



LIFESCI 2N03: Human Nutrition for Life Science

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Week 2

What is a healthy diet?

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=> Some studies say eggs are bad and others say eggs are good. What the hell is going on?

=> Studies are always polarizing

JAMA | Original Investigation

Associations of Dietary Cholesterol or Egg Consumption With Incident Cardiovascular Disease and Mortality

Victor W. Zhong, PhD; Linda Van Horn, PhD; Marilyn C. Cornelis, PhD; John T. Wilkins, MD, MS; Hongyan Ning, MD, MS; Mercedes R. Carnethon, PhD; Phillip Greenland, MD; Robert J. Mentz, MD; Katherine L. Tucker, PhD; Lihui Zhao, PhD; Anitra F. Norwood, PhD; Donald M. Lloyd-Jones, MD, ScM; Norman B. Allen, PhD

"Among 29,615 adults pooled from 6 prospective cohort studies in the United States with a median follow-up of 17.5 years, higher consumption of dietary cholesterol or eggs was significantly associated with higher risk of incident CVD and all-cause mortality, in a dose-response manner."

"This study has several limitations. First, appropriate interpretation of the study findings requires consideration of **measurement error for self-reported diet data**. Further, this study relied on [a] **single measurement of egg and dietary cholesterol consumption**." (!!!!!!!)

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=> Recent study published in a highly regarded journal said that eggs are associated with a higher risk of CVD and all-cause mortality

=> The more eggs you eat, the higher the risk

=> The study was conducted on 30k people and went on for 17 years

=> But the study was dogshit; it was limited in a serious/severe way

Harmonization of Table 1. Characteristics of Dietary Intake Assessment in 6 LRS						
Cohort	Dietary assessment tool	Dietary components	Time period covered	Data collection visit and year	Nutrient database	Source FFQ
ARIC	66-item semi-quantitative FFQ ¹	9 frequencies and reference portion size	Past year	Visit 1 (1986-89) Visit 3 (1993-1995)	Harvard Nutrient Database	FFQ modified based on the 61-item Willett FFQ ¹
CARDIA	Approximately 700-item Diet history ²	3 frequencies with participants reported serving size	Past 28 days	Visit 1 (1985-86) Visit 4 (1992-93) Visit 7 (2005-06)	NDSR	Quantitative assessment.
FHS	126-item FFQ ¹²	7 frequencies with reference portion size	Past year	Visit 20 (1986-90) Visit 21 (1988-92) Visit 22 (1990-94)	USDA and Harvard Nutrient database	Using Willett FFQ ¹
FOS	126-item FFQ ¹³	9 frequencies with reference portion size	Past year	Visit 5 (1991-95) Visit 6 (1995-98) Visit 7 (1998-2001)	USDA and Harvard Nutrient database	Using Willett FFQ ¹
JHS	158-item regional FFQ ¹⁴	10 frequencies with 4 portion sizes	Past year	Visit 1 (2000-04)	NDSR	Adapted from the 283-item Delta NIRI FFQ ¹
MESA	120-item FFQ ¹⁴	9 frequencies with 3 portion sizes	Past year NDSR	Visit 1 (2000-02)		Adapted from the FFQ in the Insulin Resistance Atherosclerosis Study ¹

ARIC, Atherosclerosis Risk in Communities; CARDIA, Coronary Artery Risk Development in Young Adults; FFQ, food frequency questionnaire; FHS, Framingham Heart Study; FOS, Framingham Offspring Study; JHS, Jackson Heart Study; MESA, Multi-Ethnic Study of Atherosclerosis; NDSR, Nutrition Data System for Research; USDA, United States Department of Agriculture.

- Different FFQs used, different time periods
- How often does your diet change?

Zhong VW, Van Horn L, Cornelis MC, et al. Associations of dietary cholesterol or egg consumption with incident cardiovascular disease and mortality. *JAMA*. doi:10.1001/jama.2019.1572

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=> The researchers combined 6 different studies to get a sample size of 30k

=> Different dietary tools were used across all studies

=> Lots of variations across all studies; like time period

=> There was a one-time measurement of how many eggs are consumed; but it doesn't capture how often participants consume eggs

What does this mean for the field of nutrition science?



Opinion: Nutrition Science Is Broken. This New Egg Study Shows Why.
At turns lauded and vilified by health experts, the humble egg is an example of what's wrong with nutrition studies.

