The New Age of Dietary Assessment:

From Quantity to Quality

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PRESENTER
Dina Aronson, MS, RDN

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Dietary Assessment

…is extraordinarily complex:

- **Interactions and synergies** exist across different dietary components
- **Different** people react **differently** to dietary exposures
- Food is not a drug; food is **infinitely variable** in quantity, type, and quality, and can vary over time and by location

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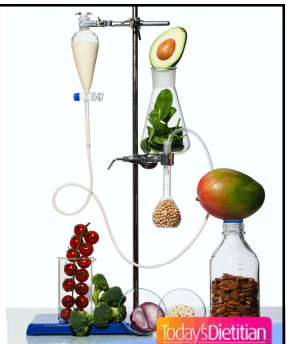
FOOD is more than the sum of its parts.



Mallory Boylan, Lydia Kloiber. Science of Nutrition Laboratory Manual (cover)

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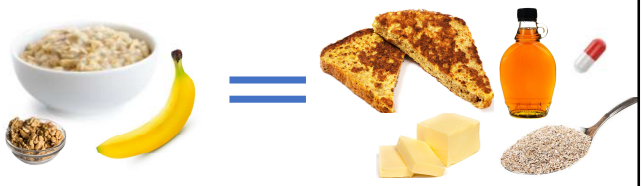
Danger of Reductionist View

460 calories, 11 grams of protein, 63 grams carbs, 18 grams of sugar, 22 grams of fat, and roughly same amounts of vitamins and minerals



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A Look Back in Time…

- 1926 – the first "vital amine" isolated and named
- By the 1950s, **all major vitamins** isolated and synthesized, launching an industry and a food ideology
- In the hospital setting, focus on enteral and parenteral nutrition
- 1970s – today, simultaneous overnutrition and undernutrition, new challenges demand **new methods of assessment**

BMJ 2018;361:k2392 | doi: 10.1136/bmj.k2392

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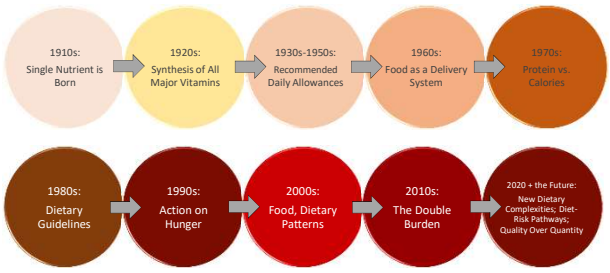
Era of Vitamin Discovery



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Goals of Dietary Assessment

Individual: identify appropriate and actionable areas of change in a diet and lifestyle with the goal of improving health and well being

Population: determine areas of dietary inadequacy and vulnerability to inform public health initiatives

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Definitions

Dietary Assessment: The evaluation and interpretation of food and nutrient intake and dietary pattern of an individual or individuals in a household or within a population over time.

Total Nutrition Assessment: Dietary assessment is a part, but also considers anthropometrics, biochemical parameters, and clinical data.

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4143479/

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Quick Review

- Indirect methods
  - National level (per capita) and household levels
- Direct methods
  - Retrospective
    - 24h recall | Food Frequency Questionnaire (FFQ) | Screeners
  - Prospective
    - Food record | Journal
  - Innovative
    - Software | Mobile | AI

24-Hour Recall (24HR)
Food Record (FR)
Food Frequency Questionnaire (FTQ)
Screener (SCR)

https://dietassessmentprimer.cancer.gov/profiles/table.html

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Dietary Assessment Basics

- Based on **validated** research
- Typically includes a **nutrient report**
  - Need a standardized and **reliable** nutrient data source
- Assessment interpretation needs to be **objective** and research-based
- Food group-based reports are still largely based on **nutrient distribution**, but criteria are changing

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Dietary Assessment Challenges

- **Differences** between populations and individuals
- Intake **variation** (amount/type) day to day and over lifetime
- **Several** eating occasions every day, may or may not be constant
- **Huge** selection of food, people tend not to know (and not accurately report) exactly what or how much they have eaten
- Availability and accessibility of different foods **may vary**

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Clinical Practice

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Best Tool for RDs: *Considerations*

- Time
- Burden (both)
- Health status of patients/clients
- Goal outcome (reduced chronic disease risk? other?)
- Level of technology literacy
- Patient/client preference, perceived value
- Budget

