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What Determines the Variety of a Household's Vegetable Purchases?

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The USDA encourages people to eat a variety of fruits and vegetables through the Food Guide Pyramid and participation in the National 5 A Day Partnership. A varied diet helps ensure a complete mix of nutrients, and a lack of variety in vegetable consumption has been further linked to the incidence of obesity (e.g., McCrory et al.). To assist these efforts, the USDA's Economic Research Service has investigated the factors that influence the purchase of vegetables, and identified obstacles to variety. These obstacles stem both from a household's level of spending on vegetables and its demographics. Social marketers and nutrition educators could use this information to better tailor their message, or determine whether any one group of consumers needs to be targeted.

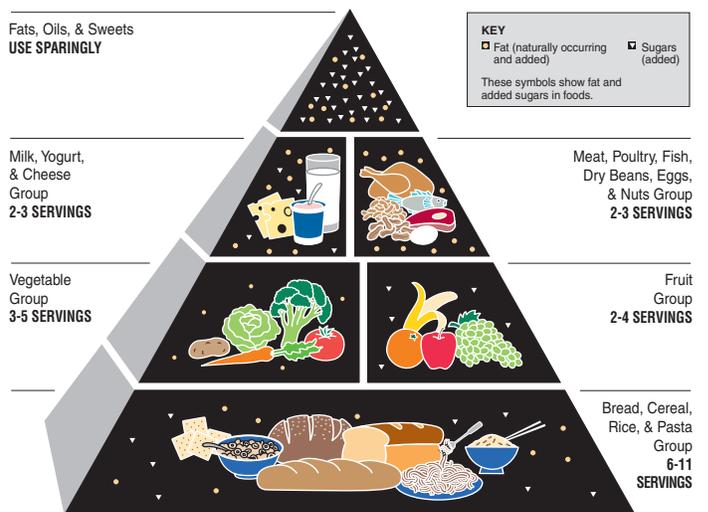
What Determines Variety?

Social marketers behind the 5 A Day campaign have long encouraged households to allocate more of their food dollar to fruits and vegetables, and it is likely that these efforts are already encouraging variety. A number of economic studies have found a positive relationship between a household's expenditures on food and the variety of foods purchased.

If a household's expenditures on vegetables are likely to affect the variety of its purchases, then so too are a household's income and demographic characteristics. Higher income households spend more money on fruits and vegetables, as do households with members who are older and who have a college education (e.g., Blisard et al.).

However, demographics could have a more direct impact on variety. Regardless of how much is spent on vegetables, we might expect differences in variety due to households' race and ethnicity, the number of people living in the household, or age and education. Suppose a homemaker is preparing a meal for his or her spouse and their children.

Food Guide Pyramid A Guide to Daily Food Choices



Source: U.S. Department of Agriculture/U.S. Department of Health and Human Services



Through the Food Guide Pyramid and participation in the National 5 A Day Partnership, the USDA encourages the consumption of a variety of fruits and vegetables.



The dish being prepared can be served with three different vegetables—potatoes, corn, and carrots. All members of the household like potatoes. However, at least one child dislikes corn, while another dislikes carrots. Does this homemaker tend to serve all three items, so that everyone in the household can have everything they like? Or does this homemaker tend to serve only potatoes because that item is agreeable to everyone?

How We Measured Variety

The annual purchases of 6,344 households at retail food stores in 1999 were examined. These marketing data allowed us to identify purchases corresponding to each of 24 types of vegetables: artichokes, asparagus, broccoli, brussel sprouts, cabbage, carrots, cauliflower, celery, corn, cucumbers, eggplant, iceberg lettuce, green beans, lettuces (other than iceberg), mushrooms, onions, peas, potatoes (other than sweet potatoes), radishes, spinach, squash, sweet potatoes, sweet peppers, and tomatoes. Each of these 24 types may include frozen, fresh, and canned items. For example, we identified purchases of spinach in all three forms, but iceberg lettuce was observed in only one form, fresh.

Variety was next defined over a full year of purchases for each household in two ways. First, we counted how many of the 24 different types of vegetables a household had bought. Second, we used a Simpson index to measure how evenly a household had spread its servings across all 24 of these types. The Simpson index assigns a lower score to households con-

centrating more of their purchases on only one or two vegetables. Thus, each measure of variety tells a different aspect of the same story. Suppose two households had each purchased one or more servings of each of 10 types of vegetable. By our first measure of variety, the two households have an equally diverse diet. Further suppose, however, that one household had purchased 100 servings of each of the 10 types, while the other had bought 900 servings of just one type, and only a few servings of each of the other nine. The Simpson index would assign a score of about 0.90 to the household allocating an equal quantity share to each type of vegetable, and a score of about 0.20 to the household concentrating most of its purchases on just one type of vegetable.

