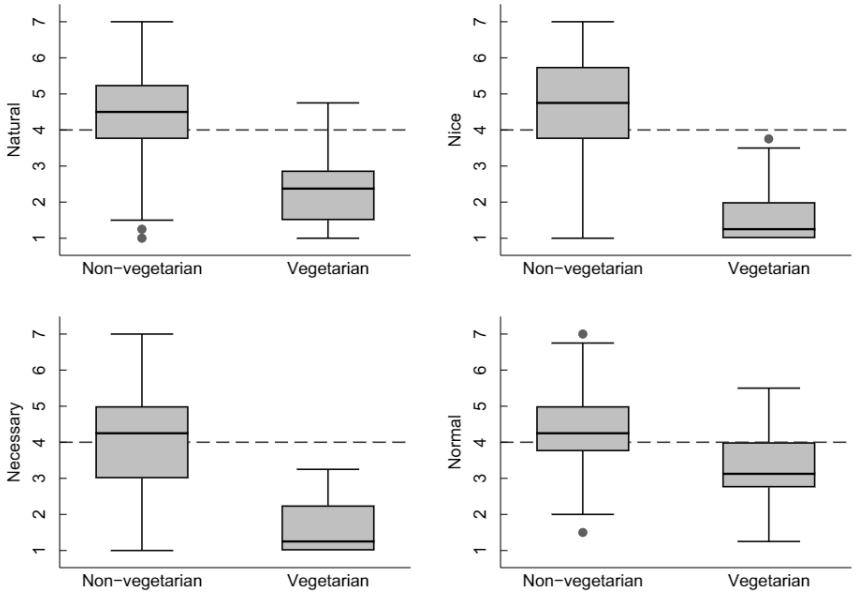
Rationalisation of meat consumption

- Four Ns questionnaire
  - Natural
  - Necessary
  - Nice
  - Normal

- Food choice motivations (food choice questionnaire and the ethical food choice motives questionnaire)
  - Health, Mood, Convenience, Sensory appeal
  - Natural content, price, weight control, familiarity
  - Animal welfare, Environmental concerns, Religion

Latimer et al (2022) Public Health Nutrition 25(4); 904-912

Meat rationalisation by vegetarian status



Latimer et al (2022) Public Health Nutrition 25(4); 904-912

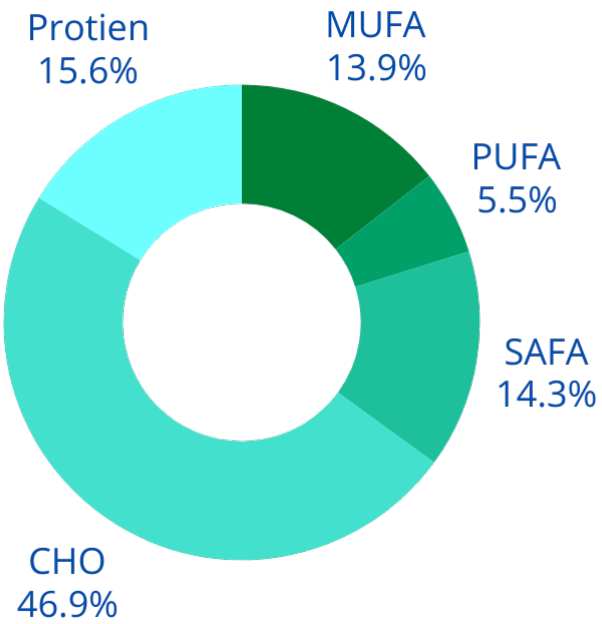
Food choice motivations in non-vegetarians

- Most important food choice motivation was sensory appeal, followed by price.
  - Religion was ranked least important
- Those whose food choice was motivated by convenience, sensory appeal, price and familiarity tended to agree more with statements indicating that meat was normal, necessary natural and nice
- Those whose food choice was motivated by animal welfare and environmental concerns were less likely to agree with the 4 N statements

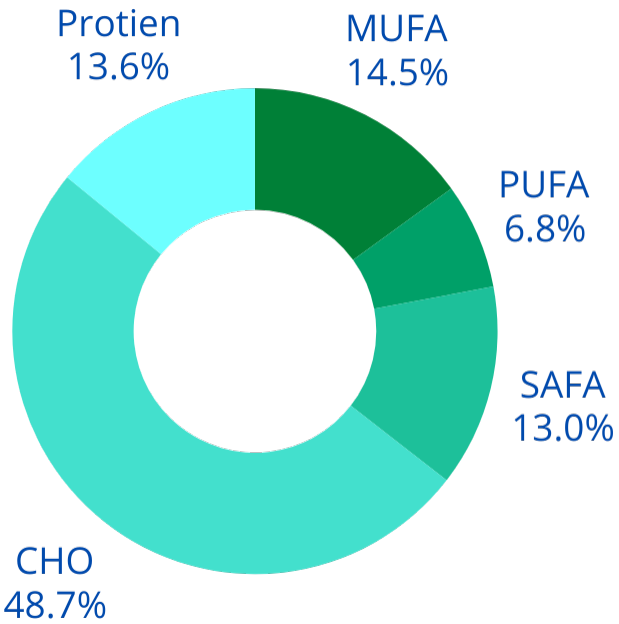
Latimer et al (2022) Public Health Nutrition 25(4); 904-912

