DEVELOPMENT OF TWO FOOD VARIETY SCORES AS MEASURES FOR THE PREDICTION OF HEALTH OUTCOMES

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Summary

Described here are methods for the calculation of two food variety scores and their applications. These food variety scores have been used in two studies and have been found to be predictive of health outcomes. The scoring systems are flexible and have the potential to be applied to a variety of studies with different designs.

I. INTRODUCTION

The relationships between diet and health outcomes have been the subject of many studies. Most of these studies have used nutrients to assess dietary intake, and in turn, to predict a particular health outcome. An alternative is to use foods to predict health outcomes. Rather than dissecting a diet into nutrients, food intake may be related directly to the health outcome by the use of food scores.

II. FOOD SCORES VS NUTRIENTS

The use of foods, and in particular food variety scores, may have a number of advantages over the use of nutrients when predicting health outcomes. Firstly, food variety together with adequacy, control of energy intake and moderation are considered important aspects of a preferred diet. Secondly, the food sources of a particular nutrient may be varied, and therefore nutrient assessment may not reflect the food source. Food variety however, encompasses sources of food intake as well as nutrients and non-nutrient components of food. Foods that offer a particular physicochemistry, or various non-nutrient components could be important to health. Thirdly, an increased food variety in the diet may dilute the effect of particular plant toxins or chemical contaminants in foods. This may be expressed another way: assuming energy balance, the probability that a particular food, or group of foods, will contribute a given amount of toxin decreases as food variety increases. This means that foods containing certain toxins will have a reduced contribution to food intake as food variety increases. A high food variety may therefore be protective against certain diseases.

III. STUDIES USING FOOD SCORES

Although most studies have relied on nutrient assessment to examine the relationship between diet and a particular health outcome, two studies have used food scores to predict coronary heart disease end points (Kushi et al. 1985; Gramenzi et al. 1990). The food scores used by Kushi et al. (1985) was calculated by determining the percentage of energy that a category of foods contributed to energy intake. It was found in this study that a "vegetable score" and a "fibre score" were related to relative risk of death from coronary heart disease.

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The study by Gramenzi et al. (1990) examined the relationship between the frequency of consumption of particular foods and acute myocardial infarction (AMI), and found that a number of foods were either positively or negatively associated with AMI. Food variety scores differ from the above food scores in that they provide a measure of the variety of food in the diet. The basis of these scores is the belief that food variety is important to health.

IV. TWO METHODS FOR SCORING FOOD VARIETY

The food variety scores described here are "food biological variety" and "food product variety". Both can be scored over different lengths of time, such as a week, a month or a year. The scoring systems make no assumptions about quantity, except that a usual serving size has been used as a minimum before a score can be given for a particular food. They also make no assumption about frequency of use, apart from defining a particular period of time over which food variety is to be scored, and no value judgements are made as to whether foods are "healthy" or "unhealthy". They can be applied to dietary intake data derived from various food intake instruments, and can accommodate different study designs.

(a) Food biological variety

An index of "food biological variety" has been developed by Wahlqvist et al. 1989.

Foods Grouped According to Biological Classification.

Group ANIMAL	Group PLANT	Group MICROBIOLOGICAL
Eggs	Vegetables:	Soil micro-organisms
Milk and dairy products	Root	Yeast
Muscle Products:	Green leafy	Fermented beverages
Fish - freshwater	Marrow - like	Fermented foods
Fish - sea-water	Flowers	
Shellfish	Stalks	
Crustaceans	Onion - like	CONFECTIONERY
Ruminants	Tomatoes	
Monogastric - domestic	Peppers	
Monogastric - game	Legumes	WATER
Avian - poultry	Cereals and grains:	
Avian - game	Wheat, rye, barley	
Organ meats:	Corn	SOIL
Liver	Rice	
Brain	Oats	
Other (kidneys, etc)	Fruits:	
Insect:	Citrus	
Insect bodies	Stone fruits	
Honey	Tropical fruits	
	Berries	
	Nuts	
	Herbs and spices	
	Fungi	

Source: D. Briggs & M. Wahlqvist (1984) Food Facts: the complete no-fads-plain-facts guide to healthy eating. Penguin Books. Australia.

Foods consumed in the diet can be categorized according to a biological classification of food for human nutrition. Foods from similar food source in nature have common nutritional characteristics. A summary of foods grouped according to biological source is given the table.

Food is broadly categorized into animal, microbiological, and plant derived sources, and then subcategorized according to biological classification. If any food within a subgroup is eaten, then a score of one is given. If many foods within a subgroup are consumed, the score does not increase. Therefore the score achieved relates directly to the number of biologically distinct foods that are eaten.

(b) Food product variety

This scoring system applies to food products; it does not subgroup foods according to biological classification. Product variety therefore takes into account different methods of processing, which can have major effects on the physical characteristics of food, as well as variety within a biological category. For example, fresh pears and canned pears would be grouped in the "food biological variety" scoring system, whereas in the "food product variety" scoring system both items may score. In this system, every food item that is consumed scores. The greater the number of distinct food products consumed, the higher the score.

V. APPLICATION OF THE TWO FOOD VARIETY SCORING SYSTEMS

The two food variety scoring systems may be applied in different types of studies examining the relationships between food intake and health outcomes. The scoring systems may also be applied to food intake information gathered using different food intake instruments. For example, if dietary intake information is obtained using a seven day food diary, then the time period which would apply to the scoring systems could be one week. For a food frequency questionnaire (FFQ), the time period may be decided by the investigators. This may depend upon the study design and the questions being asked within the study. The FFQ has the advantages of having control over the number of food items, which will be fixed, and which food items are to be included. This is important if particular foods are important in answering study questions.

There is a possibility for refinement of these methods. For example, the investigators may choose to use a plant "food biological variety" score, or a plant "food product variety" score, to predict a particular health outcome. This scoring system has been devised with no assumption about whether foods are "healthy" or "unhealthy". The investigators may choose to make this assumption about certain foods, and use a "food biological variety" score or "food product variety" score including only those foods fitting into the dietary guide-lines. The application of the food variety scoring systems therefore depends upon the method used to gather the dietary information and the objectives of the study.

Food variety scores, in relation to health outcomes, have been used in two studies. In the first of these by Wahlqvist et al. 1989, "food biological variety" was found to be associated with less macrovascular disease in those with non-insulin dependent diabetes when compared to healthy controls. In the second study by Wahlqvist et al. 1991, both "food biological variety" and "food product variety" were inversely associated with systolic blood pressure in a representative sample of the Melbourne Chinese population. Associations were also found with blood lipids. A food product variety score has also been used in a study by Horwath (1987), and was found to enhance the nutritional adequacy in the elderly.

These food variety scoring systems have the potential to be applied in a wide variety of studies. They are robust in that they are flexible for different study designs. The two food variety scoring systems described may therefore be used to determine the importance of food variety to specific health outcomes.

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