We must consider...

- Study design (many are observational)
- How often diet is assessed in a study?
 - Some longitudinal studies assess diet once and study health outcomes over years
- Hard to carry out large scale RCTs, and are they realistic?

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=> Observational studies don't introduce a new intervention and study it

=> In observational studies, people report their diet once and then data is analyzed to see where relationships lie between diet and outcomes

=> We cannot draw causal conclusions from observational studies

=> Participants may not follow an intervention for a number of reasons

Learning objectives

- Review: describe how the DRIs and EER can be used to plan a diet
- Review: practice interpreting nutrition facts tables to make healthy food choices
- Compare and contrast methods for dietary assessment
- Describe features of the Canada's Food Guide and how it can be used to plan a healthy diet

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=> The 2007 version of the CFG recommends everyone drink 3 cups of milk per day; it also tells exactly how much of each food group to consume

What do Canadians think of CFG?

What do you think of the old CFG?
What did you like? What didn't you like?



- CFG is the 4th most frequent nutrition resource accessed by Canadians
- Canadians liked:
 - the printed overall layout and arrangement
 - the inclusion of foods from various ethnic cuisines
 - tailored guide for First Nations, Inuit and Métis.

<https://www.canada.ca/en/health-canada/services/publications/food-nutrition/evidence-review-dietary-guidance-summary-results-implications-canada-food-guide.html#s3>

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=> Canadians mostly get nutrition from Internet, family, and TV

=> CFG is 4th source for nutrition

=> Doctors are 5th source for nutrition

What do Canadians think of CFG?

Challenges with:

- understanding the classification of foods
- understanding Food Guide Serving sizes
- translating guidance into meals, snacks, and menus
- influence from industry (i.e., dairy farmers)
- App
- not meeting the needs of all audiences (some audiences want more detail while others want less)



<https://www.canada.ca/en/health-canada/services/publications/food-nutrition/evidence-review-dietary-guidance-summary-results-implications-canada-food-guide.html#s3>

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=> Issues with CFG:

- Lots of serving sizes within food groups

- Influenced by (((industry)))

FIGURE 2-3 What Is One Food Guide Serving?

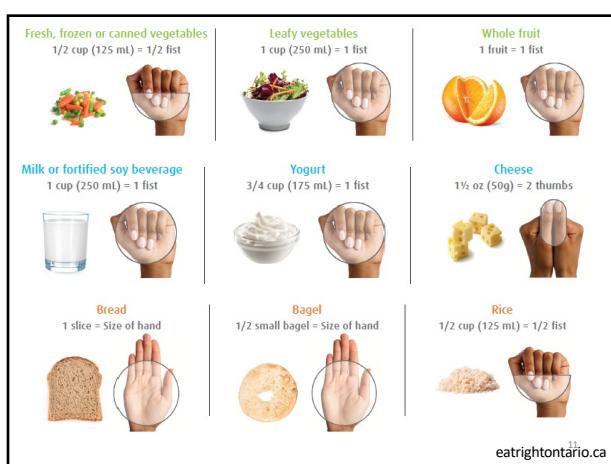
What is One Food Guide Serving?
Look at the examples below.



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=> It's impossible to keep track of the different servings; it's hard to guess what 50g of cheese looks like; meats aren't cut based on grams

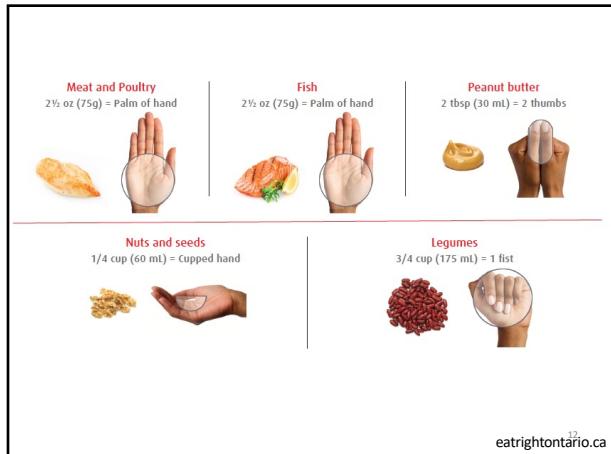
=> The original food guide was too much to keep track of



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=> This was made by dieticians