Macronutrient Intakes of non-vegetarian and vegetarian females

Non-Vegetarians

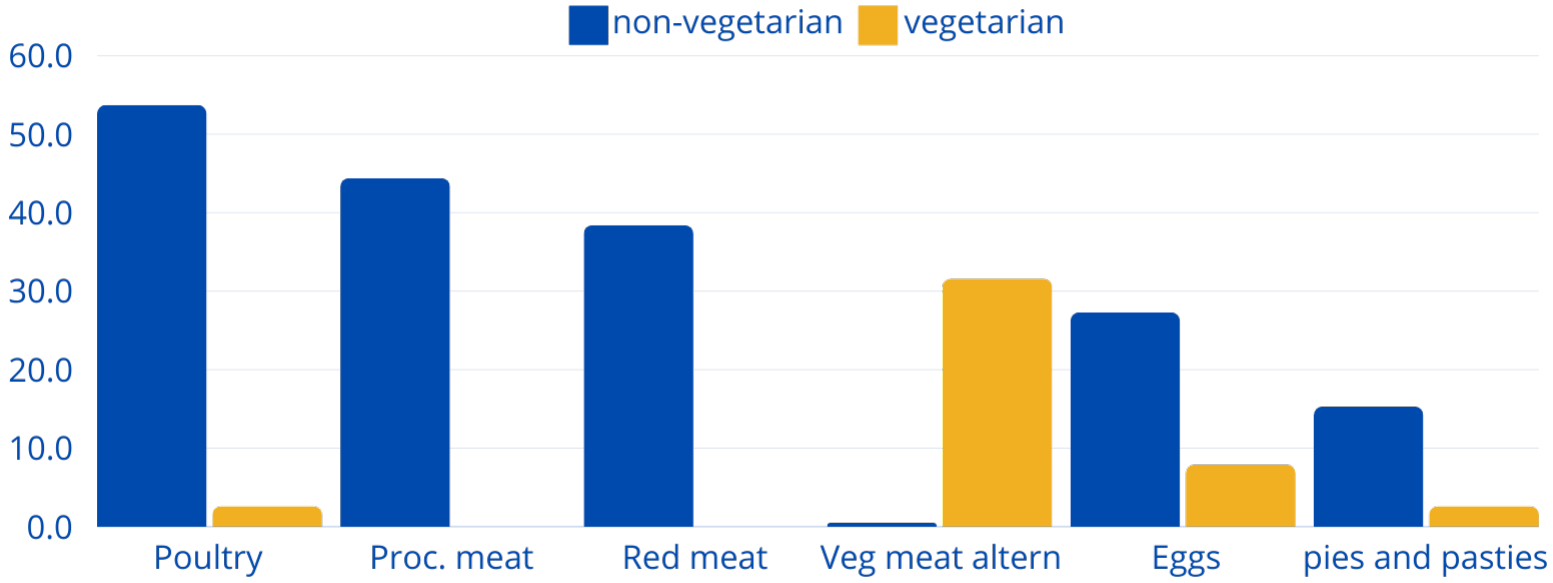


Vegetarians



Peddie et al (2022)Nutrients 14;711

Food group consumption in non-vegetarian and vegetarian females



Peddie et al (2022)Nutrients 14;771

Food groups contributions to energy

	Non-vegetarians (n=216)	Median (IQR) kj/day		Vegetarians (n=38)	Median (IQR) kj/day
1	Bread-based dishes (31%)	2325.1 (1440.9 to 3075.1)	1	Bread-based dishes (29%)	2044.3 (1312.3 to 2352.7)
2	Pies & Pasties (15%)	1757.3 (1374.6 to 2472.9)	2	Discretionary foods (87%)	1660.5 (1099.8 to 1942.4)
3	Discretionary foods (94%)	1436.3 (823.2 to 2265.3)	3	Vegetarian meat alternatives (32%)	1542.6 (1140.6 to 2525.7)
4	Grains and pasta (67%)	1143.0 (726.7 to 1732.4)	4	Pies & Pasties (3%)	1467.5
5	Bread (82%)	973 (708.3 to 1732.4)	5	Grains and pasta (61%)	1167.4 (943.7 to 1865.7)

Peddie et al (2022)Nutrients 14;711

Micronutrient Status

Adolescent Females

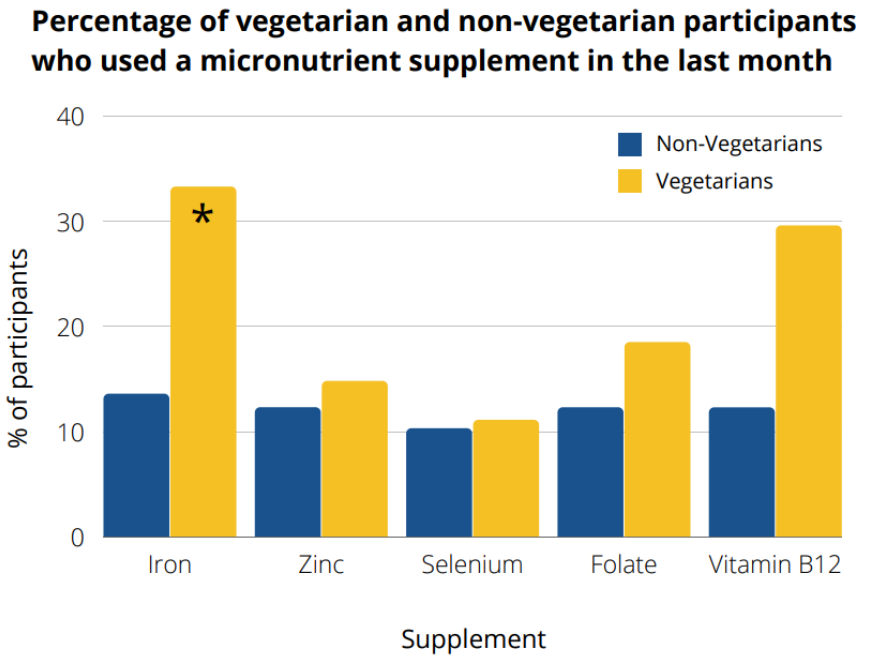
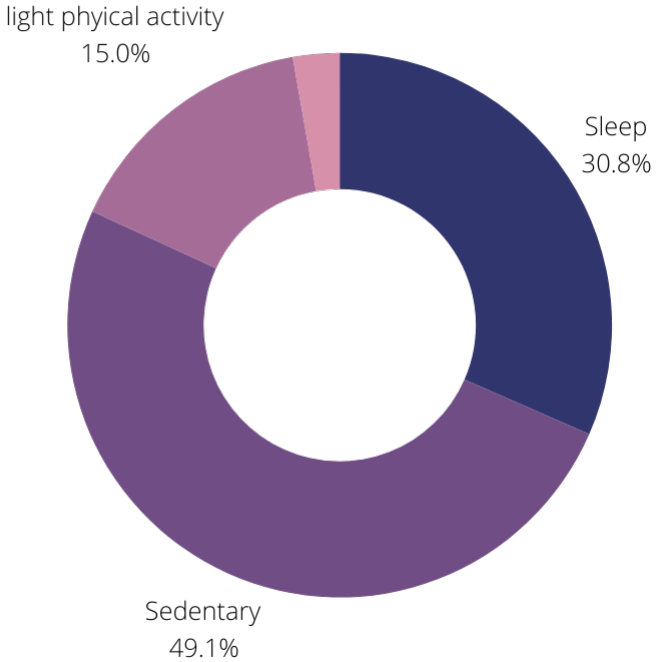


Table 3. Proportion of vegetarians and non-vegetarians with abnormal biomarker status (n=182)

Cut-points for abnormal status	Non-vegetarians (n=155) n (%)	Self-identified vegetarians (n=27) n (%)	*p*-value[†]
Anaemia			
Hb < 120 g/L	8 (5.2)	4 (14.8)	0.082
Iron depletion			
Ferritin <15 µg/L	15 (9.7)	4 (14.8)	0.492
Iron deficiency anaemia			
Hb < 120 g/L and Ferritin < 15 µg/L	3 (1.9)	2 (7.4)	0.160
Soluble transferrin receptor			
>5.3 mg/L	32 (20.7)	12 (44.4)	0.013
Total Body iron (TBI)			
<0 mg/kg	17 (11.0)	5 (18.5)	0.333
Low zinc status[‡]			
<10.09 µmol/L	31 (20.0)	13 (50.0)	0.002
Low selenium status[‡]			
<0.82 µmol/L	3 (1.9)	3 (11.5)	0.039
Low serum folate[‡]			
< 6.8 nmol/L	1 (0.8)	0	>0.999
Low serum B-12			
< 148 pmol/L	2 (1.3)	1 (3.7)	0.384
Vitamin D			0.229
Insufficient			
30-50 nmol/L	85 (55.2)	13 (48.2)	
Deficient			
<30 nmol/L	44 (28.6)	12 (44.4)	

Activity Results



- n=109
- 19% achieving the sleep recommendations of 8-10 h a night
- 24% meeting the physical activity guidelines of 60 min per day
- 7% meeting both guidelines

Tye et al (2020) Int. J. Environ. Res. Public Health, 17,

Activity Results

Adolescent Females

Commuting

Sport

PE

Compared to those who did not:

- Those who used Active Transport accumulated an additional 12 min of MVPA per day.
- Those who participated in sport accumulated an additional 17 min of MVPA per day.