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FoodData Central

- **Newest** USDA nutrient database
- An integrated, research-focused data system that provides **expanded data** on nutrients and other food components
- Includes **USDA nutrient database** for standard reference (now referred to as SR Legacy), Food and Nutrient Database for Dietary Studies (FNDDS) survey foods, branded foods, foundation foods, and experimental foods

https://fdc.nal.usda.gov/about-us.html

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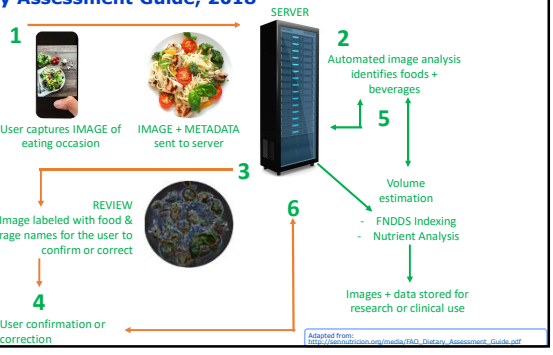
FAO Dietary Assessment Guide, 2018



Adapted from: http://gainnutrition.org/media/FAO_Dietary_Assessment_Guide.pdf

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Is High Tech Always Better?

Google:
Chihuahua + Muffin

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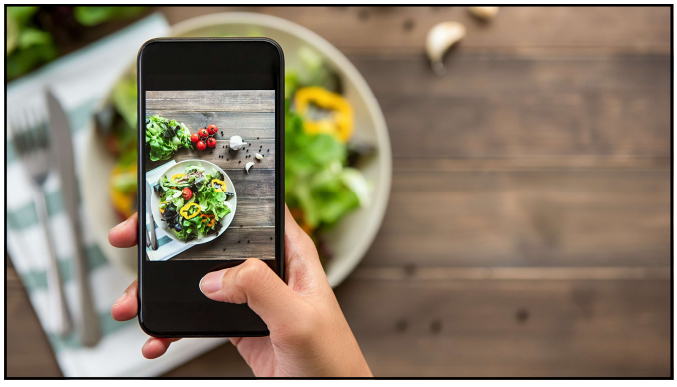

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Self-Reporting: *Error-Prone and Memory-Dependent*

- Over- or under-reporting
- Food types **not described** sufficiently
- Portion sizes are **incorrectly quantified**
- Timeframe context **skewed** (habitual vs. seasonal/cyclic vs. infrequent)
- Certain nutrients **difficult to assess** (salt, etc.) especially in foods prepared outside home

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Nutrition Research

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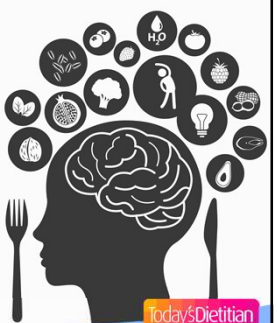
Traditional Dietary Assessment

...is based on **traditional** nutrition science research



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Validation

A tool is considered **validated** if it meets certain statistical criteria. Typically, there is a **comparison** with intake data and blood biomarkers and/or comparison to previously validated tools (like the FFQ)

Lennernas M. Dietary assessment and validity: To measure what it meant to measure. Scand J Nutr 1998;42:63-65.

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Research Often Informs Dietary Assessment Methodology

- Lab/Animal Studies
- Case-control Studies
- Cohort Studies
- Randomized Trials

- Doubly-labeled water
- Portion size assessment system
- Image-based dietary assessment
- Photo-assisted dietary assessment
- Indirect calorimetry
- 24-hour recalls
- Food diary
- Weighted food record

https://www.sciencedirect.com/science/article/pii/S0749379718320178; doi: 10.1093/nutrit/nuw026 Nutrition Reviews® Vol. 75(7):491–499

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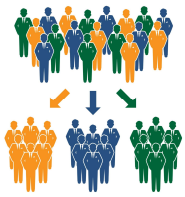
Classic Interventions (RCTs): *Gold Standard?*

- **Formally** test hypotheses
- **Allow** for isolation of nutrients and control of confounders
- **Important** for dose-response effects and safety guidelines
- Interesting to study **specific** metabolic mechanisms



Katz et al. BMC Medical Research Methodology (2019) 19:178; doi: 10.1093/nutrit/nuw026 Nutrition Reviews® Vol. 75(7):491–499

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Classic Interventions (RCTs): *Gold Standard?*

- In real people, a change in one dietary component is **typically accompanied** by compensatory change in another component
- **Cannot** double-blind a diet
- **Do not capture** dietary patterns or lifetime effects of eating behaviors on health
- **Cannot** be used as a basis for public health messages and population-based interventions

Katz et al. BMC Medical Research Methodology (2019) 19:178; doi: 10.1093/nutrit/nuw026 Nutrition Reviews® Vol. 75(7):491–499