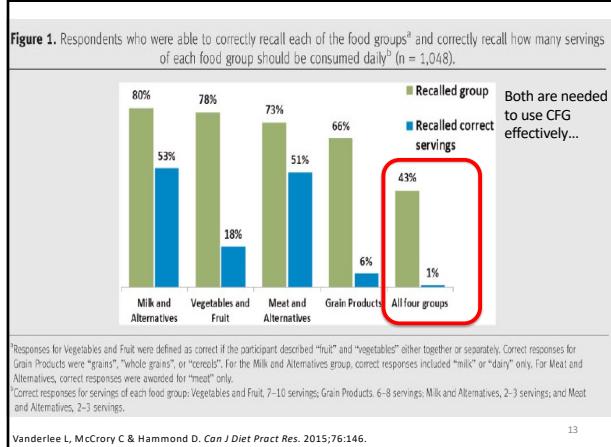
=> Helps you incorporate more food groups and eat the right amount



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=> Human bodies cannot process a lot of meat

=> Proportions at restaurants are way too big

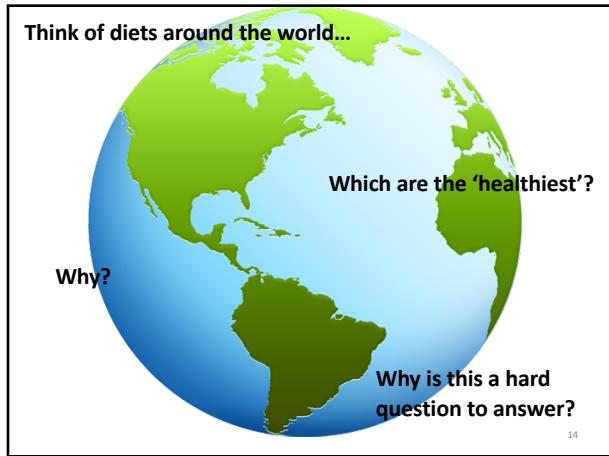


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=> Most Canadians cannot use CFG; they can't even read it

=> The old CFG was hard to keep track of

=> Only 1% can recall the serving size for all 4 food groups



=> Making a food guide to satisfy everyone is hard; resources, culture, etc. are all factors to consider

=> Some people have dietary restrictions

Healthy and Unhealthy Dietary Patterns Are Related to Depression: A Case-Control Study

Maryam Khosravi¹, Gity Sotoudeh¹, Reza Majdzadeh², Somayeh Nejati³, Samaneh Darabi⁴, Firoozeh Raisi⁵, Ahmad Esmailzadeh⁶, and Maryam Sorayani⁷

Table 4. Factor loading matrix for major dietary patterns

Food groups	Dietary patterns		Food groups	Dietary patterns	
	Healthy	Unhealthy		Healthy	Unhealthy
Refined grains and all kinds of breads	-	0.636	Legume	-	-
Whole grains	0.403	-	Egg	-	-
Yellow vegetables	0.615	-	Nuts	0.513	-
Cruciferous vegetables	0.643	-	Seeds	-	-
Green vegetables	0.717	-	Sweets	-	0.364
Other vegetables	0.610	-	Pickle	-	0.301
Fruits	0.486	-	Snacks	-	0.375
Low fat dairy	0.305	-	Soft drinks	-	0.38
High fat dairy	-	0.387	Caffeine	-	-
Red meats	-	0.407	Industrial fruits and juice	-	0.442
Fishes	-	-	Liquid oils	-	0.516
Poultry	-	0.395	Solid oils	-	0.318
Processed meat	-	0.555	Olives	0.336	-

Values <0.30 were excluded. Bartlett's Test of Sphericity <0.0001. Kaiser Meyer Olkin=0.671. Total variance=23.66%

Psychiatry Investig. 2015 Oct; 12(4): 434–442.

