Diet pattern and longevity: do simple rules suffice? A commentary[1–4]

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ABSTRACT

Nutritionism reduces dietary advice to statements about a few nutrients, with sometimes unintended implications for science, industry, and the public. Although reductionist questions about nutrition are legitimate scientifically, a nutrient focus in the public arena forces the food industry to compete with the use of nutrient statements. Consumers must interpret information that may not be correct or relevant. The theory of food synergy, which postulates that the many constituents of individual foods and dietary patterns act together on health, leads to the idea that dietary policy would be clearer if it focused on foods. To illustrate this method, the food-based A Priori Diet Quality Score was described in the Iowa Women's Health Study; a substantial total mortality reduction for increasing quartiles of the score was found. The simple food-based rules implied in this a priori score support minimizing meat, salt, added sugar, and heavily processed foods while emphasizing phytochemical-rich foods. These principles could help improve nutrition policy, help industry to supply better food, and help to focus future scientific research. Although an understanding of what foods are best for health is a step forward in nutrition, other major challenges remain, including getting high-quality food to the masses and food sustainability. *Am J Clin Nutr* 2014;100(suppl):313S–9S.

NUTRITIONISM

Although people eat food, not isolated nutrients, the practice of talking about nutrition as a composite of nutrients and other biochemicals rather than as food is widespread in the public, in industry, in government, and among scientists. This practice may be called *nutritionism* (1, 2). According to Scrinis (1), "nutritionism or nutritional reductionism … do not simply refer to the study or understanding of foods in terms of their nutrient parts. … Rather, it is the ways in which nutrients have often been studied and interpreted, and then applied to the development of dietary guidelines, nutrition labeling, food engineering, and food marketing, that are being described as reductive." In full-blown "nutritionism," dietary advice is reduced to statements about a few nutrients. The actuality is that people talk about both nutrients and foods in the same breath.

Thinking only of food, a lot is known about diet to prevent cardiovascular disease (CVD)[5], diabetes, and other conditions. Among the healthiest of known dietary patterns (3, 4) is vegetarianism, which is food-, not nutrient-, oriented. Other formulations, often referred to as prudent or Mediterranean (5–7), are low in meat and detrimentally processed foods; high in fruit, vegetables, legumes, whole grains, nuts, berries, seeds, unrefined unsaturated oil, and fish; and may include dairy, coffee, tea, chocolate, and alcohol (not in excess). With this knowledge, it ought to be easy for the consumer to select healthy food. Yet, the food industry advertises the use of nutrients to gain a market edge.

One apparently healthful breakfast cereal advertises itself as containing whole grain, nuts, and berries, which should be sufficient for dietary choice. However, the box goes on to mention "less processed," "high in fiber," and "antioxidants" (equated with vitamins C and E) and implies low fat by saying that it contains "3 g total fat." The consumer has to decipher all of this nutrient information, which ranges from ambiguous to probably incorrect. "Processed" is ambiguous; some processing is good (such as cooking at home to make food palatable and to avoid bacterial infection), but some is highly questionable (such as adding preservatives solely to maintain shelf life and fortifying on the basis of unproven benefit for isolated nutrients and biochemicals). "High in fiber" is interesting, but in some instances "fiber" is manmade (such as polydextrose, inulin, or maltodextrin) or isolated (such as guar gum or pectin), not the naturally occurring nonstarch polysaccharide that is an indicator of the walls of phytochemical-rich cells. "Antioxidants" is a complicated story (8). Several randomized clinical trials have shown that isolated antioxidants are not helpful, or even harmful, including vitamins C and E (9). Although it is likely that the antioxidant property generally marks phytochemical-rich plant food, the implication that antioxidants are the main actors in disease prevention is questionable and misleading. The message "3 g total fat" is unnecessary: whole grains and berries are well known to be low in fat and the high-fat nuts are a minor constituent. The low-fat message is itself misleading because not all fats have the same health effect.

Many US consumers spent much of the past 30 y trying to comply with recommendations to eat low-fat diets, potentially tending to reduce intake of healthy foods such as fatty fish, olives,

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[5] Abbreviations used: CVD, cardiovascular disease; IWHS, Iowa Women's Health Study; SEAD, Southern European Atlantic Diet.