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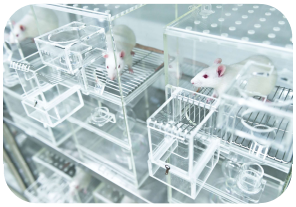
The Metabolic Ward

- Pros:
  - Extremely controlled conditions
  - Can manipulate variables to measure multiple responses
  - Evaluates specific and precise data
- Cons:
  - Expensive
  - No one lives that way for real
  - Cannot measure effect over time



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Nutritional Epidemiology

- Pros:
  - Valuable insights on diet and health outcomes can be obtained
  - The more data we have, the more insights we collect and can apply to public health
- Cons:
  - Cannot accurately measure diet
  - Limited data on effects of any one change
  - Diets evolve and change over time

Satija A, Yu E, Willett WC, Hu FB. Understanding nutritional epidemiology and its role in policy. *Adv Nutr*. 2015;6(1):5–18. Published 2015 Jan 15. doi:10.3945/an.114.007492

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Surveys & Screeners: *Examples*

- Population:
  - Dietary Screener Questionnaire (DSQ), used for NHANES, What We Eat in America
  - National Health Interview Survey (NHIS)
  - Each country that participates has it own tool
- Individual:
  - Rate Your Plate
  - Food Frequency Questionnaires (FFQ)
  - Rapid Eating and Activity Assessment for Patients (REAP)
  - Weight, Activity, Variety, and Excess (WAVE)

https://www.nutritools.org/tools
https://epi.grants.cancer.gov/nhanes/dietscreen
https://epi.grants.cancer.gov/diet/screeners/

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Choosing Diet Assessment Tools

- What?
  - Specific Dietary components
  - Overall contribution of nutrients / foods
  - Diet Quality
- Why?
  - Establish recommendations
  - Compare to recommendations
  - Health Risk Outcomes
- Who?
  - Specific populations
  - Individuals
- When?
  - Timeframe
- How?
  - Depends on resources and answers to above questions

Nutritools.org

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Quality vs. Quantity

One of the most widely used methods today in the US tells us a lot about **quantity**, but what does it tell us about **quality**? And why does quality matter?

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Capturing Quality

Many **different systems** have been developed over the years in attempt to classify dietary intake in terms of their quality, which provides information on their **health impact**.

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Capturing Quality

NOVA is the food classification system that categorizes foods according to the **extent** and **purpose** of food processing, rather than in terms of **nutrients**.

- Unprocessed- or minimally-processed foods
- Oils, fats, salt, and sugar (processed culinary ingredients)
- Processed foods
- Ultra-processed foods

Monteiro CA, Cannon G, Levy RB et al. NOVA. The star shines bright. [Food classification. Public health.] World Nutrition January-March 2016; 7, 1-3, 28-38...

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Image-Based Tools

- In general, may increase **accuracy**
- **Easier** to remember details, estimate portions
- **Saves** time
- **Image-ASSISTED** tools uses more methods than image-BASED
- Passive modalities (wearables) provide **context** (such as time and location)

https://www.todaysdietitian.com/newarchives/081712p40.shtml

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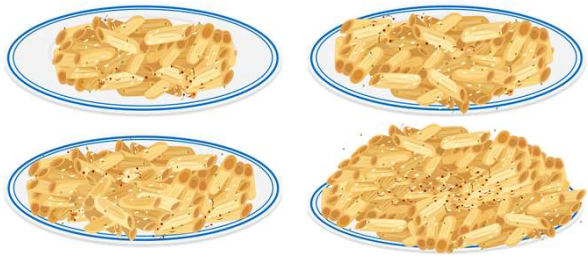
Food Atlas Images

A photographic atlas of food portion sizes



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Dietary Patterns

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Dietary Patterns: *A Better Story?*

- People eat food, **not isolated nutrients**, with complex, interactive, synergistic combinations
- The high level of **intercorrelation** among some nutrients (e.g. K and Mg) makes it difficult to examine their **separate effects**, because the degree of independent variation of the nutrients is **markedly reduced** when they are entered into a model simultaneously

Hu, Frank. Dietary pattern analysis: a new direction in nutritional epidemiology. Current Opinion in Lipidology 2002;13:3-9.

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Dietary Patterns: *A Better Story?*

- A **single nutrient effect** may be too small to detect, but the cumulative effects of multiple nutrients in a dietary pattern may be **sufficiently large** to be detectable (e.g. DASH diet for blood pressure, rather than Na alone)
- Analyses **based on multiple nutrients** may produce statistically significant associations simply by chance

Hu, Frank. Dietary pattern analysis: a new direction in nutritional epidemiology. Current Opinion in Lipidology 2002;13:3-9.