Participation in organised sport resulted in the greatest increase in LPA and MVPA.

For every additional domain of PA, participants accrued additional LPA and MVPA.

Gale et al (2021) Int. J. Environ. Res. Public Health, 18,

Conclusions

- Most adolescents rationalize their meat consumption because it tastes good, but there is also some concern that not eating meat may lead to nutritional inadequacies.
- In this sample of female adolescents, vegetarians did appear to be at risk of lower protein intakes, but consumed more fibre and a better fatty acid profile than non-vegetarians.
- Vegetarians were more likely to have lower iron, zinc and selenium status than non-vegetarians

Conclusions

- In the overall sample of female adolescents many were obtaining a high proportion of their fat and CHO from food groups associated with poorer dietary quality.
- The possible increase in fat intake (particularly saturated fat) across both vegetarians and non-vegetarians when compared to the ANS data is concerning

Conclusions

- To facilitate adolescents to follow a more plant based eating pattern we need to promote meat alternatives that taste, good, are easy and cost effective to prepare and provide less fat, more protein and amounts of iron, zinc and selenium that would reduce the risk of deficiency

- Public health messages around the importance of physical activity should be reshaped to focus on the entire 24 h day, where a clear focus on sleep, in addition to physical activity, is needed in this age group.

Conclusions

- Maintaining sport participation throughout adolescence may be an important way of increasing physical activity, but school PE and active commuting (or better yet a combination of all three) can also promote an increase in physical activity

Acknowledgements

Te Tahua Rangahau Hauoratanga
Lottery Health Research

Heart Foundation™

Department of Human Nutrition
Te Tari Kai Tōtika Takata

University of Otago
Te Whare Wānanga o Otāgo
New Zealand

MDiet cohorts from 2019 and 2020

Questions?

Adolescent Nutrition

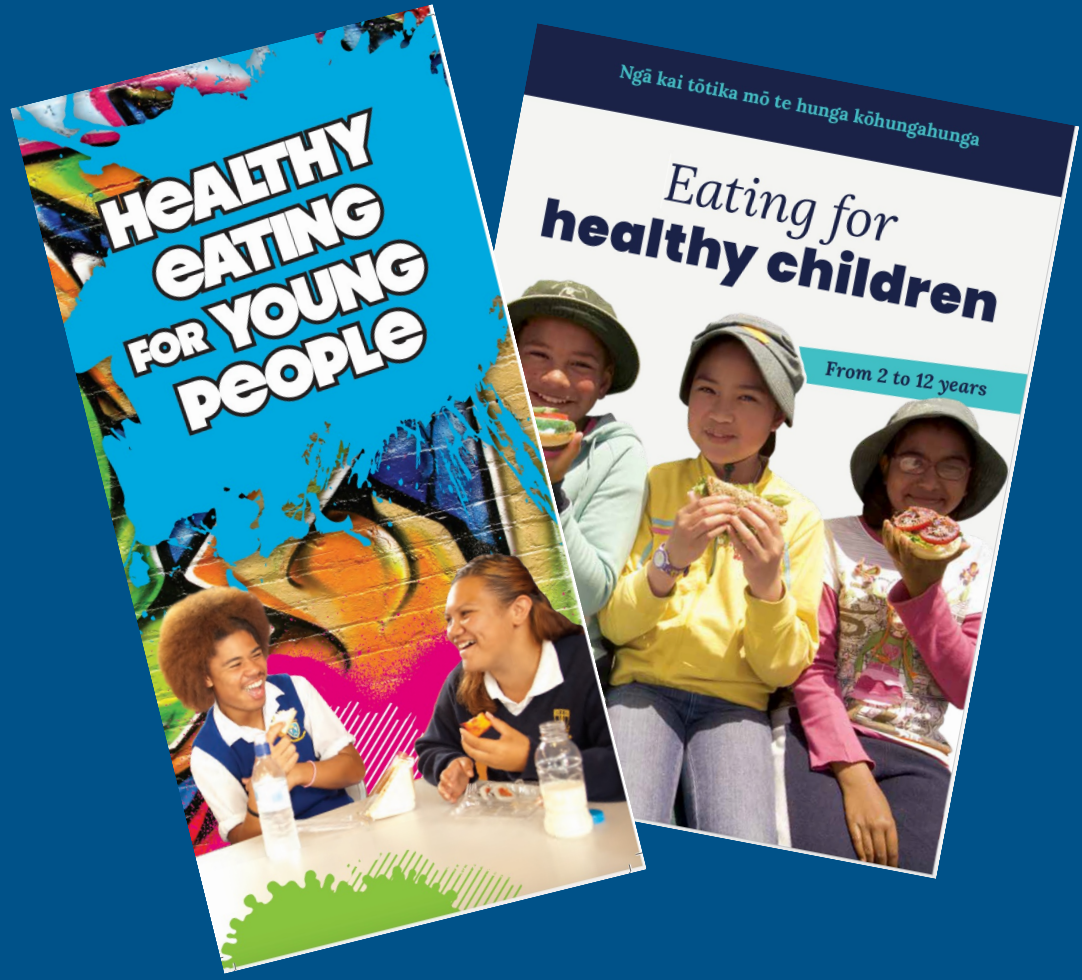
MoH Dietary Guidelines - Update

Adolescent Dietary Guidelines

Eating for healthy children
- Y7 & Y8 (11 – 13yrs)
- Revised April 2023

Healthy eating for young people
- Y9 – Y13 (13- 18rs)
- Revised Oct 2021

Serving sizes updated



What is a serving size?

c = cup
med = medium
w/grain = wholegrain

Fruit	Vegetables	Breads & Cereals	Milk & Milk Products	Lean meat, fish, legumes etc
1 cup fresh/cooked fruit	½ c cooked veges	½ w/grain roll	1 c reduced fat milk	1 c dried beans, lentils
1 med apple, pear	1 c salad	1 sandwich slice bread	2 x 40g slices cheese (Edam)	30g nuts 2 eggs
	1 med potato	½ c cooked oats	¾ c reduced fat yoghurt	1 piece fish (100g)
		¼ c muesli ½ c cooked pasta or rice	1 c *calcium added plant-based milk	½ chicken breast 2 drumsticks ½ c mince
			* At least 100mg calcium/100ml	2 slices (65g) meat

