

Healthy Nutrition Environments: Concepts and Measures

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INTRODUCTION

The widespread prevalence of obesity is poorly explained by individual-level psychological and social correlates of diet and physical activity behaviors. Moreover, advice to simply “eat less and move more” ignores the complex influences of the social and built environments on individuals’ access to affordable, healthful food and activity-friendly communities. Although the body of research on active living environments has recently grown exponentially,¹⁻⁴ the same cannot be said for our understanding of healthy nutrition environments.

Eating, or “nutrition environments,” are widely believed to contribute to the increasing epidemics of childhood and adult obesity in the United States and globally. Numerous authors and agencies, including the World Health Organization,¹⁴ the Institute of Medicine,^{5,15} the International Obesity Task Force,¹⁶ and the Centers for Disease Control,¹¹ have identified environmental and policy interventions as the most promising strategies for creating population-wide improvements in eating, physical activity, and weight status.⁵⁻¹³ To make significant progress in this area of inquiry, and to inform public health policy, well-defined concepts and valid, reliable measures of nutrition environments are needed. The purposes of this editorial are to provide a brief selective overview of the literature on food environments, propose a conceptualization of nutrition environments, and describe our work to develop and test measures of nutrition environments.

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SUMMARY OF THE LITERATURE ON NUTRITION ENVIRONMENTS

Several studies have examined schools as important sources of children’s food.¹⁷⁻²⁰ For example, fruit and vegetable availability and school lunch selection correlate with youth fruit and vegetable consumption.²¹⁻²⁶

The nutrition environment might explain some of the racial/ethnic and socioeconomic disparities in nutrition and health outcomes. For instance, fast-food restaurants are more prevalent in minority neighborhoods, whereas supermarkets are less prevalent.²⁷⁻²⁹ Some healthy foods, such as low-fat dairy products³⁰ and fruits and vegetables, are less available or of poorer quality in minority and lower income areas.^{28,31} A recent, important publication reported that African-American adults’ fruit and vegetable intake increased with each additional supermarket in a census tract.²⁷

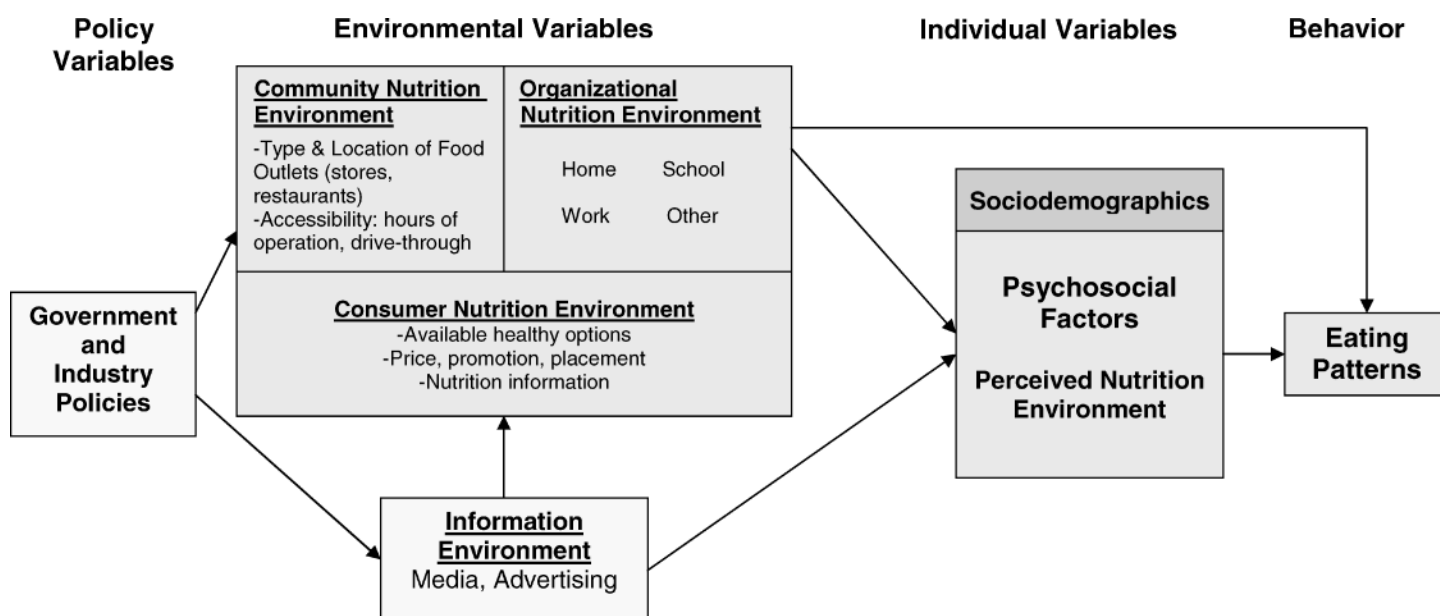
The nutrition environment in the United States has been changing rapidly. The increasing popularity of dining out over the past two decades has raised the proportion of nutrients obtained at away-from-home food sources.³² Away-from-home foods typically contain more fat and saturated fat and less fiber than foods prepared at home.³² Expanding portion sizes appear to be contributing to the obesity epidemic.³³