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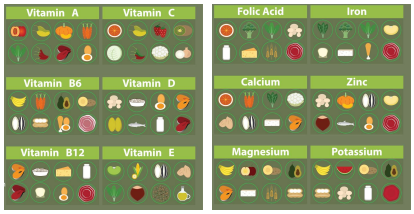
Dietary Patterns: *A Better Story?*

- Since nutrient intakes are commonly associated with **certain dietary patterns**
- "Single nutrient" analysis may potentially be **confounded** by the effect of dietary patterns



Hu, Frank. Dietary pattern analysis: a new direction in nutritional epidemiology. Current Opinion in Lipidology 2002;13:3-9.

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Defining Dietary Patterns

- Factor Analysis
  - A multivariate statistical technique using information reported in FFQs or diet records **to identify common underlying dimensions of food consumption**. Produces a summary score per pattern.
- Cluster Analysis
  - Similar to FA but aggregates individuals into homogenous subgroups with similar diet in order to establish standards of comparison.

VALUE
These can be used in correlation or regression analysis to examine **relationships between eating patterns and health outcomes** such as risk factors and blood biomarkers (indicators of health)

Hu, Frank. Dietary pattern analysis: a new direction in nutritional epidemiology. Current Opinion in Lipidology 2002;13:3-9.

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Dietary Pattern Research: *Validity & Reproducibility*

- Most studies to date examine relative risks of CHD, metabolic syndrome, and cancer in relation to defined patterns (quality & type)
- More emerging studies looking at mortality rates and dietary patterns

Hu, Frank. Dietary pattern analysis: a new direction in nutritional epidemiology. Current Opinion in Lipidology 2002;13:3-9.

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	Exposure definition	Optimal level of intake (optimal range of intake)	Data representativeness index (%)
Diet low in fruits	Mean daily consumption of fruits (fresh, frozen, cooked, canned, or dried fruits, excluding fruit juices and salted or pickled fruits)	250 g (200–300) per day	94·9
Diet low in vegetables	Mean daily consumption of vegetables (fresh, frozen, cooked, canned, or dried vegetables, excluding legumes and salted or pickled vegetables, juices, nuts, seeds, and starchy vegetables such as potatoes or corn)	360 g (290–430) per day	94·9
Diet low in legumes	Mean daily consumption of legumes (fresh, frozen, cooked, canned, or dried legumes)	60 g (50–70) per day	94·9
Diet low in whole grains	Mean daily consumption of whole grains (bran, germ, and endosperm in their natural proportion) from breakfast cereals, bread, rice, pasta, biscuits, muffins, tortillas, pancakes, and other sources	125 g (100–150) per day	94·9
Diet low in nuts and seeds	Mean daily consumption of nut and seed foods	21 g (16–25) per day	94·9
Diet low in milk	Mean daily consumption of milk including non-fat, low-fat, and full-fat milk, excluding soy milk and other plant derivatives	435 g (350–520) per day	94·9
Diet high in red meat	Mean daily consumption of red meat (beef, pork, lamb, and goat, but excluding poultry, fish, eggs, and all processed meats)	23 g (18–27) per day	94·9
Diet high in processed meat	Mean daily consumption of meat preserved by smoking, curing, salting, or addition of chemical preservatives	2 g (0–4) per day	36·9
Diet high in sugar-sweetened beverages	Mean daily consumption of beverages with ≥50 kcal per 226·8 serving, including carbonated beverages, sodas, energy drinks, fruit drinks, but excluding 100% fruit and vegetable juices	3 g (0–5) per day	36·9
Diet low in fiber	Mean daily intake of fiber from all sources including fruits, vegetables, grains, legumes, and pulses	24 g (19–28) per day	94·9
Diet low in calcium	Mean daily intake of calcium from all sources, including milk, yogurt, and cheese	1·25 g (1·00–1·50) per day	94·9
Diet low in seafood omega-3 fatty acids	Mean daily intake of eicosapentaenoic acid and docosahexaenoic acid	250 mg (200–300) per day	94·9
Diet low in polyunsaturated fatty acids	Mean daily intake of omega-6 fatty acids from all sources, mainly liquid vegetable oils, including soybean oil, corn oil, and safflower oil	11% (9–13) of total daily energy	94·9
Diet high in trans fatty acids	Mean daily intake of trans fat from all sources, mainly partially hydrogenated vegetable oils and ruminant products	0·5% (0·0–1·0) of total daily energy	36·9
Diet high in sodium	24 h urinary sodium measured in g per day	3 g (1–5) per day*	26·2

*To reflect the uncertainty in existing evidence on optimal level of intake for sodium, 1–5 g per day was considered as the uncertainty range for the optimal level of sodium where less than 2·3 g per day is the intake level of sodium associated with the lowest level of blood pressure in randomized controlled trials and 4–5 g per day is the level of sodium intake associated with the lowest risk of cardiovascular disease in observational studies.