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and nuts. In the early 1980s, it was thought that the low-total-fat message would reduce saturated fat intake, with minimal damage from not eating a few healthful fatty foods. However, the food supply changed. Industry reacted to the low-fat message by creating many new low-fat foods, adding sugar and starch, and using food technology to maintain the accustomed consistency and taste of altered foods. Thus, choosing low-fat food items did not necessarily lead to healthy food choices and may have at times led to selecting worse foods. This result was not foreseen by those advocating this nutrient-based dietary recommendation. These policy statements and industrial actions likely reduced intake of phytochemicals. It is not inconceivable that they contributed to the obesity epidemic. Sijtsma et al (10) provided evidence for worsening diet quality in the general population. They studied Coronary Artery Risk Development in Young Adults participants aged 25–30 y in 1985–1986 and different participants of the same age 7 y later. The A Priori Diet Quality Score (described in detail below), which has a cross-sectional SD of 13 points, was ~2.5 points higher in 1985–1986 than in 1992–1993 after age was controlled for in this way (*see* Figure 2 in reference 10). This diet pattern was shown to correlate inversely with BMI (11) and with change in weight over a 1-y intervention study (12). In the context of obesity, guidelines and review articles often continue to emphasize the central importance of total caloric intake and energy density of foods. In these arguments, the 9-kcal/g energy density of fats is reviewed, with an emphasis on the reduction in total fat intake as being important to reducing total calories (13–16). This ignores the findings that people seem to compensate for eating some fatty foods by eating less of other foods (17, 18), thus resulting in minimal weight loss in a very large trial of total fat reduction (19). In these studies, judging the effect of foods on body weight by their fat content seems to be uninformative and perhaps counterproductive.

In this context it is interesting to ask what the negation of the low-fat message means. It does not mean that all fat is good, or even that more fat is good. It does not mean that we should eat more meat. It does mean that oversimplification of the nutrition message in terms of a single nutrient is not a wise strategy. Hopefully, we (scientists and policy makers, especially) should be forewarned and learn from this series of events.

The focus on nutrients may not have served us well. Whereas nutrients cure deficiencies, isolated nutrients greatly in excess of dietary intake have been neutral or sometimes harmful in randomized clinical trials (9). More important, nutrient-based dietary guidelines may not lead to healthy food choices and may have unintended adverse consequences. The nutrient approach has broad political and social implications. A broader focus on foods both in scientific study and as the basis for dietary guidelines could alter the scientific and political cascade, leading to improved dietary choices and a different relation between the public and the food industry.

CONSIDERING THE SYNERGISTIC ASPECTS OF FOOD MAY BE HELPFUL

The theory of food synergy (20–23) postulates concerted action, namely that the many constituents of individual foods and dietary patterns act together on health. With a few exceptions such as water and salt, food is composed of organisms, which are nonrandom, complex mixtures of compounds, developed under evolutionary control. That the composite nature of food, serving the life of the organism being eaten, also is important to the health of the eater is central to the food synergy concept. The composite nature of dietary patterns is somewhat different, relating to taste, culture, complementarity of food compounds, and people informing each other about what to eat. Viability of the food synergy idea implies several testable propositions, as follows:

1) There are a very large number of compounds in food, each with potentially important impacts on health.

Molecules exist in great diversity in all living organisms. It would be difficult to get an exact count of the number of distinct molecules in a morsel of food, but the number must be very large, because every small difference in chemical structure must be counted (24). Small changes in a molecule can affect health. An example in the diet is the fatty acid 18:1. The naturally occurring form, prominent in olives, is *cis*-oleic acid, whereas *trans*-elaidic acid does not occur naturally but has been consumed heavily in recent years as a food technology product of partial hydrogenation of vegetable oils. Oleic and elaidic acids differ only in the position of the double bond, which results in a bent molecule in the *cis* form but a straight molecule in the *trans* form. The *trans* form increases serum cholesterol (25, 26) and is related to increased incidence of coronary artery disease (27).

2) There is inherent balance in the biochemical constituents of the organism being eaten, and such inherent proportionality of compounds may have health effects.