Price and availability are influential features of the nutrition environment—and the influences are not necessarily health promoting. Cost has been reported as the second most important factor in food decisions, behind taste.³⁴ Government regulations that affect price are consistent influences on the purchase of fruits, vegetables, beef, and pork.³⁵ Vending machine purchases have also been shown to relate to price. A recent study showed a 93% increase in low-fat snack sales after a 50% price reduction.³⁶ Although the literature to date is limited, diverse studies support the principle that nutrition environments might be important influences on eating behavior and could help explain disparities in behavior and disease. In the context of an obesity epidemic,³⁷ it is essential to improve our understanding of food environments as rapidly as possible.

CONCEPTUALIZING AND MEASURING NUTRITION ENVIRONMENTS

We propose a conceptual model for the study of nutrition environments based on an ecological model of health

Figure 1
Model of Community Nutrition Environments



behavior^{6,38} and ongoing work by the authors supported by the Robert Wood Johnson Foundation. The model incorporates constructs found or hypothesized to be related to the healthy eating outcomes from the fields of public health, health psychology, consumer psychology, and urban planning. The model in Figure 1 identifies four types of nutrition environments that need to be studied, and those environments are affected by policies of governments and other organizations. Food environments are shown as having two pathways of influence on eating patterns. Environmental effects can be moderated or mediated by demographic, psychosocial, or perceived environment variables. Environmental, social, and individual factors influence eating patterns, which in turn affect risk of many chronic diseases.

This model has been used to guide the development of nutrition environment measures that are needed to support studies of environments and eating behaviors. Because of the large number of potential variables that could be measured, we have identified the "community nutrition environment" and the "consumer nutrition environment" as highest priority because they have been less studied and could have broad effects.

At the general community environment level, we can observe the distribution of food sources, that is the number, type, and location and accessibility of food outlets. Accessibility can include drive-through windows and hours of operation. Stores and restaurants are the most numerous food outlets. We term other sources of food, such as homes and cafeterias in schools, worksites, and other locations such as churches and healthcare facilities as "organizational nutrition environments" that generally are available to defined groups rather than to the general popula-

tion. Several sources of data could be used for identifying food outlets in communities: GIS-based analyses of land use data, census data, food license lists from health and agriculture departments, Web site searches, and online Yellow Pages and phone books. Each method has advantages and limitations, and a combination is probably the best way to assure coverage.

The home environment could be the most complex and dynamic food source. Food at home is affected by food availability at other outlets. Frequency of shopping can affect the environment's effect on food choice. The primary food shopper and preparer has particular influence on the eating patterns of others in the household, so there is a strong social influence component. The availability of food and parental influence are especially strong for children.¹⁵

Several recently reported studies examined community-level access to food sources, such as grocery stores and fast-food restaurants, and have found community-level associations related to socioeconomic, racial, and ethnic health patterns.^{29,30,39} Others have found correlations of neighborhood characteristics with individual food purchasing or consumption behaviors.^{27,40} Although these relationships are particularly intriguing, such ecological studies might oversimplify complex systems.⁴¹ They suggest broad policy opportunities for health promotion, but such efforts might be misdirected if the root causes are not examined more closely. These findings are consistent with the "gravity model," which is employed in transportation and urban planning research; it predicts aggregate human behaviors related to spatial interaction, such as traffic flow and shopping activities.⁴² Recent results also support the usefulness of Zipf's Principle of Least Effort,

which suggests that relative proximity in space of healthy vs. unhealthy food products affects the odds of a healthy vs. an unhealthy diet.⁴³

Consumer environment data reflect what consumers encounter within and around a retail food outlet (i.e., store or restaurant), and most of these characteristics also will apply to food sources in organizational environments, although the home might be a special case. Relevant characteristics can include nutritional qualities, price, promotions, placement, range of choices, freshness, and nutritional information. In retail food stores, the target categories of food of broadest interest would be those most closely related to obesity and other chronic diseases (i.e., those that contribute most to fat and calories⁴⁴ and those that are most recommended for healthful eating^{45,46} and are consistent with the Dietary Guidelines for Americans and the Food Guide Pyramid^{47,48}). Therefore, the *categories of foods* of highest priority are proposed as dairy products, meat and poultry, fruits and vegetables, packaged main dishes, and baked goods/sweets.