Adapted from Health effects of dietary risks in 195 countries, 1990–2017: a systematic analysis for the Global Burden of Disease Study. Lancet 2019;393:1958-1972. doi: 10.1016/S0140-6736(19)30041-8

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Targets for the healthy reference diet and the mean dietary intakes and AHEI[1] scores in men and women aged ≥25 y in 190 countries/territories in 2017 and 1990[2]

	Reference Healthy Diet	2017 Men	2017 Women	2017 Both Sexes	1990 Men	1990 Women	1990 Both Sexes
Total AHEI	94·0	49·5	50·5	50·0	45·3	45·6	45·4
Vegetables							
Intake, g/d	300	197	183	190	134	125	129
AHEI	9·2	5·9	5·5	5·7	4·1	3·8	3·9
Fruit							
Intake, g/d	200	87·0	99·5	93·4	58·2	68·1	63·2
AHEI	7·7	1·3	1·8	3·6	2·2	2·6	2·4
Whole grains							
Intake, g/d	232	29·9	28·0	28·9	28·1	26·2	27·1
AHEI	10·0	1·2	1·4	1·3	1·2	1·3	1·2
Sugar-Sweetened Beverages							
Intake, g/d	0	58·4	41·5	49·8	55·9	41·5	48·7
AHEI	10·0	7·6	8·2	7·9	8·1	8·4	8·2
Nuts and Legumes							
Intake, g/d	125	54·3	44·3	49·2	44·2	37·3	40·7
AHEI	10·0	7·3	8·7	7·8	7·2	6·5	6·8

	Reference Healthy Diet	2017 Men	2017 Women	2017 Both Sexes	1990 Men	1990 Women	1990 Both Sexes
Total AHEI	94·0	49·5	50·5	50·0	45·3	45·6	45·4
Red/Processed Meats							
Intake, g/d	14	36·6	24·3	30·4	32·6	22·7	27·6
AHD	9·1	7·6	8·4	8·0	7·8	8·5	8·2
Trans fat							
Intake, % of energy	0	0·4	0·5	0·5	0·6	0·7	0·7
AHD	10·0	9·7	9·5	9·6	9·3	9·0	9·2
Long-chain n–3 PUFAs							
Intake, mg/d	250	105·0	90·4	97·6	66·7	60·0	63·3
AHD	10·0	2·3	2·0	2·2	1·7	1·6	1·7
PUFAs							
Intake, % of energy	10	4·3	4·2	4·3	3·3	3·3	3·3
AHD	10·0	2·9	2·8	2·8	1·9	2·0	2·0
Sodium							
Intake, mg/d	2300	5792	5134	5560	3866	5731	5788
AHD	8·0	1·7	2·0	1·8	1·7	1·8	1·8

1. The AHEI score ranged from 0 (nonadherence) to 100 (perfect adherence); each of the components was scored from 0 to 10. For fruits, vegetables, whole grains, nuts and legumes, long-chain n–3 PUFAs, and PUFAs, a higher score indicated higher intake. For trans fat, sugar-sweetened beverages, red/processed meat, and sodium, a higher score indicated lower intake.
2. Values are means of dietary intake and the AHEI calculated based on dietary data in 190 countries/territories in the GBD Study 2017. AHEI, Alternate Healthy Eating Index; GBD, Global Burden of Disease.

Adapted from: Wang DD, Li Y et al. Global Improvement in Dietary Quality Could Lead to Substantial Reduction in Premature Death. J Nutr 2019;149:1065–1074.

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Numbers of preventable deaths and percentage reductions in deaths as a result of improvements in AHEI scores from the current diet to the reference healthy diet in men and women aged ≥25 y in 190 countries/territories in 2017[1]

