You are what you eat, are you?
How to interpret the evidence from nutritional epidemiology studies – PART 2

Patricia Chocano-Bedoya, MD. PhD.
Head of Ageing Research Group, Institute of Primary Health Care (BIHAM), University of Bern
Senior lecturer, Population Health Laboratory (#PopHealthLab), University of Fribourg

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Overview

• What is nutritional epidemiology?
• Criticism to nutritional epidemiology
• Can we reliably measure dietary intakes in individuals and populations?
• Translating science into policy: Food Pyramids
What is “nutritional epidemiology”?
Definition

• Nutritional epidemiology examines dietary or nutritional factors in relation to disease occurrence in populations. (M. McCullough and E. Giovannucci, Nutritional Oncology, 2006)

• Nutritional epidemiology is the application of epidemiological methods to the study of how diet is related to health and disease in humans at the population level. (K. Thornton and E. Villamor, Encyclopedia of Food and Health, 2016)

It’s directly relevant to human health.

• Epidemiologists study real life.
• They do not need to extrapolate from animal models or in vitro systems.
• The results of their work can be translated into specific recommendations for changes in nutrient intakes or food consumption patterns.
According to the 2019 Global Burden of Disease study of 195 countries, dietary factors are the single leading cause of death (greater health burden than smoking).
Criticism to nutritional epidemiology studies
Public perception
Conflicting messages from media (and scientists?) regarding nutrition

Dairy products, especially cheese and yogurt, were found to protect against death from any cause, according to two recent studies.

Walter Grant Thombrough
30 August 2019

Assassin: “drops empty gun” why won’t you die
Me: “eating my 28th block of cheese” I came prepared
Why is nutrition so hard to study?

Is dairy good or bad for health? Is cholesterol evil? Does red meat kill or cure? Is the ketogenic diet a godsend or a health hazard? Can the vegan, vegetarian, pescatarian, or raw food diet extend disease-free life?

- Research is an ongoing process
- Contradictions are inevitable and part of the scientific process
- Not all studies are created equal
- Newer studies are not necessarily more reliable than older studies
The complex nature of diet

**Nutrients** can be highly correlated with one another
- Same food sources
- Act synergistically or antagonistically (e.g. compete for intestinal absorption)

Same **foods** with different preparation methods can have different effects (e.g. coffee)
Eating more of one type of food could be compensated with eating less of another

**Foods as part of dietary patterns**
→ broader picture of food and nutrient consumption

How to weigh evidence for nutrition studies

- How was diet assessed?
- What type of study?
- How large is the study?
- Animals or humans?
- Real disease endpoints or markers for these diseases?
- Does the given study fit into the entire body of evidence? Weight of the evidence?
Can we reliably measure dietary intakes in individuals and populations?
Everybody eats

• Diet is the main exposure

Also important: relevant period of exposure

• No method is perfect

• Self-report (subjective methods) and objective methods
Dietary Records

- Participants record everything they eat or drink over several days.
- Multiple diet records can be considered as the gold standard of dietary information.

✓ Do not rely on memory
✓ Accurately ascertain detailed dietary information
✓ Open ended data

- High participant burden (literate, motivated participants)
- Resource intensive
- Recording can change individual’s diet
Repeated 24h diet recalls

Report all foods consumed in the previous 24h to a trained interviewer

✓ Accurate, detailed, open-ended data
✓ Lower participant burden
➢ Relies on memory (short term)
➢ Depends on interviewer’s training
Food Frequency Questionnaires

Structured food list and a frequency section – intake of food over a certain period of time in the past (usually 1 year)

✓ Low participant burden/Low cost
✓ Captures long-term dietary intake
✓ Allows repeated assessments over time
➢ Recall error (long term memory)
➢ Fixed food list ➔ omissions
Food Questionnaire Serving Size Pictures

Please note: Use these pictures to help estimate your usual serving sizes.
- Medium serving sizes are given on the Food Questionnaire.
- A small serving is about one-half (1/2) the medium serving size or less.
- A large serving is about one-and-a-half (1 1/2) times the medium serving size or more.