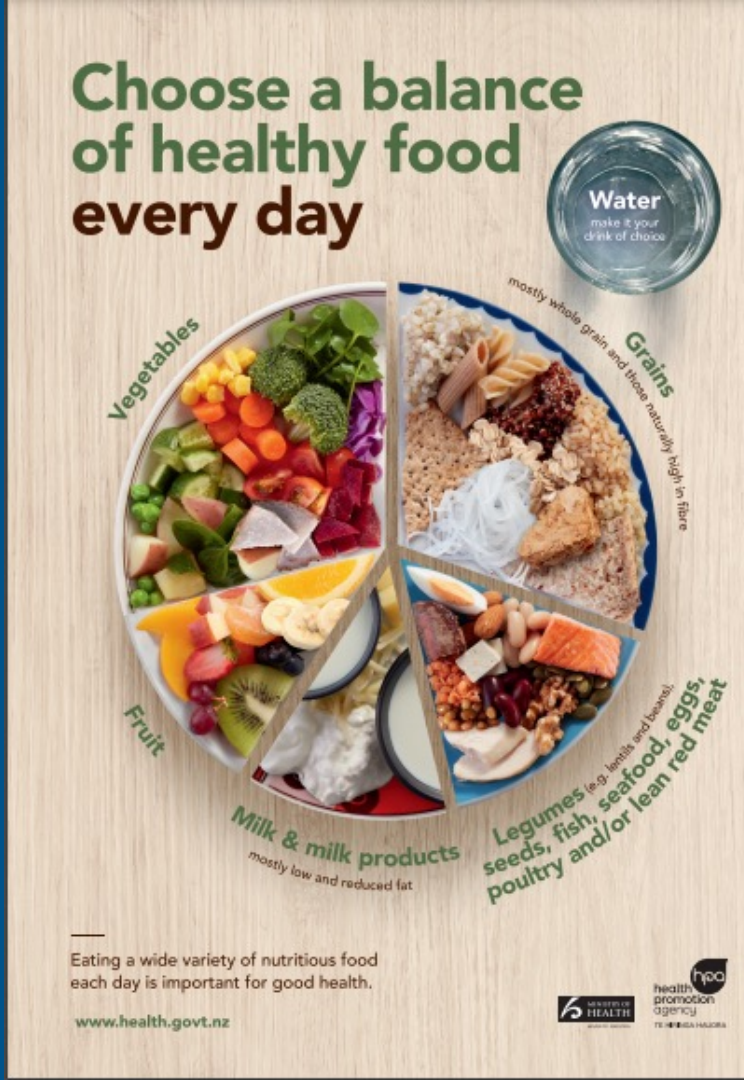
Serving Sizes

Food Group	12-13yrs	14-18yrs
Vegetables Fruit	Girls – 5 Boys – 5.5 Girls – 2 Boys – 2	Girls & Boys – at least 5 Girls & Boys – 2
Breads & Cereals	Girls – 5 Boys – 6	Girls – at least 7 Boys – at least 7
Milk & Milk Products	Girls – 3.5 Boys – 3.5	Girls – at least 3 Boys – at least 3
Lean meats, chicken, seafood, eggs, legumes, nuts and seeds	Girls – 2.5 Boys – 2.5	Girls – at least 2 Boys – at least 2 Vegetarian – at least 3

Food Model

Purpose: to describe what a healthy eating pattern looks like

- Four Food Groups
  - Vegetables & Fruit
  - Breads & Cereals
  - Milk & Milk Products
  - Lean Meats, chicken, seafood, eggs, legumes, nuts and seeds
- Water – make it drink of choice
- Eating a wide variety of nutritious food daily, is important for good health



Key Considerations

Adolescence (10 – 19yrs)

- Transformative growth phase
  - 20% of adult height
  - 50% adult weight
  - 40% increase in bone mass
- Impacted by under and over nutrition
- Food system is changing

Nutrition has a role in:

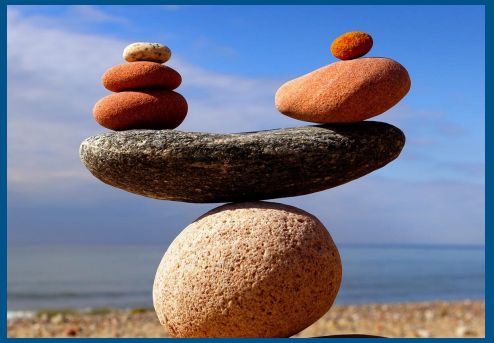
- Timing of puberty
- Height, muscle and fat accrual
- Neurodevelopment, immunity
- NCD prevention (T2DM, CVD, some cancers)

Energy

- Growth, metabolic and physiological functions, heat production and physical activity.

- Requirements vary widely
  - Gender, age, body size, physical activity level

- A balance between consumption and output.



Energy

- Main dietary sources:
  - carbohydrate, protein and fat
- Eat meals and snacks based on the 4 Food Groups
- Limit high fat, sugar and salt foods
  - energy dense, nutrient poor
- Good quality (nutrient dense) most of the time

Key Nutrients - Protein

Builds, maintains and repairs tissues *(skin, bones, muscles hair, nails, teeth)*

Animal Sources:

Lean meat, chicken, fish, egg, low fat milk, cheese and yoghurt.

Plant sources:

Soy *(edamame beans, soy milk, tofu)*, grains *(oats, barley, quinoa)*, nuts, pulses (*kidney/black/baked beans, chickpeas, lentils)*.

Food Groups

- *Lean meat, fish, chicken, eggs, legumes, nuts and seeds*
- *Milk and milk products*
- *Breads and cereals*

Key Nutrients - Iron

Transports oxygen. Helps muscles, heart and lungs work.

Animal Sources: lean meat, chicken, fish, eggs.

Plant Sources: soy foods (*edamame beans, tofu*), legumes (*lentils, kidney beans*), nuts (*almonds*), seeds (*pumpkin, sunflower*), wholegrains, iron fortified breakfast cereals, dried fruit (*apricots, raisins*), dark greens (*broccoli, parsley*).

Add Vitamin C: Increase absorption *(tomato, capsicum, or a glass of juice).*

Key Nutrients - Calcium

Build strong bones and teeth, also needed for muscle function.

Animal Sources:

Milk, cheese, yoghurt.