For example, in studies of large doses of supplemental purified β-carotene, excess cancer resulted (9). Nevertheless, β-carotene is common in food, never in isolation and always proportionate to other compounds. Diet patterns that contain plentiful carotenoid-containing foods appear to be healthful. Organisms that contain β-carotene must have strategies for preventing it from causing damage.

3) Multiple biologically relevant compounds in certain proportions survive digestion to enter the body system and affect human biology.

Although some compounds, such as protein, are broken down to elemental molecules during digestion, other compounds, such as polyphenols, are not broken down and can be absorbed, mostly in a conjugated state. Natella et al (28, 29) showed that 3 compounds in coffee were found in conjugated form in platelets and LDL particles, in both cases 30 min and 1 h after ingestion, in similar proportion to their proportions in coffee. After coffee consumption, the platelets were less sticky and the LDL particles less prone to oxidize, and the composite of purified coffee polyphenols had a similar effect in an in vitro model.

In summary, the concept of food synergy recognizes that foods are complex mixtures of biologically important chemical compounds, that the compounds occur in biologically dictated proportions that may be important to health, and that such compounds, in proportion, survive digestion and affect human biology. This concept provides a rationale for why the health effects of foods may not be accurately reduced to the effects of isolated nutrients.

FOODS ARE NOT DRUGS

A focus on individual nutrients tends to suggest thinking of nutrition as similar to pharmacology, a comparison that may often be misleading. Nutrition, which is the fostering of health through diet, differs fundamentally from pharmacologic treatment of disease. In health, complex body systems function in harmony. Most drugs, on the other hand, are isolated chemicals, whether synthetic or originally derived from living organisms, given at larger doses than would occur in food. Many drugs work through pathway interruption. Drugs block a pathway gone wrong, perhaps to the detriment of other pathways. An example is that statins inhibit cholesterol synthesis in hopes of reducing cholesterol supply to atherosclerotic plaque, with remarkable clinical success. Yet, cholesterol and its precursors are critical for many body systems and inhibition could ultimately cause harm, such as rhabdomyolysis and diabetes (30–32).

Thus, food is more complex than drugs, but it is investigated as if it were simpler and less important. Articles concerning so-called functional foods suggest that such foods go "beyond basic nutrition" (33). Within the construct of the theory of food synergy, this is strange. There is nothing simple about basic nutrition, which keeps the multifaceted organism working well. Adding isolated substances to food helps only if the substance has a beneficial, druglike effect.

CASCADE OF MISINTERPRETATIONS

Scrinis (1) asserted that overreliance on nutrients and even on bioactive food compounds leads to problems from farm to fork. Regulators are affected because they need legally defensible rules to define regulated entities using "objective standards." These standards are not always correct from a food synergy perspective. For example, one definition of "whole grain food" is that it should have 51 g whole grain by weight and 2 g dietary fiber. This definition counts water within the total product weight and excludes rice, the latter because it is relatively low in dietary fiber.

The media is affected because nutrition does not fit easily into rapid-fire and controversial communications. The media seems to favor emphasizing contradictory findings between studies, when a scientist might weight the evidence more unevenly on the basis of study quality and other factors. Most nutrition answers are not simple, and few issues in science are settled by a single study.

The public is also affected. Most members of the public are not experts and want clear advice. Among other sorts of information, they listen to advertising and true believers. Neither source is always accurate, especially when issues are multifaceted and complex. The public is not equipped to sort through contradictory messages. In science, one speaks of provisional hypotheses that can be overturned given new evidence. It is much harder for the public, including scientists who are expert in one area but not in another, to determine that certain findings are indeterminate and to "take no action." We speculate that food-based messages would be simpler and more likely to be correct and would therefore lessen interpretive problems for regulators, media, and the public.

MOVING TO A FOOD-BASED APPROACH

For our society to move beyond the limitations of nutrient-based dietary guidelines, we need much more information about foods and health. This will require a different way of thinking as well as a change in funding priorities. Science and scientists tend to be reductionist; in the first author's experience, it is hard to get food studies past peer scientist reviewers unless the food is taken apart, apparently under the assumption that such deconstruction of food and dietary patterns does not miss important synergies. On the other hand, some scientists are beginning to recognize the importance of a shift in focus away from nutrients to foods and dietary patterns (34, 35). Set-aside or required moneys for food and dietary pattern studies are simply not there in anything like the magnitude needed to support nutrition research that would provide a truly adequate base for policy making about food. The amount of such needed funds is not clear but could be substantial.

