# Dietary Patterns and Longevity: Expanding the Blue Zones

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# Editorial

# Dietary Patterns and Longevity
## Expanding the Blue Zones

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The scientific literature on diet and health is large and burgeoning. Until now, researchers have focused predominantly on the effects of individual nutrients and sometimes foods, but rarely on dietary patterns. Outcomes are often biomarkers, risk factors, or morbidity. Studies with total mortality as an outcome are uncommon, in large part because the sample size must be extremely large and/or the duration of follow-up long. Nonetheless, such studies are important because mortality as an outcome has unequivocal clinical relevance. In this issue of *Circulation*, Heidemann and colleagues[1] document the relationship of 2 dietary patterns with total and cause-specific mortality.

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The setting is the Nurses' Health Study. In this large, prospective, observational study of 72 113 female nurses who were free of coronary heart disease, stroke, diabetes, and cancer, factor analysis identified 2 dietary patterns from data collected on serial food frequency questionnaires. One pattern, called prudent, was characterized by a high consumption of vegetables, fruit, legumes, fish, poultry, and whole grains. The other pattern, called Western, corresponded to a high consumption of red meat, processed meat, refined grains, french fries, sweets, and desserts. Individuals were classified by their level of adherence to both the prudent diet and the Western diet. After baseline data collection in 1984, follow-up lasted 18 years, during which time 6011 deaths occurred (3319 [52%] as a result of cancer; 1154 [19%] resulting from cardiovascular disease [CVD]; and 1718 [29%] resulting from other causes).

In multivariable analyses, there was a 17% lower risk of total mortality among those who were most adherent to the prudent diet (highest versus lowest quintile of adherence), a 28% lower risk of CVD mortality, and 30% lower mortality from non-CVD, noncancer causes. Interestingly, there was no significant relationship between the prudent dietary pattern and cancer. Comparing the highest and lowest quintiles of adherence showed that consumption of the Western diet was associated with increased total mortality (21%), CVD mortality (22%), cancer mortality (16%), and mortality from non-CVD, noncancer causes (31%). Hence, except for cancer, risk relationships for the prudent and Western dietary patterns appear to be the inverse of each other: Mortality increased as adherence to the prudent diet decreased and adherence to the Western diet increased.

One must be cautious, of course, about drawing causal inferences from observational studies, even if the sample size is huge and the duration of follow-up long. However, the observed relationships of dietary patterns and CVD are quite likely to be causal. There are multiple, well-defined pathways, often operating through traditional CVD risk factors (blood pressure, lipids, and diabetes), by which diet affects CVD risk.

In contrast, the relationships of diet with cancer mortality and with mortality from non-CVD, noncancer causes observed by Heidemann et al[1] may have resulted from residual confounding. As displayed in Table 2, risk ratios were considerably attenuated after multivariable adjustment. Furthermore, external evidence on the relationship of diet with the most common types of cancer (lung, breast, colon, and prostate) is considerably less compelling than corresponding evidence for CVD. Still, for certain types of cancer, diet likely has a causal role. Alcohol has well-recognized, direct relationships with cancers of the oral cavity and esophagus, especially among smokers. Evidence from a variety of sources has implicated excess salt intake and cancers of the esophagus and stomach.[2] Nonetheless, these types of cancer are relatively uncommon in the United States.

Studies of dietary patterns are inherently complex. One approach, used by Heidemann et al,[1] incorporates statistical techniques, in this case factor analysis, to identify patterns that represent actual food consumption and then to assess the relationship of adherence with these patterns to subsequent disease. An advantage of this approach is that the resultant dietary patterns reflect what individuals are eating. A disadvantage is that factor analysis may not capture all relevant dimensions of a healthy diet. For example, because sodium is ubiquitous in the food supply and because food frequency questionnaires do not accurately measure sodium intake, it is unclear whether this aspect of diets is captured as part of either the prudent or Western dietary pattern. A second disadvantage is that high adherence to the optimal pattern does not guarantee that individuals will achieve recommended or ideal intakes of nutrients. For instance, it is unclear whether persons with the highest level of adherence to the prudent diet are achieving the currently recommended intake of saturated fat intake, namely <7% kcal.[3]

An alternative approach is to develop scoring systems based on adherence to specific diets (eg, Mediterranean-style



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diets[4,5] or Dietary Approaches to Stop Hypertension [DASH]–style diets[6–8]; dietary recommendations[9]; or with a set of lifestyle behaviors that includes dietary factors[10]). This approach commonly relies on researchers who exercise best judgment in selecting biologically relevant aspects of the diet and developing a formula that typically weights each dimension to be of equivalent importance. Not surprisingly, there are different scoring systems for the same diet, ie, several for the Mediterranean diet and the DASH diet.

A complementary approach incorporates ecological analyses that take advantage of the tremendous worldwide variation in both diet patterns and disease risk. The Seven Countries Study characterized diets in countries with high coronary heart disease rates (eg, northern Finland) and those with low coronary heart disease rates (eg, Crete).[11] Regrettably, such ecological studies, particularly those that collect dietary data in a standardized fashion across multiple countries, remain uncommon despite their landmark contributions.[12,13] A related type of study is the case report of distinct populations with unusual health experiences, eg, the absence of hypertension in Yanomami Indians[14] and the impressive longevity of Japanese living in Okinawa.[15] The latter population was recently highlighted in a book that characterized diets of 4 populations with well-documented longevity.[16] Residents of Okinawa, Japan; Sardinia, Italy; Loma Linda, Calif; and the Nicoya Peninsula, Costa Rica, have extraordinarily high longevity and often survive past 90 or even 100 years of age.

Regardless of scientific approach, there is a remarkable convergence of evidence: Certain aspects of diets improve health and prevent disease, particularly CVD. Whether by factor analysis, as done by Heidemann et al,[1] by scoring systems for specific diets,[4–8] or by qualitative description of diets consumed by informative populations,[17] dietary patterns associated with longevity emphasize fruits and vegetables and are reduced in saturated fat, meats, refined grains, sweets, and full-fat dairy products.[18] Equally notable is the wide variation in other aspects of healthy diets, particularly macronutrient intake. Traditional Okinawan diets provide $\geq$90% of calories from carbohydrate (predominantly from vegetables), whereas the traditional Mediterranean diet provides $>$40% of calories from fat, mostly monounsaturated and polyunsaturated fat.[19]

Clearly, one can live long. Diet matters, as do other lifestyle habits (including smoking and physical activity), environmental exposures, and genetic factors. While scientists dissect the relative contributions of these factors, it is prudent to recommend a diet rich in fruits and vegetables and reduced in saturated fat, salt, meats, refined grains, sweets, and full-fat dairy products. Blue zones, now limited to just a few populations in the world, can become commonplace.

## Disclosures

None.

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