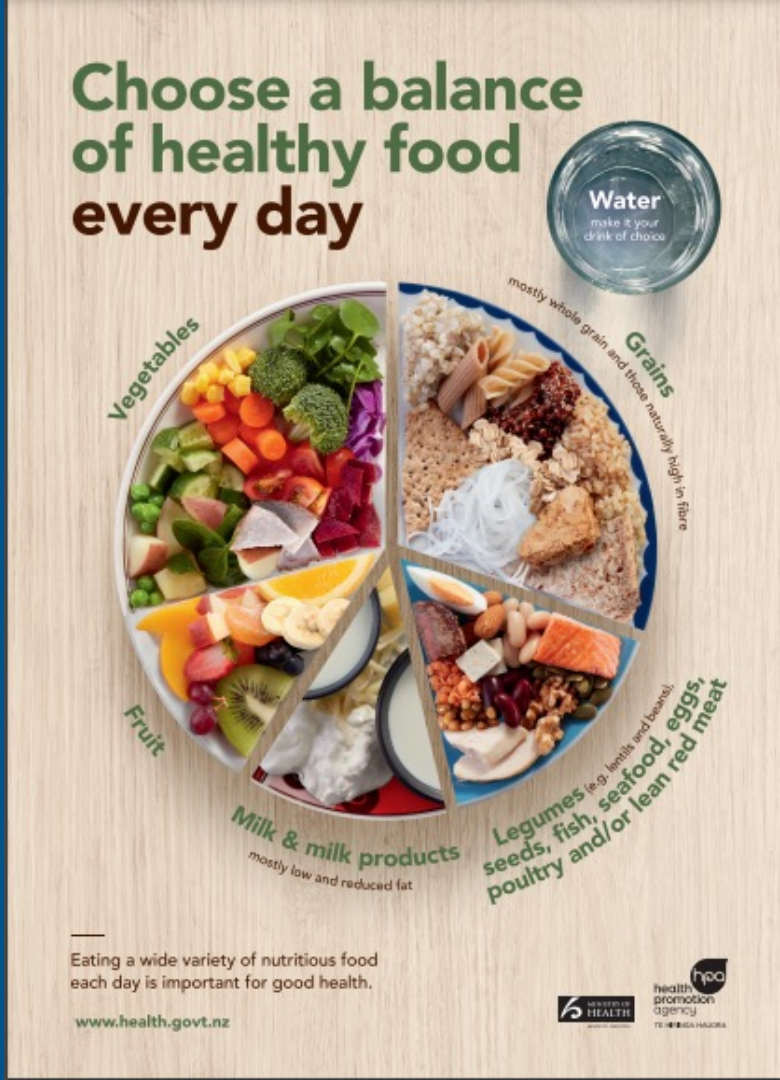
Plant Sources:

Tofu, almonds, wholegrain bread, peanut butter, sunflower seeds, broccoli.

Calcium fortified plant milks *(e.g. soy, almond).*

What does all this mean in terms of dietary intake and lifestyle?

- Follow the age-appropriate MoH Dietary Guidelines.
- Base meals & snacks on the 4 Food Groups
- Mostly choose nutrient dense food choices
- Drink mostly water
- Be physically active at least 1 hour a day



Adolescent Nutrition

Health Promotion Models

Health Promotion Models

- Ottawa Charter
- Socio-ecological Model

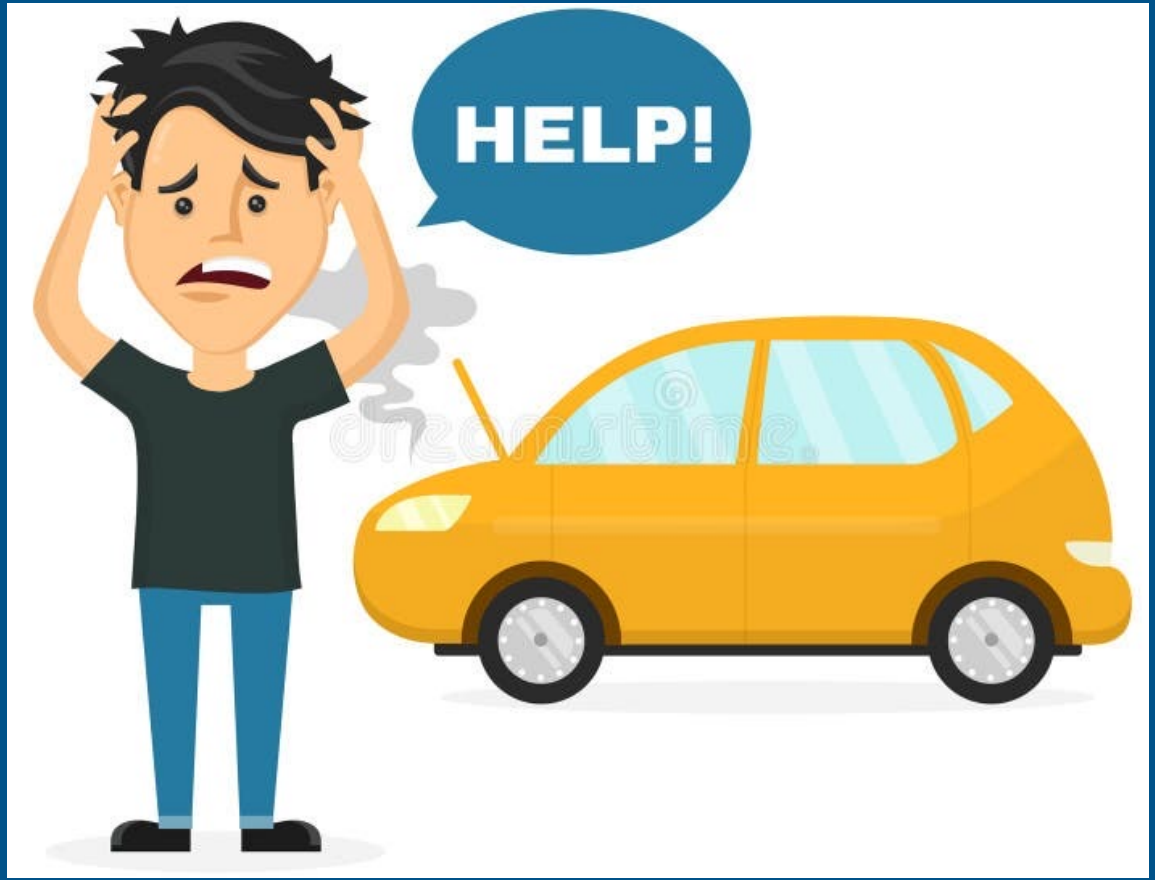
Health Promotion

Definition (World Health Organisation)

The process of enabling people to increase control over, and to improve, their health.