BUILDING ON WHAT IS KNOWN ABOUT FOODS AND DIETARY PATTERNS: THE A PRIORI DIET QUALITY SCORE

One of the most consistent findings in nutritional epidemiology is reduced chronic disease risk with various dietary patterns (6, 7, 36, 37). In general, these dietary patterns are plant-centered, including vegetarian diets (3, 4). Therefore, a focus on dietary patterns may advance nutrition science and favorably affect the political cascade.

The A Priori Diet Quality Score, initially introduced in 2007 (38), is based entirely on foods and furthers this idea. This score has commonalities with the Recommended Food Score (39, 40), but the A Priori Diet Quality Score incorporates quantity as well as variety of foods. The score follows a set of principles but with slightly varying implementation between studies. Moderately detailed food groups, expressed either in grams or servings per day, are selected. Nutrition researchers rate the groups as "favorable (+)," "adverse (−)," or "neutral (0)," allowing latitude for opinion and discussion between raters. The food groups are placed in quantiles. Specifically, in the Iowa Women's Health Study (IWHS) (41), quartiles (or a large noneater category and tertiles among eaters) were used. In the IWHS, each food group contributes 0–3 points to the sum score. For "+" groups, the lowest category adds 0, the next adds 1, the third adds 2, and the highest category adds 3. For "−" groups, the scoring is reversed (eg, 3 for the lowest category). Each point of the A Priori Diet Quality Score is therefore a one-category change in one of the "+" or "−" food groups. "0" food groups do affect the score: assuming energy balance, eating any food group limits choice for other food groups. Choosing more "−" groups reduces the score. Sijtsma et al (10) described in an online table the food groups included and the agreement among ratings as the A Priori Diet Quality Score was implemented in 4 studies. The score was shown to have considerable predictive power for health outcomes, including total, CVD, cancer, and inflammatory-related mortality (41); myocardial infarction (38); diabetes (42); oxidative stress (11); body fatness and metabolic variables (12); and subclinical disease, including common carotid intima media thickness and albuminuria (43).

The A Priori Diet Quality Score was studied extensively in the IWHS (41) in women aged 55–69 in 1986. Information included periodic questionnaires and record linkage for disease ascertainment. Among 29,634 women with no heart disease, diabetes, or cancer at baseline in 1986 and adequate

food-frequency questionnaire information, there were 10,343 deaths through 2008. In **Table 1**, we describe the diet score in terms of food groups in 403 women with a score of 25 (fifth percentile) and at the other extreme in 423 women with a score of 51 (95th percentile); findings are consistent with a previously reported quantitative analysis of food group levels by quartiles of the diet score (41). Those with the higher score ate substantially more of many favorably rated foods, such as green vegetables, other vegetables, fruit, seeds and nuts, whole-grain foods, poultry, fish, oil in salad dressing, and low-fat dairy, and tended toward higher (but still moderate) alcohol consumption. However, legumes, tomatoes, coffee, and tea were only modestly higher. Among adversely rated foods, the women consumed substantially less red meat, processed meat, fried foods, butter, whole-fat dairy, soft drinks, and nonchocolate sweets. Among neutrally rated foods, they ate less refined-grain foods. Thus, a high score reflects phytochemical-rich plant foods; limits meat and favors fish and poultry; favors low-fat milk, coffee, tea, and moderate alcohol consumption; and favors less-processed foods.