Finally, a two-step statistical model was estimated. In the first step, we explain a household's level of spending on vegetables as being dependent upon its income and various demographic characteristics. In the second step, we further demonstrate how a household's variety of purchases depends upon its demographic characteristics, holding fixed the household's level of spending from the first step. A more complete description of this model is provided in a forthcoming article in the *Review of Agricultural Economics* by H. Stewart and J.M. Harris, "Obstacles To Overcome in Promoting Dietary Variety: The Case of Vegetables."

Households spent \$56 per person per year, on average, to buy 13 of our 24 types of vegetables.

Expenditures Are Critical

If social marketing campaigns can encourage households to spend more money on vegetables, then our statistical analysis suggests that they may already be encouraging households to buy a wider variety of vegetables. Households spent \$56 per person per year, on average, to buy 13 of our 24 types of vegetables. If social marketers could induce the typical household to double its spending to \$112, we would expect this household to buy 3 or 4 more types of vegetables. Similarly, we would expect the same household to score 32 percent higher on the Simpson index. In 1999, only 12.5 percent of households spent \$100 or more per person per year.

Income was found to be important to variety, because a household's income affects its vegetable expenditures. For example, an increase of 10 percent in a typical household's income is associated with spending 2.5 percent more on vegetables.

A number of demographic factors are also found to influence a household's expenditures on vegetables. For example, an increase of 10 years in the age of a household's head is expected to raise that household's annual, per-person spending on vegetables by about \$8.33 (an increase of about 15 percent for the typical household).

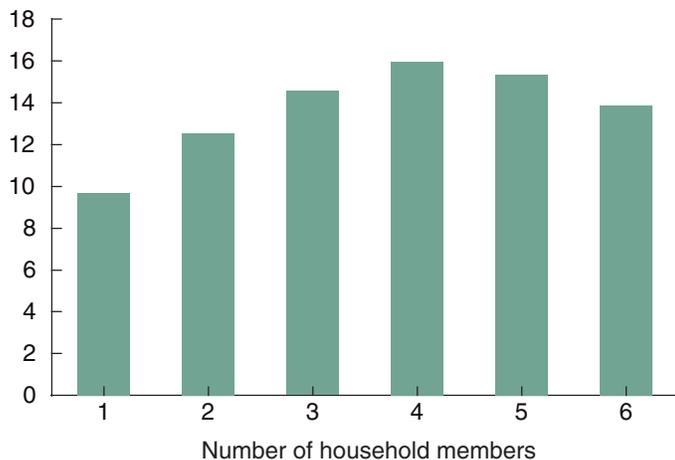
The relationship between variety and spending for vegetables is nonetheless an imperfect one. For example, one surveyed household spent \$231.38 on vegetables in 1999. They bought 2.5 servings of carrots, 2 servings of onions, and 652 servings of potatoes (mostly frozen). While this example is admittedly extreme, our findings about the direct effects of demographics on variety help to explain this sort of behavior.

Demographics Are Key to Variety

For any level of spending on vegetables, the number of people living in a household affects the variety of that household's purchases. In fact, variety of purchases increases if a second person is added to a single-person household, probably because both people are exposed to foods enjoyed by the other. A different picture emerges as more people are added to the household, however. Variety will decrease if an

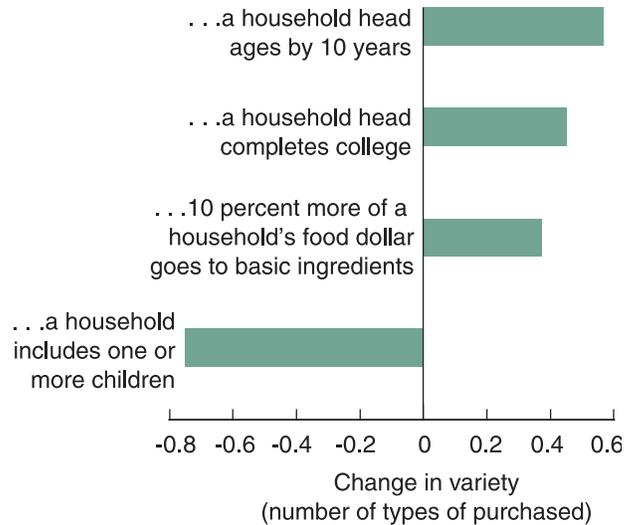
Variety increases with the size of a household up to a point, and starts to decrease thereafter

Variety (number of types purchased)



Note: Variety of purchases was simulated by holding all variables at their sample mean except for a household's size. Similar results apply if variety is measured by the Simpson index. Source: Economic Research Service.