**Beef, pork, chicken and fish as a main dish**
- Small (2 ounces)
- Medium (4 ounces)
- Large (6 ounces)

**Spaghetti and casseroles**
- Small (1/2 cup)
- Medium (1 cup)
- Large (1 1/2 cups)

**Vegetables such as green beans, corn, and potatoes**
- Small (1/4 cup)
- Medium (1/2 cup)
- Large (3/4 cup)
Objective methods for dietary assessment

• Do not rely on written or verbal responses from the individual (or his/her proxy)

• Can be more accurate, less respondent bias (recall error, social desirability)

• Can be costly, intrusive, burdensome for participant and researcher
Examples of objective methods

- Direct observation: recording what and how much people are consuming.
- Duplicate diets: recording or assessing individuals’ diets, collecting or preparing as identical meals as possible, and assessing the chemical compositions.
Image-based dietary assessments

When using RFPM, the SmartIntake® app captures images of participants' foods and beverages. A reference card is used for scaling/portion size. A description is included.

*Figure 1. The Remote Food Photography Method (RFPM) applied using the SmartIntake app.*
Biomarkers

Collecting bio-specimens and assaying chemical compositions that reflect dietary exposure, at least partly.

Could be used to calibrate self-reported data in large studies

- Sensitivity/Specificity
- May not represent long-term intake
- Expensive, invasive
- Biomarkers not available for many nutrients
‘Omics

High-throughput methods for assessing a large number of genomic, epigenomic, transcriptomic, proteomic and metabolomic traits from biological specimens

• Close interplay between food and metabolism
• Can provide additional insights on mechanistic pathways
• Not yet able to accurately distinguish between most specific foods
• Example: Dairy and cognition
Translating science into policy
Evidence for decision making

• A central goal of nutritional epidemiology and public health research is to improve health and well-being.

• In the absence of large RCTs with hard endpoints, evidence from prospective cohort studies and smaller RCTS with intermediate endpoints is considered.

Examples of nutrition policy

• Education and awareness: Dietary guidelines by governments, WHO, organizations such as American Health Association

• Labeling: Nutrition facts on foods/menu

• Economic strategies: taxes/subsidies

• Fortification

• Banning
Recommendations from the Swiss Society for nutrition

• A well-balanced diet is vital in promoting a healthy lifestyle. It influences our mental and physical well-being and helps in prevention of illnesses.

• Switzerland published its first set of dietary guidelines in 1998. The current is the third version and was introduced in 2011.

https://www.sge-ssn.ch
Swiss food pyramid (adults)

**Swiss Food Pyramid**

**Sweets, Salty Snacks & Alcohol**
In small quantities.

**Oils, Fats & Nuts**

**Dairy Products, Meat, Fish, Eggs & Tofu**
3 portions of dairy products and 1 portion of meat/fish/eggs/tofu... per day.

**Grains, Potatoes & Pulses**
3 portions per day. Grains should preferably be wholegrain.

**Vegetables & Fruit**
5 portions per day of different colours.

**Beverages**
1-2 litres of unsweetened beverages per day. Preferably water.

At least 30 minutes of physical activity daily and sufficient relaxation.
Diet in Switzerland

- The swiss food pyramid was followed by <1% of the population.
- 4 in 10 participants met ≥3 criteria.
- 18% of participants ate ≥5 portions of fruit and vegetables a day, without regional differences.
EAT Lancet Commission: Planetary Health Diet

• Guidelines for an optimal diet for human health and environmental sustainability

• It emphasizes a plant-forward diet where whole grains, fruits, vegetables and nuts comprise a greater proportion of foods consumed.

• Meat and dairy significantly smaller proportions

• Discourages overconsumption

https://eatforum.org/eat-lancet-commission/
Precision nutrition

• Dietary guidelines are often based on population average estimates

• Aims to use individualized information (genome, microbiome, metabolome) to receive personalized dietary recommendations for chronic disease prevention and management

• Interactions of nutrition with other potentially modifiable exposures such as the microbiome, environment, physical activity...

Take home message

• Assessment of diet in free-living individuals is challenging but some methods can classify properly people into different levels of intake

• Evidence on the role of diet on disease is ongoing, with inevitable contradictions as part of the scientific process

• Dietary guidelines are established based on the available evidence
Thank you