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=> Authors classify food into healthy and unhealthy

Table 5. Results for testing the association between depression and quartiles of healthy and unhealthy dietary patterns						
Variables	OR	95% CI	P*	OR	95% CI	P†
Healthy pattern quartiles			0.022			0.047
Quartile (1)	1	-	-	1	-	-
Quartile (2)	0.501	0.261–0.962	0.038	0.464	0.217–0.994	0.048
Quartile (3)	0.393	0.202–0.765	0.006	0.388	0.181–0.834	0.015
Quartile (4)	0.440	0.227–0.852	0.015	0.383	0.176–0.834	0.016
Unhealthy pattern quartiles			0.017			0.017
Quartile (1)	1	-	-	1	-	-
Quartile (2)	1.393	0.678–2.859	0.367	1.782	0.794–3.999	0.161
Quartile (3)	2.316	1.157–4.636	0.018	2.404	1.130–5.111	0.023
Quartile (4)	2.714	1.357–5.428	0.005	3.619	1.593–8.220	0.002

*unadjusted binary logistic regression, †adjusted binary logistic regression for non-depression drug use, job, BMI, children number, and marital status. BMF: Body Mass Index

If OR is less than 1.0, it is suggesting protective effect

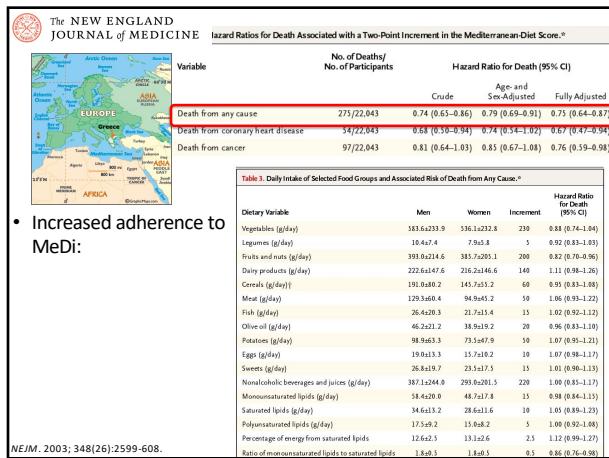
$1.0 - 0.383 = 0.617 \times 100\% \rightarrow$ healthier diet, 62% less likely to have depression

If OR is more than 1.0, it is suggesting risk effect

$3.619 - 1.0 = 2.619 \times 100\% \rightarrow$ healthier diet, 262% more likely to have depression, or 3.6 times higher

Psychiatry Investig. 2015 Oct; 12(4): 434–442.

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- Increased adherence to MeDi:

NEJM. 2003; 348(26):2599-608.

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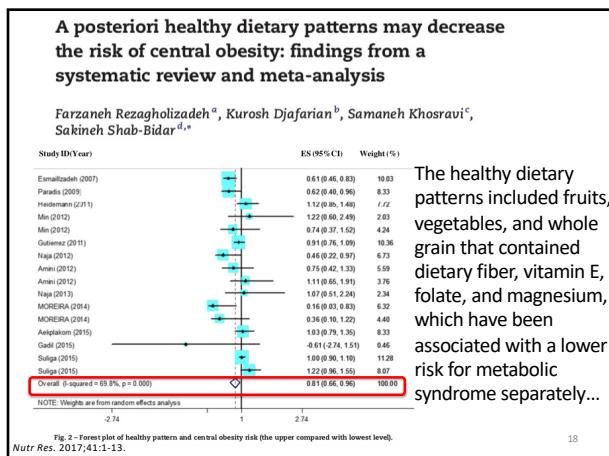


Fig. 2 – Forest plot of healthy pattern and central obesity risk (the upper compared with lowest level).
NOTE: Weights are from random effects analysis.

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=> People with the healthiest diet had the least risk of depression

=> People with unhealthy diet had the highest risk of developing clinical depression

=> Odds ratio is a measure of likelihood

=> People that followed the med. diet had lower odds of death from any cause

=> They only had a 75% chance of dying from any cause, compared to people not on the med. diet

=> Researchers added confounding variables into the model

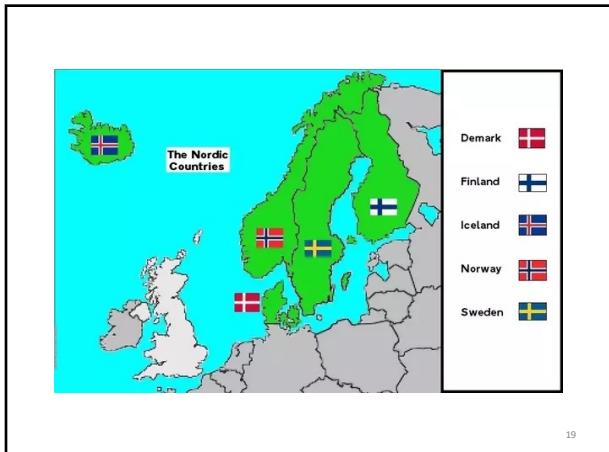
=> Fruits and nuts have the lowest hazard ratio for death