	Men	Women	Both sexes
Total deaths (Summation of cause-specific deaths) [2]			
Preventable deaths	6,071,032 (2,412,523, 8,985,512)	5,522,247 (2,360,919, 8,017,118)	11,593,279 (4,773,442, 16,982,629)
PAF, %	22.8 (9.1, 33.7)	24.6 (10.5, 35.7)	23.6 (9.7, 34.6)
Total deaths (Calculated based on RRs of total mortality)[3]			
Preventable deaths	6,369,653 (5,082,373, 7,543,363)	6,120,233 (5,081,657, 7,073,697)	12,489,883 (10,164,040, 14,617,060)
PAF, %	23.9 (19.1, 28.3)	27.3 (22.6, 31.5)	25.5 (20.7, 29.8)
Cause-specific deaths			
Cancer			
Preventable deaths	1,031,548 (333,972, 1,641,670)	551,585 (79,850, 970,588)	1,583,133 (413,822, 2,612,260)
PAF, %	18.3 (5.9, 29.1)	13.6 (2.0, 24.0)	16.4 (4.3, 27.0)
Coronary artery disease			
Preventable deaths	2,015,380 (1,408,313, 2,542,408)	1,876,413 (1,237,393, 2,417,194)	3,891,799 (2,645,697, 4,959,603)
PAF, %	34.7 (24.2, 43.8)	37.0 (24.4, 47.7)	35.8 (24.3, 45.6)
Stroke			
Preventable deaths	353,474 (-581,198, 947,220)	685,946 (201,983, 1,092,552)	1,039,420 (-179,176, 2,039,772)
PAF, %	11.3 (-12.1, 30.2)	23.1 (6.8, 36.8)	17.0 (-2.9, 33.4)
Respiratory disease			
Preventable deaths	710,420 (174,376, 1,108,400)	958,753 (540,219, 1,239,757)	1,669,173 (714,595, 2,348,158)
PAF, %	33.2 (8.1, 51.8)	55.5 (31.3, 71.7)	43.1 (18.5, 60.7)
Neurodegenerative disease			
Preventable deaths	361,334 (130,885, 542,682)	34,642 (-380,672, 382,289)	395,975 (-249,792, 924,947)
PAF, %	34.0 (12.3, 51.1)	1.9 (-21.2, 21.2)	13.8 (-8.7, 32.3)
Kidney disease			
Preventable deaths	247,448 (-47,308, 429,402)	279,764 (-1,045, 439,642)	527,212 (-48,354, 866,044)
PAF, %	39.1 (-7.5, 67.9)	49.7 (-0.2, 77.6)	44.1 (-4.0, 72.5)
Diabetes			
Preventable deaths	274,212 (205,259, 332,458)	293,277 (239,950, 340,646)	567,489 (446,209, 673,104)
PAF, %	42.0 (31.8, 51.0)	41.7 (34.1, 48.4)	41.8 (33.3, 49.6)
Digestive system disease			
Preventable deaths	730,098 (412,985, 1,039,193)	455,382 (186,584, 638,129)	1,245,471 (599,569, 1,677,324)
PAF, %	57.0 (28.8, 75.0)	50.2 (20.6, 70.3)	54.3 (26.2, 73.2)
Other causes			
Preventable deaths	287,123 (174,204 - 382,075)	386,486 (256,668 - 496,345)	673,608 (430,872 - 881,419)
PAF, %	38.0 (23.0, 50.5)	35.1 (23.3, 45.4)	36.3 (23.2, 47.5)

1-Values were PAFs (95% CIs) calculated based on comparison in the AHEI scores between global diet in 2017 and the reference healthy diet modified slightly from the target dietary pattern in the EAT–Lancet Commission Report (23). AHEI, Alternate Healthy Eating Index; ; PAF, population attributable fraction; RR, risk ratio.

2-Total preventable deaths were calculated by summing up all the preventable cause-specific deaths. PAFs were calculated as the percentage of preventable total deaths in total deaths, including those due to infection and injury in the denominator.

3-PAFs for total mortality were calculated based on the biological effects (RRs) for total deaths (deaths due to injury and infection excluded) from the NHS and the HPFS. Preventable total deaths were calculated by multiplying the total deaths (deaths due to injury and infection excluded) by the PAFs. The final PAFs for total mortality were calculated as the percentage of preventable total deaths in total deaths, including those due to infection and injury in the denominator.

Adapted from: Wang DD, Li Y et al. Global Improvement in Dietary Quality Could Lead to Substantial Reduction in Premature Death. J Nutr 2019;149:1065-1074.

PAF = the population attributable fraction
RR = relative risk

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Study Conclusions

- The global quality of diet is far from optimal, and varies greatly across countries/territories.
- Authors estimate that a potential change from current national diets to a healthy dietary pattern could prevent >11 million premature deaths annually.
- Given recent regulatory successes in beginning to address healthy eating, such as elimination of trans fat and taxation on sugary beverages, further policy initiatives and actions are needed to also increase healthful foods and reduce the burden of major chronic disease.

Wang DD, Li Y et al. Global Improvement in Dietary Quality Could Lead to Substantial Reduction in Premature Death. J Nutr 2019;149:1065-1074.