Differences in variety can also be expected if...



Note: Similar results apply if variety is measured by the Simpson index.

Source: Economic Research Service.

additional person is added to a household with five or more members. This is somewhat surprising. Because they eat out less often and buy fewer convenience foods, larger families are a prime market for basic food ingredients, which include vegetables. One possible explanation is that homemakers in larger households have greater difficulty producing meals with vegetables that all members of their household find acceptable.

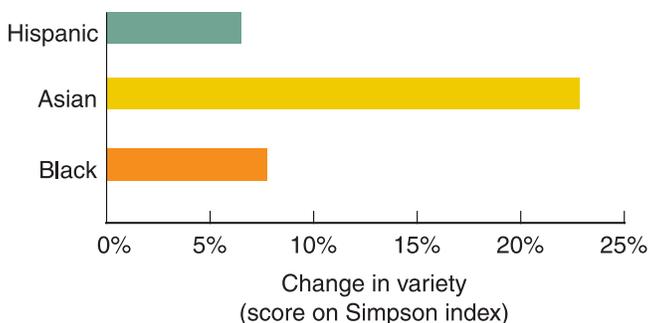
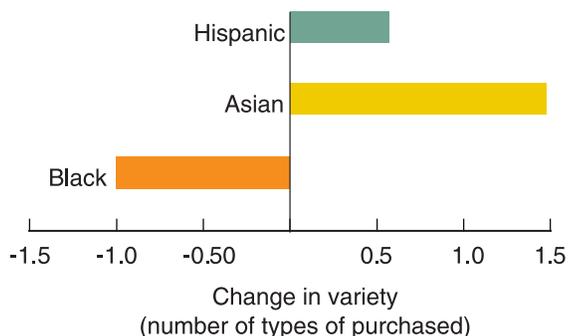
Consistent with the above, if one or more members of a household are children, the household is likely to purchase one fewer type of vegetable. This finding is consistent with the possibility that children are most likely to protest the presence of certain vegetables on the dinner table.

Youth can also limit variety. Compared with a household headed by a 50-year old, a household headed by a 30-year old is expected to buy one fewer type of vegetable and spread out its servings of vegetables 5 percent less evenly, as measured by the Simpson index.

Education may promote variety. A household with a college-educated head is expected to buy slightly more types of vegetables than an otherwise identical household whose head has not completed college.

Households likely to cook more meals from "scratch" also appear to buy a more varied mix of vegetables. If a household spends 10 percent more of its at-home food dollar on 39 basic cooking ingredients other than vegetables (e.g., cooking oil, flour, and sugar), that household scores 4.1 percent higher on the Simpson index.

Relative to White, non-Hispanic households, Asian and Hispanic ones purchase more variety, Black households buy fewer types of vegetables, but spread out their purchases more evenly across what they do buy



Source: Economic Research Service

Finally, *race and ethnicity are important*. As measured by the Simpson index, Asian and Hispanic households spread out their vegetable purchases 23 percent and 6.5 percent more evenly than White, non-Hispanic households do.

Implications for Social Marketers

Encouraging households to allocate more of their food dollar to vegetables may be a reasonable starting point for promoting variety. Still, social marketers may want to add strategies for overcoming obstacles associated with demographics. For instance, returning to our simple example of a homemaker preparing a meal for his or her spouse and their children, the typical homemaker may serve only the potatoes to negate the competing preferences of different household members. To overcome this sort of problem, social marketers might suggest offering a raw vegetables platter from which each household member can take what they like, exposing all members to a variety of foods without limiting the choices available to others. Another strategy for social marketers to consider might involve exposing children to a wider variety of vegetables through ethnic dishes. Asian and Hispanic diets appear richer in variety than those of other ethnic groups.

Information Sources

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