=> Obesity increases death rate

=> Meta analysis combines a bunch of studies together

=> This is a forest plot; all the results of all the studies are included

=> Healthy diet protects risk of developing obesity



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Adherence to a Healthy Nordic Diet and Risk of Stroke A Danish Cohort Study

Camilla Plumbeck Hansen, PhD; Kim Overvad, MD, PhD; Cecilie Kyns, PhD; Anja Olsen, PhD; Anne Tjønneland, MD, DMSc; Søren Paaske Johnsen, MD, PhD; Marianne Uhr Jakobsen, PhD; Christina Catherine Dahm, PhD

A healthy Nordic diet → high intakes of fish, apples and pears, cabbages, root vegetables, whole grains from oat, barley and rye, berries, and rapeseed oil

Healthy Nordic Food Index

	Healthy Nordic Food Index			P for Trend
	0-1	2-3	4-6	
Total stroke				
Cases, n	431	1052	800	
Incidence rate/10,000 person-years	39.5	33.8	27.3	
Model 1a	1.00 (ref)	0.83 (0.74, 0.93)	0.67 (0.59, 0.75)	<0.001
Model 1b	1.00 (ref)	0.94 (0.84, 1.06)	0.86 (0.76, 0.98)	0.022
Model 2	1.00 (ref)	0.93 (0.82, 1.04)	0.83 (0.73, 0.95)	0.004
Large-artery atherosclerosis				
Cases, n	74	142	103	
Incidence rate/10,000 person-years	6.7	4.5	3.5	
Model 1a	1.00 (ref)	0.66 (0.49, 0.87)	0.51 (0.38, 0.69)	<0.001
Model 1b	1.00 (ref)	0.76 (0.56, 1.02)	0.68 (0.48, 0.95)	0.032
Model 2	1.00 (ref)	0.75 (0.56, 1.00)	0.66 (0.47, 0.93)	0.023

Stroke. 2017;48(2):259-264.

=> The nordic diet is rich in fish, pears, apples, grape-seed oil, etc.

=> People that closely follow this diet are less likely to experience a stroke and atherosclerosis

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Brazil's 10 steps to a healthy diet

1. Make natural or minimally processed foods [of great variety] the basis of your diet
2. Use oils, fats, salt and sugar in small amounts when seasoning and cooking
3. Limit consumption of processed foods (cheeses, fruit in syrup)
4. Avoid consumption of ultra-processed foods (packaged snacks, soft drinks, sweetened breakfast cereal, instant packaged foods)
5. Eat regularly and carefully in appropriate environments, with people

[22](http://www.fao.org/nutrition/education/food-based-dietary-guidelines/regions/countries/brazil/en/)

=> Brazil's guide incorporates the social aspect of food; eat with others

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Brazil's 10 steps to a healthy diet

6. Shop in places that offer variety of natural or minimally processed foods
7. Develop, exercise and share cooking skills
8. Plan your time to make food and eating important in your life
9. Out of home, prefer places that serve freshly made meals
10. Be wary of food advertising and marketing

[23](http://www.fao.org/nutrition/education/food-based-dietary-guidelines/regions/countries/brazil/en/)

=> Shop for minimally processed foods

=> Do not fall prey to (((advertising)))

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Why is it a good idea to teach people about dietary patterns rather than single nutrients or food groups?

- Sustainable
- Realistic (140 nutrients to track...)
- Nutrients in dietary patterns may work synergistically to produce health effects
- Prevents people from reaching for supplements
- When we talk about nutrition, we need to talk about more than just food (relationships with it, social aspects, preparation)

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=> Studying individual food instead of whole diet patterns is flawed; foods change over time for lots of reasons like season, money, life stage, etc.