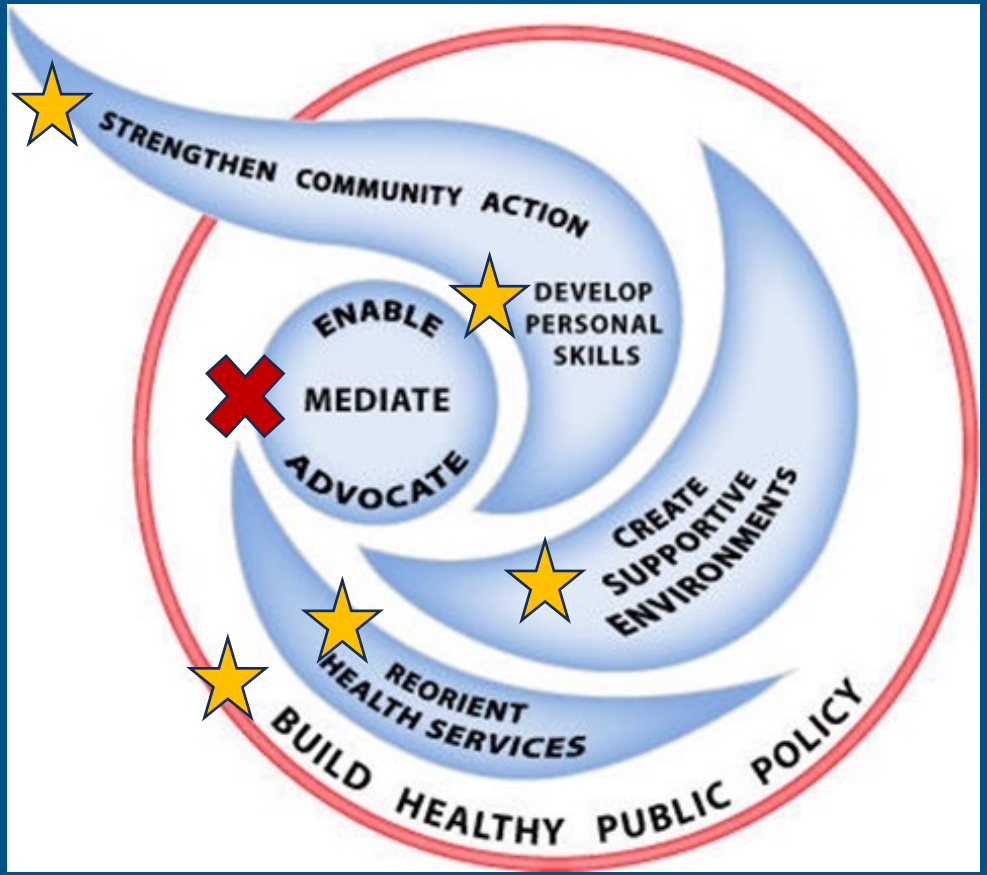
It moves beyond a focus on individual behaviour towards a wide range of social and environmental interventions.

How could this be integrated into student learning?


HELP!

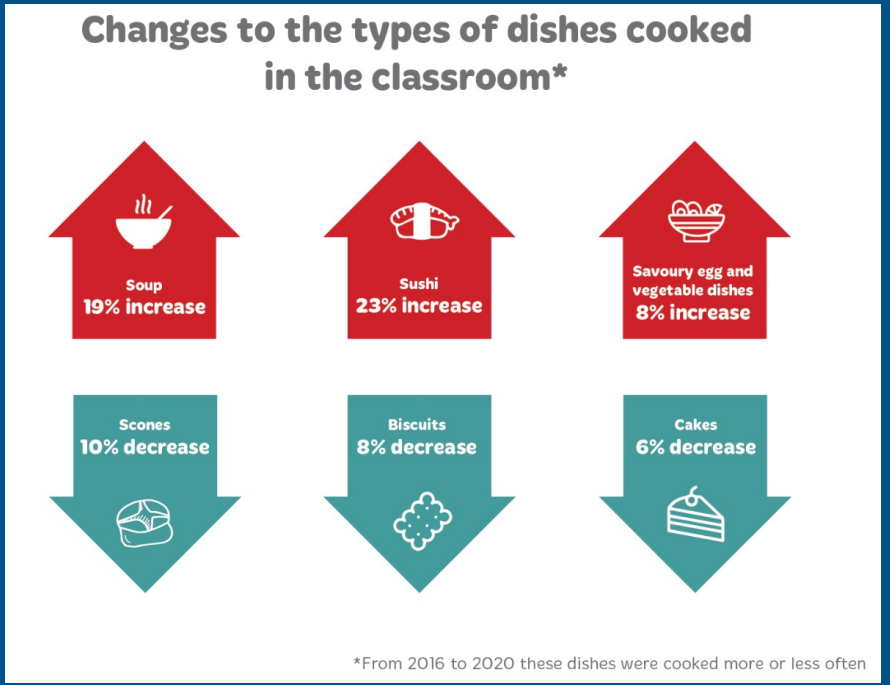
Ottawa Charter

- 3 Strategies
- 5 areas of Action



Food Curriculum Research (Heart Foundation 2020)

- Y8 Food skill learning
- HF & vegetables.co.nz collaborated with teachers
  - Developed new teaching materials
  - Lesson plans, activities
  - Recipe cards, videos
- Cooking more dishes with veges/less baking



Heart Foundation, Massey University, vegetables.co.nz. Food curriculum research 2020.

Food Curriculum Research
(Heart Foundation 2020)

"There is a visible improvement with their cooking skills and confidence as each week progresses which is nice. Many are making the dishes at home after making them at school too."

— Food technology teacher trialling the unit plan

Heart Foundation, Massey University, vegetables.co.nz. Food curriculum research 2020.

Socio- ecological Model

What influences food choice and dietary behaviour?