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Dietary Pattern Analysis: *Limitations*

- **May lack specificity** about the particular nutrients responsible for the observed differences in disease risk
- **May not inform** about biological/ biochemical relationships between dietary components and disease risk
- **Dietary patterns vary** according to culture, geographic region, sex, socioeconomic status, ethnic group, etc.

Hu, Frank. Dietary pattern analysis: a new direction in nutritional epidemiology. Current Opinion in Lipidology 2002;13:3-9.

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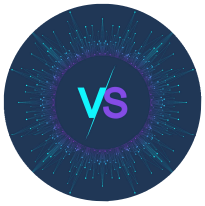
Diet Pattern vs Dietary Analysis

- **One or both** can be used, depending upon purpose of study
- Single nutrient effects (e.g. fa and neural tube defects) need DA; DP would dilute the findings
- **Overall diet effects** (e.g. cardiovascular disease) need DP, which goes beyond nutrients and foods, to examine effects of overall diet



Hu, Frank. Dietary pattern analysis: a new direction in nutritional epidemiology. Current Opinion in Lipidology 2002;13:3-9.

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Diet Pattern + Dietary Analysis

- Together, can theoretically be used to reveal information about diet and disease on a **more granular level**
- DP can be used as a covariate when studying a specific nutrient, to determine whether the effect of the nutrient is independent of the **overall dietary pattern**

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Measuring Dietary Pattern Quality

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Dietary Quality Indices

- A **single summary** measure (score) of the degree to which a diet pattern conforms to standard dietary recommendations
- The most commonly used DQI in the US is the **Healthy Eating Index**, first developed in 2005, updated in 2010 and 2015 (also AHEI)
- Many countries have their own **DQIs**
- Global Overall Dietary Index, Healthy Diet Indicator, more have been developed

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6130981/#bp-r.89474

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Dietary Quality Indices

- Some specially designed for specific markers and/or compliance to a pattern:
  - Dietary Inflammatory index
  - Mediterranean Diet Score
- Criteria for quality scoring:
  - Food groups
  - Nutrients and nutrient ratios
  - Adequacy
  - Moderation/Balance
  - Variety

https://pubmed.ncbi.nlm.nih.gov/29439509

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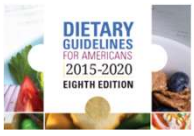
Healthy Eating Index 2015

- Measures degree to which an eating pattern conforms to the specific Dietary Guidelines for Americans recommendations.
- Assesses diet, not supplement intake
- Focuses on nutrient density by uncoupling dietary quality from quantity
- Accommodates a variety of eating patterns



Krebs-Smith SM, et al. Update of the Healthy Eating Index: HEI-2015. JAND 2018;118(9):1591-1602. https://doi.org/10.1016/j.jand.2018.05.021

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How is HEI-2015 Scored?

HEI-2015[1] Components and Scoring Standards

Component	Maximum points	Standard for maximum score	Standard for minimum score of zero
Adequacy:			
Total Fruits[2]	5	≥0.8 cup equivalent per 1,000 kcal	No Fruit
Whole Fruits[3]	5	≥0.4 cup equivalent per 1,000 kcal	No Whole Fruit
Total Vegetables[4]	5	≥1.1 cup equivalent per 1,000 kcal	No Vegetables
Greens and Beans[5]	5	≥0.2 cup equivalent per 1,000 kcal	No Dark-Green Vegetables or Legumes
Whole Grains	10	≥1.5 ounce equivalent per 1,000 kcal	No Whole Grains
Dairy[6]	10	≥1.3 cup equivalent per 1,000 kcal	No Dairy
Total Protein Foods[4]	5	≥2.5 ounce equivalent per 1,000 kcal	No Protein Foods
Seafood and Plant Proteins[4,5]	5	≥0.8 ounce equivalent per 1,000 kcal	No Seafood or Plant Proteins
Fatty Acids[7]	10	(PUFAs + MUFAs) / SFAs ≥2.5	(PUFAs + MUFAs)/SFAs ≤1.2
Moderation:			
Refined Grains	10	≤1.8 ounce equivalent per 1,000 kcal	≥4.3 ounce equivalent per 1,000 kcal
Sodium	10	≤1.1 grams per 1,000 kcal	≥2.0 grams per 1,000 kcal
Added Sugars	10	≤6.5% of energy	≥26% of energy
Saturated Fats	10	≤8% of energy	≥16% of energy