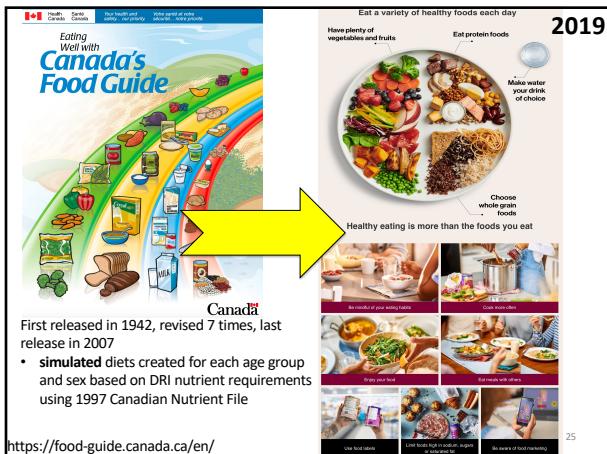
=> Taking a broad approach is more informative

=> Don't focus on a single food item, take a dietary pattern approach

=> More realistic to do, because you don't have to keep track of (140) nutrients

=> Helps foster a healthy relationship with food

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=> CFG was first developed in 1942

=> CFG has been revised 7 times

=> 2007 version created a simulated diet for each age group and gender

=> The latest version is 2019

=> 2019 version is quite broad

Key features of the NEW CFG

- Based on scientific evidence, less on opinions of industry (Diary Farmers, Meat Council etc.)
- Guidance aligns with the EAT-Lancet Commission report
 - Transformation of global diet for health and environment
 - Focus on fruit, vegetables, nuts, legumes
 - Less red meat, sugar and processed food and meat that contain mostly saturated fat
 - 'demotion' of meat

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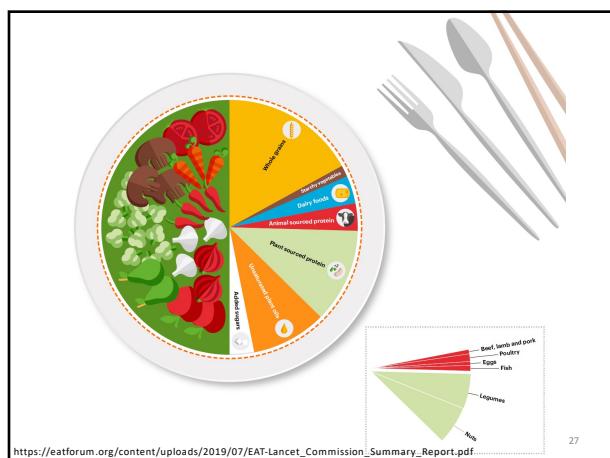
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=> 2019 was clear on the lack of influence from the food industry

=> 2019 CFG is consist with the Eat-Lancet commission

=> Lancet is a reputable scientific journal

=> Lancet demotes meat and focuses plant-based foods; focus on fruit, vegetables, nuts, and legumes



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=> This is how Lancet recommends dieting

=> Meat is demoted

=> Also looks at diet from environmental perspective

=> Medi. diet places a big emphasis on fish

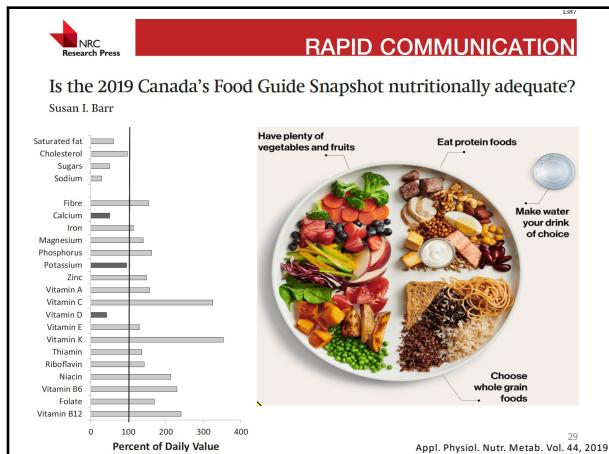
Key features of the NEW CFG

- Drink more water
- Cook more often
- Eat meals with others
- Mindful eating
 - Take time to eat and pay attention to feelings of hunger and fullness
 - Avoid eating in front of a screen!
- For health professionals, more guidance coming on weight and volume of food portions...

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=> Guidelines for kids, pregnant women, and elderly are coming

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=> If the food guide was followed, then nutrients like calcium, vitamin D would be lacking

=> Bio-availability impacts nutrient absorption

=> Calcium in milk is more bio-available than kale

=> Vitamin D is naturally found in egg yolks, mushroom, fatty fish. But it's only a little bit. You need sunlight for Vitamin D.



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=> Question: Which of the following is true about the CFG (2019 version)?