TABLE 1
Description of the A Priori Diet Quality Score: food group values at the fifth percentile (score 25) and the 95th percentile (score 51)[1]

Diet category	Food groups	Score 25 (n = 403)	Score 51 (n = 423)
		servings/wk	*servings/wk*
Positively rated			
Vegetables	Beans and legumes	0.4 ± 0.5	0.6 ± 0.8
	Green vegetables	2.5 ± 2	7.6 ± 4.7
	Other vegetables	10 ± 5.5	24.4 ± 12.6
	Tomatoes	1 ± 1.3	2.7 ± 2.8
Fruit	Fruit	8.4 ± 6	18.3 ± 8.9
Nuts and seeds	Seeds and nuts	1.8 ± 3.5	3 ± 3.5
	Soy products	0 ± 0	0.1 ± 0.5
Grains	Whole grains	7 ± 7.2	15.8 ± 9
Meat	Poultry	1.1 ± 1.3	3 ± 2.7
	Fish	0.9 ± 2.4	3 ± 2.9
Fat/dairy	Oil (salad dressing)	0.3 ± 0.6	2 ± 2.4
	Low-fat dairy	4.1 ± 6.7	11.6 ± 7.9
Alcohol	Beer	0.3 ± 1.3	0.8 ± 2.9
	Liquor	0.4 ± 2.6	1.3 ± 3.5
	Wine	0.1 ± 0.3	1.2 ± 2.3
Nonalcoholic beverages	Coffee	10.5 ± 12.9	12.7 ± 12.6
	Tea	1.9 ± 5.3	3.4 ± 5.6
Sugar and salt			
Negatively rated			
Vegetables	Fried potatoes	0.7 ± 0.9	0.2 ± 0.4
Fruit			
Nuts and seeds			
Grains			
Meat	Red meat	7 ± 4.4	4.3 ± 2.7
	Liver	0.3 ± 0.6	0.3 ± 0.4
	Processed meat	3 ± 3	0.9 ± 1.2
Fat/dairy	Fried foods	3.6 ± 2.3	0.8 ± 1.4
	Butter	5.1 ± 8.1	0.6 ± 2.4
	Whole-fat dairy	16.5 ± 14.6	6.9 ± 5.7
Alcohol			
Nonalcoholic beverages	Soft drinks	2.8 ± 4.7	0.5 ± 1.2
Sugar and salt	Salty snacks	4.4 ± 5.9	3.8 ± 7
	Nonchocolate sweets	10.8 ± 8.9	5.5 ± 7.8
Neutrally rated			
Vegetables	Potatoes	3.8 ± 3.5	2.6 ± 1.8
Fruit	Fruit juice	4.5 ± 5.4	5.4 ± 5.6
Nuts and seeds			
Grains	Refined grains	12.4 ± 9.3	6.1 ± 5.7
Meat			
Fat/dairy	Margarine	9.1 ± 9.5	9 ± 7.7
	Chocolate	1.2 ± 3.3	0.5 ± 1.3
	Eggs	2.3 ± 2.6	2.2 ± 2.3
Alcohol			
Nonalcoholic beverages	Diet soft drinks	1.5 ± 5.5	2 ± 3.9
Sugar and salt			

[1] All values are means ± SDs. The same diet categories are given for positively rated, negatively rated, and neutrally rated foods. Where there is not a food group within a given diet category, the row is left blank.

The A Priori Diet Quality Score relates to nutrients mostly as expected, but not always. Mursu et al (41) showed that it was unrelated to energy intake and inversely related to *trans* fat. It was positively related to EPA plus DHA, yet was unrelated to total PUFAs and had a small positive gradient with sodium content. We performed new analyses for a few more nutrients of interest, with adjustment for age and energy intake. These showed that the fourth compared with the first quartile of the a priori score contained 7 g less sucrose/d but 5 g more fructose/d and 80 mg more sodium/d. Comparing the same groups, saturated fat was 7 g/d less and animal fat 12 g/d less; vegetable fat was 1 g/d less. All of these differences were highly significant ($P < 0.0001$). An area for investigation is whether the a priori score could be improved by further consideration of nutrient associations; however, it is also possible that the success of this dietary score could inform our concepts about specific nutrients.

Although diet is notorious for measurement variability (44–47), dietary patterns are not as subject to within-person variability as are nutrients or foods. Dietary patterns track strongly over long periods of time (**Table 2**) (10, 11, 41, 48–51), at within-person correlation levels comparable to those for measured variables such as blood pressure. The lack of correlation over 8 y of the traditional Iranian pattern (48) may reflect nutrition transition.