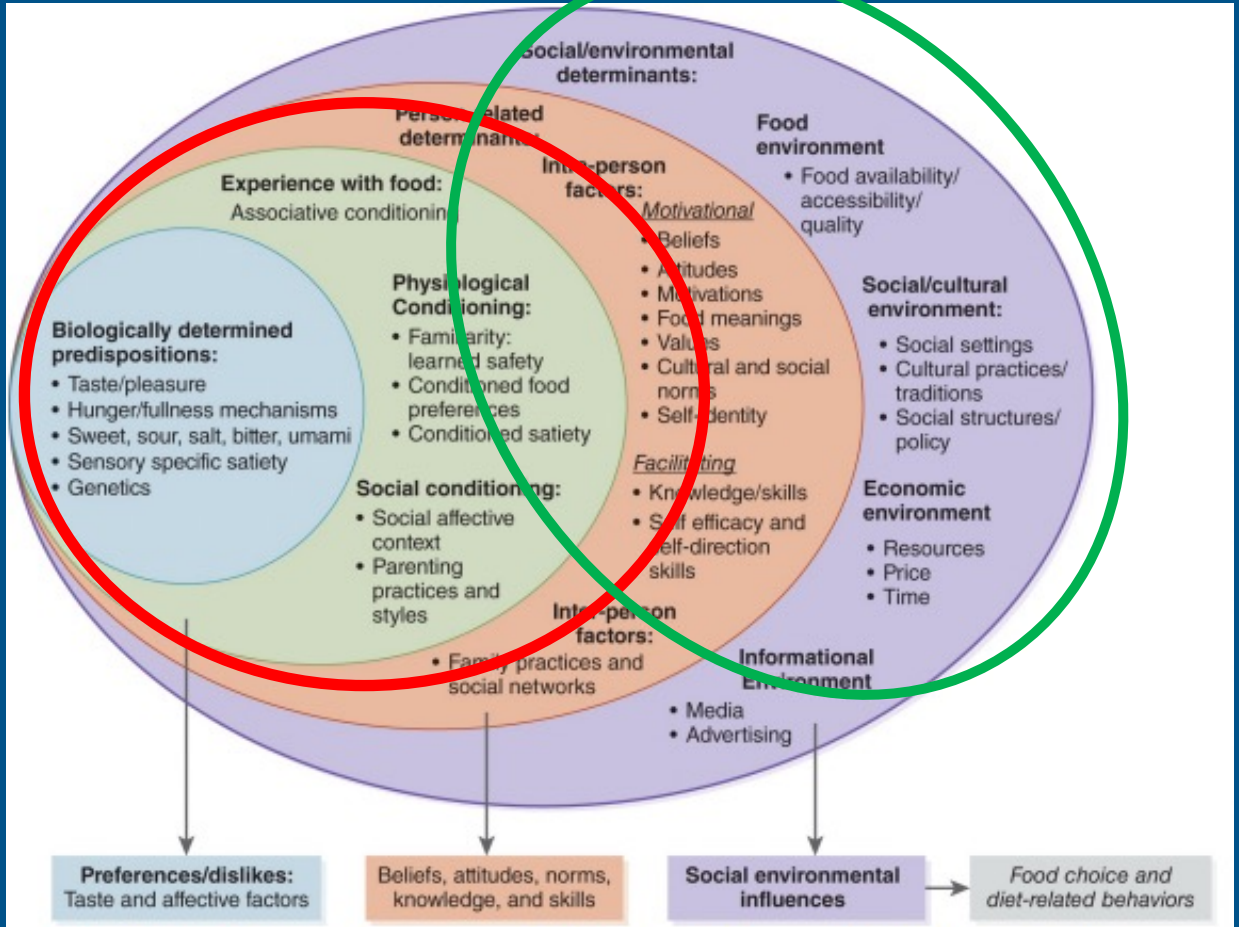
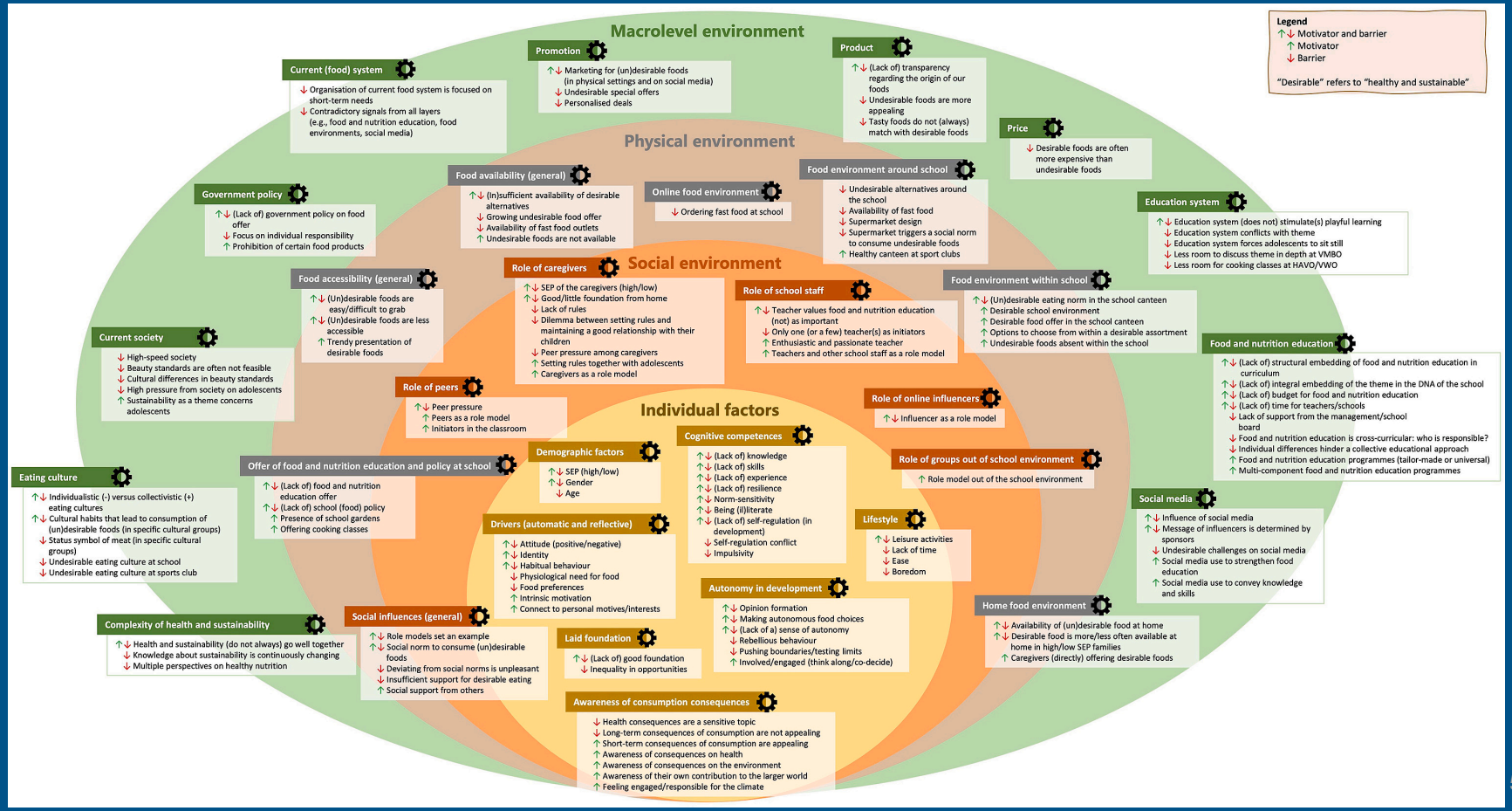
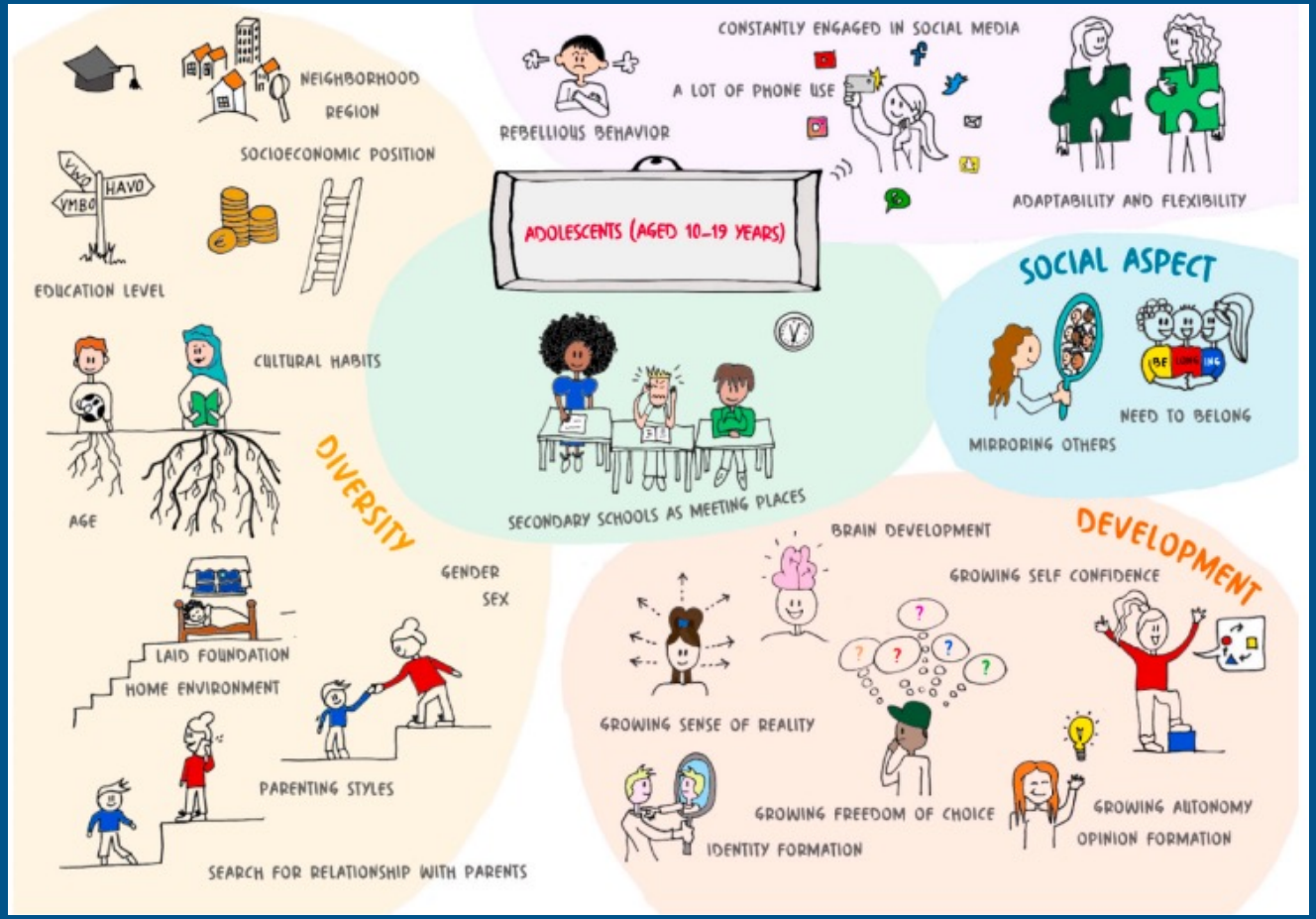