Our current work developing environmental assessments in retail food stores (grocery/supermarket and convenience stores) measures two factors for fresh and packaged food products: availability of healthy food options (low-fat, vegetables, fruits or unsweetened fruit juices) and cost. Cost is assessed per pound for fruits and vegetables and for “healthy” vs. “regular” options for comparable products, such as low-fat dairy products, lean meats, and prepackaged main dishes. Specific criteria for what is “healthful” have been suggested by various health researchers and community and government agencies,^{45,46,49,50} and these criteria should be adapted for use in consumer nutrition environment indicators.

Some of the earliest published measures of availability were reported by Cheadle and others,^{51–53} who calculated the percentage of shelf space used for healthy food options, such as low-fat milk and cheese and lean meats. These measures are theoretically robust but could be more difficult to apply in contemporary grocery stores that are larger and more varied in layout than they were a decade ago. Other opportunities for consumer-level measures in stores include assessing product promotion and placement related to children (e.g., store displays marketing energy-dense foods; unhealthy products on lower shelves). These issues have been found to be important in tobacco control efforts.⁵⁴

Assessments of the consumer nutrition environment at restaurants, including fast-food restaurants, are more challenging than food store measures, and there are few published examples.^{55,56} We propose restaurant evaluations initially focus on four indicators of the availability of healthy choices or options: healthy main dish choices (low-fat, low-calorie, healthy main dish salads), availability of fruit (without added sugar or sauce), availability of nonfried vegetables (and vegetables without fat-laden sauces), and portion sizes (availability of small portions and, for chain restaurants, presence of “super-sizing”). These selected key variables are recognized in the descriptive literature as contributing to consumer food choice and are most likely to affect weight and cardiovascular

risk factors. Because many restaurant chains and most fast-food restaurants publish their menus and nutrient values, it is possible to obtain nutritional information from books or on the internet. However, an important caveat is that such information is seldom available at the point of choice, where it would be most informative to customers. Other key data sources for restaurant environments include reviewing menus, interviewing managers or making inquiries to waiters, and visual scanning of the restaurant environment. Although it might be easy to determine whether restaurants offer super-sized items, other dimensions of restaurant offerings are more difficult to evaluate if nutrition information is not provided.

We identify the “information environment” as a fourth, independent type of environment whereby media reports and advertising are affected by government and industry policies, and could in turn affect attitudes and the appeal of certain foods and food sources. The information environment is unique because it can operate on a national or regional level, as well at the neighborhood and store or restaurant level.

Although there are an increasing number of reports of various dimensions of nutrition environments, there is no guidance in the literature on how best to measure nutrition environments in a comprehensive manner. Our typology is based on an ecological model, our field experience, criteria put forward by authoritative health groups, and preliminary studies. Our Nutrition Environment Measurement Study (NEMS), currently underway, is an effort to develop a comprehensive set of tools that is reliable and demonstrates criterion validity to characterize nutrition environments in neighborhoods. In defining these measures, we have been attentive to the nutritional meaningfulness of indicators, relevance and feasibility of measures, and potential for linking environmental and individual assessments in subsequent studies.

CONCLUSION

The model in Figure 1 is presented as a starting point for conceptualizing nutrition environment variables that are believed to be related to eating behaviors. On the basis of a broad consideration of nutrition environments, our group prioritized specific variables in the community and consumer environments. Measures are being developed that will allow associations between environments and eating behavior to be tested. It is likely other investigators will prioritize other food environment variables, so additional measures will need to be developed. More setting-specific models might be needed as well. The complexity of the research area is clear, but given the public health imperative to improve eating behaviors in the population,³⁷ greater priority needs to be given to understanding the role of food environments on individual’s eating patterns.

Acknowledgment

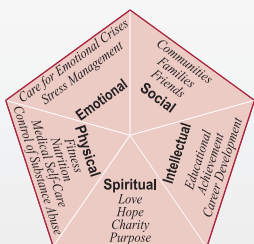
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