Higher values of the A Priori Diet Quality Score in the IWHS showed a significant inverse trend toward lower total mortality rates during 22 y of follow-up (41). Here we recomputed the findings (41) as incidence density/100 person-years for total death over 22 y of follow-up, adjusted by Poisson regression for age, energy intake, marital status, education, residence, hormone replacement therapy, physical activity, and smoking. Rates were 36.9, 34.6, 32.5, and 30.2 across the increasing score quartiles, respectively (P-linear trend < 0.0001).

Some new analyses were performed on meat intake, the lack of which defines most forms of vegetarianism. Meat intake in these IWHS women was typical of the general population: 11.3 ± 6.0 servings/wk (~290 g/d). Servings per week were 5.9 ± 4.0 for red meat, 1.9 ± 2.4 for processed meat, 0.3 ± 0.7 for organ meat, 1.7 ± 2.0 for fish and seafood, and 1.8 ± 1.9 for poultry. Only 3.8% (n = 1121) of women approximated vegetarianism, with consumption of <0.5 serving meat/d. In Poisson regression, the adjusted incidence density/100 person-years for total death over 22 y of follow-up was 33.8, 33.7, 32.8, and 33.8 across the 4 total meat intake quartiles, respectively (P-trend = 0.37). Within each quartile of the A Priori Diet Quality Score, there was no association of total meat intake with total death. Thus, the IWHS A Priori Diet Quality Score, but not meat intake, related to mortality in older women, with a significant absolute difference over 22 y of nearly 7 total deaths/100 person-years, graded across quartiles, and independent of meat intake.

LESSONS FROM THE A PRIORI DIET QUALITY SCORE

The a priori score concept appears to be a "sensible" approach to diet, consistent with the concept of food synergy. It is highly correlated with other dietary patterns that successfully predict chronic disease outcomes (41) in prospective epidemiologic study but is based only on foods. In this sense, it is directly applicable to food choice. It favors less-processed, varied plant food: a plant-centered diet.

Some lessons can be learned from this score. A palatable diet is a mixture of many foods, prepared in different ways, and dependent on factors such as taste, meal composition, and social aspects of food. A range of diets with high scores is healthful, but less healthful diets are sorted out by virtue of their low scores. A high score can be achieved with substantial flexibility in food choice but tends to minimize meat, salt, added sugar, and heavily

TABLE 2
Tracking correlation of dietary pattern scores in several studies[1]

Study (ref)	Cohort description[2]	Time interval	Name of diet pattern	Tracking correlation
		y		
CARDIA (10, 11)	Young white adults [1142]	20	A Priori Diet Quality Score	0.57
	Young black adults [1510]	20	A Priori Diet Quality Score	0.43
IWHS (41)	Older women [15,076]	18	A Priori Diet Quality Score	0.55
		18	Alternative Healthy Eating Index–2010	0.42
TLGS (48)	Adults [89]	8	Western	0.49
		8	Traditional Iranian	−0.09
ALSPAC (49)	Women (third-trimester pregnancy) [8953]	4	Health conscious	0.42
		4	Processed	0.42
		4	Confectionery	0.42
		4	Vegetarian	0.50
ALSPAC (50)	Children aged 7 y [6177]	3	Processed	0.65
		3	Traditional	0.58
		3	Health conscious	0.55
SMC (51)	Older women [967]	7	Healthy pattern	0.50
		7	Western pattern	0.39
		7	Alcohol pattern	0.46

[1] ALSPAC, Avon Longitudinal Study of Parents and Children; CARDIA, Coronary Artery Risk Development in Young Adults; IWHS, Iowa Women's Health Study; ref, reference; SMC Swedish Mammography Cohort; TLGS, Tehran Lipid and Glucose Study.
[2] n in brackets.

processed foods while emphasizing phytochemical-rich foods. It does not forbid any food.

BEYOND THE A PRIORI DIET QUALITY SCORE

Although a lot is known about nutrition and chronic disease associations from dietary pattern scores, Kant (52) sounded a discouraging note. She commented that reductions in risk of total mortality and CVD are generally <30% and that "Novel findings with the potential to change existing beliefs about diet and health relationships are yet to emerge from the dietary patterns research." More optimism is warranted about deconstructing dietary scores to get beyond the information in any given dietary score taken as a whole. Dietary scores have been much more successful and consistent in their predictions of chronic disease than have individual dietary elements, whether foods or nutrients. Further investigation in nutrition would do well to consider the successful dietary scores as a starting point.