[1] Intakes between the minimum and maximum standards are scored proportionately.
[2] Includes 100% fruit juice.
[3] Includes all forms except juice.
[4] Includes legumes (beans and peas).
[5] Includes all milk products, such as fluid milk, yogurt, and cheese, and fortified soy beverages.
[6] Includes seafood, nuts, seeds, soy products (other than beverages), and legumes (beans and peas).
[7] Ratio of poly- and mono-unsaturated fatty acids (PUFAs and MUFAs) to saturated fatty acids (SFAs).

https://www.fns.usda.gov/how-hei-scored
Krebs-Smith SM, et al. Update of the Healthy Eating Index: HEI-2015. JAND 2018;118(9):1591-1602. https://doi.org/10.1016/j.jand.2018.05.021

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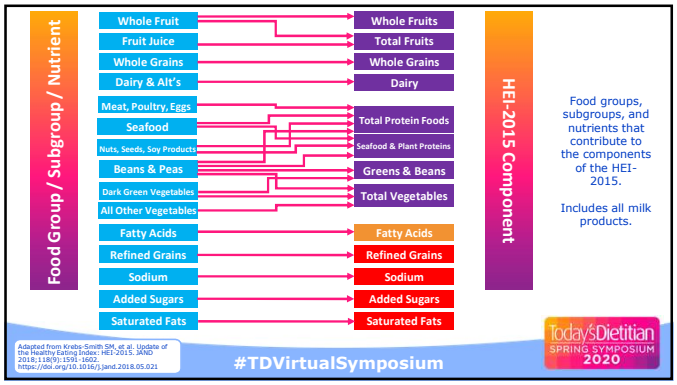

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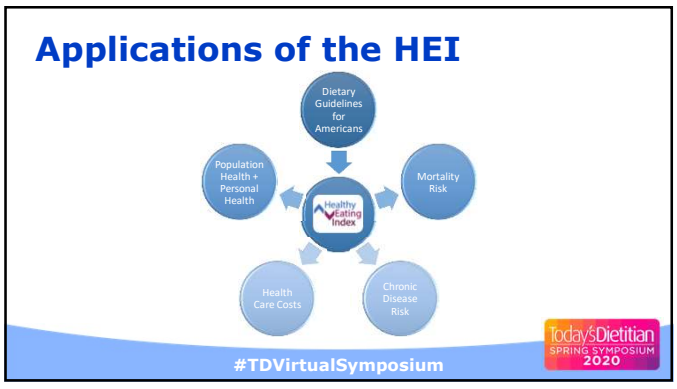

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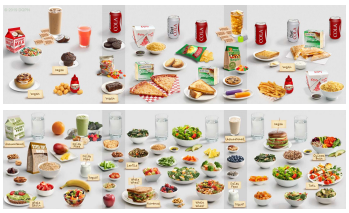
Dietary Quality is Agnostic to…

- Macronutrient distribution and thresholds (reasonable)
- Ethnic inspiration (Mediterranean vs. Asian vs. South American…)
- Most diet types (vegan vs. paleo vs. flexitarian)



*Photos are both of an isocaloric vegan diet pattern (3 days shown) – the first one is extremely low quality while the second is extremely high quality.

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Applications of Dietary Assessment for National and Global Initiatives

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NHANES Video: *Representation of US Intake*

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NHANES: *Criticism*

"…Across the 39-year history of the NHANES, energy intake data on the majority of respondents (67.3% of women and 58.7% of men) were **not physiologically plausible**."

Archer E, Hand GA, Blair SN. Validity of U.S. Nutritional Surveillance: National Health and Nutrition Examination Survey Caloric Energy Intake Data, 1971-2010. PLoS One. 2013; 8(10):e76632.

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Global Dietary Database

- **Mission**: To improve the health of the poorest and most vulnerable populations in the world through improved diet by:
  - Assessing global dietary intakes throughout the lifecourse, with particular focus on children, adolescents, and pregnant/nursing mothers
  - Understanding how both undernutrition and overnutrition affect health worldwide
  - Evaluating how dietary policies impact disease and assessing effectiveness of global dietary interventions

https://globaldietarydatabase.org

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Global Dietary Database

Impact:

This research will provide **innovative** and highly **relevant** findings on dietary intakes, diseases, and policies that will **inform priorities** for prevention strategies to **improve the diets** and health outcomes of people around the world.

https://globaldietarydatabase.org

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FoodEx2

- A comprehensive food classification and description system released by European Food Safety Authority (EFSA)
- Designed to merge and standardize data collections related to food intake and safety
- The application of FoodEx2 to dietary surveys ensures that individual foods are uniformly classified across surveys, no matter how different, from around the world

https://efsa.onlinelibrary.wiley.com/doi/epdf/10.2903/sp.efsa.2019.EN-1584

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Questions?

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