FIGURE 2-4 Social and environmental factors influence food choices and dietary behaviors.

Motivators and Barriers plotted on the SEM



Characteristics of Adolescents



The main determinants

- **Role of peers** (Social)
- **Food environment around school** (Physical)
- **Food availability** - in general (Physical)
- **Social influences** - in general (Social environment)
- **Autonomy in development** (Individual)

- Food environment within school (Physical)
- Drivers - auto & reflective (Individual)
- Current food system (Macro)
- Food & nutrition education & policy at school (Physical)

How can health promotion models support learning activities?

- Develop personal skills
- Create supportive environments
- Strengthen community action
- Build healthy public policy
- Target determinants
  (cost, taste, familiarity, social norms)

Intermittent Fasting

Or time restricted feeding

What is intermittent fasting?

- An eating pattern that switches between fasting and eating on a regular schedule
  - 5:2 diet : 2 day with very low calorie intake (500-600 cal), 5 days of regular eating
  - 12-16 h of fasting, followed by 8-12 h of eating (repeated every day)

What does it claim to do?

- Increase fat burning
- "ramp up' your metabolism
- Extend the lifespan
- Reduce the risk of all sorts of diseases

What does it actually do?

- Reduces weight
- Improves glycemic control (blood glucose management)

- Buts not magic, it just tends to result in a reduction in calorie intake

What are the risks?

- Eating disorders/disordered eating
- Challenging in social situations
- Hypoglycemia
- Under nutrition

- Higher risk of CVD?

What are the risks?

- Eating disorders/disordered eating
- Challenging in social situations
- Hypoglycemia
- Under nutrition

- ~~Higher risk of CVD~~? (interpret with caution!)

Afternoon Tea

Group Discussion/Exploration

Pick your topic to discuss in a groups. How can you use this learning to develop activities for your curriculum?

1. Food and recipes to help meet health and nutrition requirements (key nutrients, Energy)
2. Popular Dietary Trends
3. Health Promotion Models

Wrap Up

Feedback from groups, final discussions and take-home messages

Advice for students wanting to study Nutrition

Studying Nutrition @ Otago

We have minors too!

- Human Nutrition
- Sport and Exercise Nutrition

Studying Nutrition @ Otago

Degrees offered

- Bachelor of Science in Human Nutrition
  - 3 year degree

- Bachelor of Science in Sport and Exercise Nutrition
  - 3 year degree, with some papers coming from Physical Education, Sport and Exercise Science

- Bachelor of Biomedical Sciences in Nutrition, Metabolism and Human Health

Studying Nutrition @ Otago

NCEA

- Strongly recommend students who want to study Nutrition to have:
  - Year 12 (NCEA Level 2)
    - Biology, Chemistry, Maths with Stats and English
  - Year 13 (NCEA Level 3)
    - Maths with Stats and Chemistry

Studying Nutrition @ Otago

NCEA

- Sport and Exercise Nutrition majors we also recommend Year 12 and Year 13 Physical Education

- Bio Med Science – Year 13 Biology is also strongly recommended

Studying Nutrition @ Otago

First year

- CHEM 191: Chemical Basis of Biology and Chemical Health
- HUBS191 Human Body Systems 1
- HUBS 192 Human Body Systems 2
- BIOC192 Foundations of Biochemistry
- HUNT141 Understanding Human Nutrition
- One or two other papers of their choice

Studying Nutrition @ Otago

Second Year

- HUNT241 Fundamentals of Nutrition and Health
- HUNT242 Nutritional Assessment
- HUNT 243 Lifecycle Nutrition

- HUNT245 Sport and Exercise Nutrition
- HUNT246 Applied Nutrition

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Third Year

- HUNT341 Nutrition and Behaviour Change Communication
- HUNT342 Nutrition and Chronic Disease
- HUNT343 Community and Public Health Nutrition

- HUNT345 Applied Sports Nutrition
- HUNT246 International Nutrition

Studying Nutrition @ Otago

Career Opportunities

- Private practice nutritionist (post grad study encouraged)
- Dietitian (post grad study required)
- Public Health
- Food industry
- Sports Nutrition
- International Nutrition
- Research (post grad study required)
- … (opportunities are endless)


Power point slides
Resource reference list