The A Priori Diet Quality Score works well as a whole, but the nature of its predictive ability is only partially understood. Not every element of the score has equal certainty in its rating. Furthermore, the score seems to be robust to small changes in food group ratings across studies. A correlation of 0.9 was seen in 2 versions of the IWHS A Priori Diet Quality Score after changing ratings in the IWHS A Priori Diet Quality Score to more closely reflect vegetarian philosophy. Breaking meat out of the IWHS dietary score did not provide much new information. Nettleton et al (43) attempted to deconstruct the A Priori Diet Quality Score in the Multi-Ethnic Study of Atherosclerosis by forming a Simplified Healthy Dietary Pattern composed of sums of quartile ranks of 3 favorably rated foods (whole grains, fruit, and seeds and nuts) and subtracting quartile ranks from 3 unfavorably rated foods (added fats and oils, processed meats, and fried potatoes). This method of looking for a less-complex solution was fairly successful in its predictions. However, the 6 foods selected are correlated with the rest of the diet, and the residual between the full A Priori Diet Quality Score (called the "Comprehensive Healthy Dietary Pattern Score") did provide some additional prediction.

An example of a partially deconstructed diet pattern score is the Southern European Atlantic Diet (SEAD) (53), which was studied in 820 hospitalized patients with incident, nonfatal, acute myocardial infarction and 2196 population-based controls in Porto, Portugal. The SEAD score ranged from 0 to 9 points, giving 1 point for being above the median (0 points for below the median) in cod, fresh fish excluding cod, red meat and pork products, dairy products, legumes and vegetables, vegetable soup, potatoes, and whole-grain bread and 1 point for moderate wine intake.

The highest SEAD quartile (best adherence to traditional pattern compared with the lowest quartile) showed a 33% lower myocardial infarction risk (OR: 0.67; 95% CI: 0.51, 0.88; *P*-trend = 0.003). An alternative SEAD index calculated by reverse scoring for red meat and pork products led to a stronger association: 60% lower myocardial infarction risk (upper compared with lower quartile OR: 0.45; 95% CI: 0.34, 0.60; *P*-trend < 0.001). Additionally reverse scoring potatoes reduced the OR further. Ideas such as these for deconstructing successful scores should be pursued in an effort to use such scores as a stepping stone for an even better score. Thus, whereas diet scores may be robust to certain minor changes, they are also sensitive to the correct classification of certain foods as more beneficial or detrimental, such as red meats and pork products in this example. The optimal specification of diet scores should result in maximal predictive ability and thus in greater utility as the basis for dietary recommendations.

CONCLUSIONS: SIMPLE RULES SUFFICE TO FORM A DIET PATTERN FOR LONGEVITY

Several principles derived from the theory of food synergy and from studies of the A Priori Diet Quality Score can be phrased as simple rules. We expand Pollan's (2) aphorism to incorporate our own and Scrinis' (1) aversion to detrimental processing while maintaining a phytochemical-rich diet with substantial individual flexibility: "Eat foods, mostly plants, not too much, in colorful variety, maximizing nutrients per bite." "Eat foods" means to avoid many forms of industrial processing that degrade access to nutrients, phytochemicals, and other beneficial compounds. "Mostly plants" means to eat a plant-centered diet, remembering not only health but also the environmental cost of converting plants to animals. "Not too much" refers to maintaining energy balance. "In colorful variety" suggests that color may be a clue to phytochemical content and a good way to keep track of eating a variety of plant foods. It also refers to enjoyment of eating. "Maximizing nutrients per bite" is a reminder that most modern humans have low energy expenditure. We should not waste the intake allotment with low-nutritional-quality foods—for example, because of detrimental processing (ie, processing that reduces the nutritional value of food).

These simple rules may be particularly helpful for individuals selecting what to eat. Other aspects of improving the diet present a variety of other challenges. To get a healthy diet to the masses, a clever political solution is needed that delivers good food while making a profit for farmers and the food industry. At the same time, the human population keeps growing. To attain sustainability in feeding billions of people, it does not make sense to feed plants to animals and then eat the animals, certainly not to the extent to which it is currently done.

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