=> Answer: It includes recommendations about mindful eating and eating with others

DRIs	CFG
Useful for healthy population	Useful for healthy population
More specific recommendations (ie., amount nutrient vs foods)	Simple
Harder to remember	Easier to remember recommendations
Harder to compare diet to DRIs	Visual
Data are often extrapolated (ie., estimation of RDA from EAR)	Broad recommendations backed by evidence (ie., more fruit, less cancer)
For RDA to predict adequacy for 97.5% of population, nutrient intake assumed to be normally distributed (ie., not the case with iron intake)	

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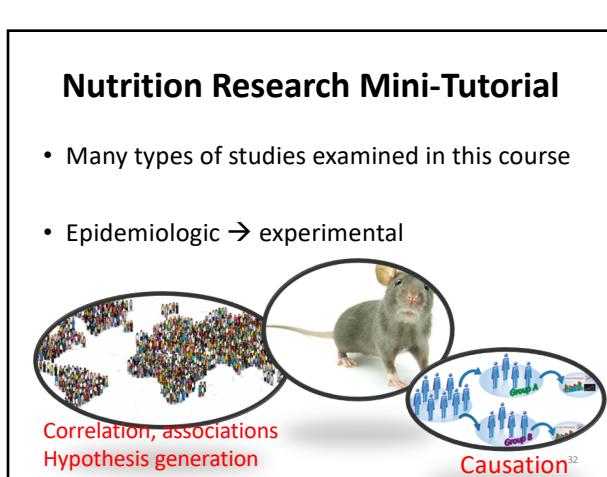
=> DRIs and CFG is used for healthy population

=> DRI is more specific/detailed; includes different age groups and genders

=> CFG is meant to be memorable, easier to memorize and implement

=> CFG comes from studies that look at dietary patterns

=> DRI and CFG are available on health Canada website

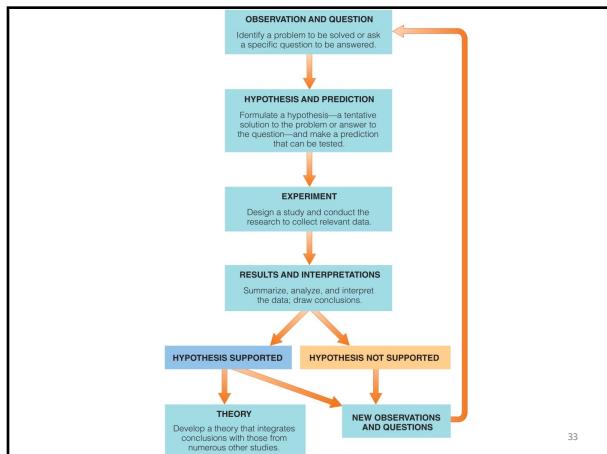


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=> Epidemiologic studies look at people from all around the world

=> Stay away from evidence that comes from rodents/mice; but it may be useful for theory

=> Mice studies are better for hypothesis generation



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=> The steps taken by researchers

=> Hypothesis must be laid out in the beginning

=> Even if the hypothesis is supported, more research is needed

So you have found a convincing study...

What things should you consider before believing it??



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=> Find a study published in a scientific journal (i.e. JAMA)

=> Top journals have a high impact factor

=> JAMA has a high impact factor

=> Canadian Journal of Dietetic Practice and Research does not have a high impact factor

=> This is the epidemiological pyramid

=> Bottom of pyramid is the lowest rank; you are less likely to believe this

=> Going up the pyramid increases rigour and research

=> Case reports are very observational (i.e. 10 people are blind and vitamin A deficient)

=> The egg study is a cohort study; researchers follow a group of people over time

=> Randomized controlled trials are the gold standard; groups for control, placebo, and experiment. People are followed from start to finish

=> Systematic review: someone searches the literature for a topic and analyzes everything

=> Meta analyses: Run additional statistical analysis on the stuff found in systematic review. This is filtered information

=> Other factors to look at: sample size, placebo-controlled, researchers are blinded, what journal is it in, who are the authors and their affiliations/funders/sponsors

=> Filtered information means a lot of studies are looked at and the researcher is critically analyzing all studies

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Things to watch out for in studies:

- Sample size
- Placebo controlled
- Blinding (i.e. Double blind)
- Journal (i.e. Is it reputable)
- Impact factor
- Authors
- Affiliations
- Sponsors



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=> Filtered information means a lot of studies are looked at and the researcher is critically analyzing all studies



Q: Which study design is at the top of the evidence pyramid?

A: Meta-analysis
