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Meets learning need codes 9010, 9020, 9060, and 9070

Secondary analysis of a marketing research database reveals patterns in dairy product purchases over time

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ABSTRACT

Objective Development of a method using marketing research data to assess food purchase behavior and consequent nutrient availability for purposes of nutrition surveillance, evaluation of intervention effects, and epidemiologic studies of diet-health relationships.

Design Data collected on household food purchases accrued over a 13-week period were selected by using Universal Product Code numbers and household characteristics from a marketing research database. Universal Product Code numbers for 39,408 dairy product purchases were linked to a standard reference for food composition to estimate the nutrient content of foods purchased over time.

Subjects/setting Two thousand one hundred sixty-one households located in Victoria, Texas, and surrounding communities who were active members of a frequent shopper program.

Analyses Demographic characteristics of sample households and the nutrient content of their dairy product purchases were analyzed using frequency distribution, cross tabulation, analysis of variance, and *t* test procedures.

Results A method for using marketing research data was successfully used to estimate household purchases of specific foods and their nutrient content from a marketing database containing hundreds of thousands of records. Distribution of dairy product purchases and their concomitant nutrients between Hispanic and non-Hispanic households were significant ($P < .01$, $P < .001$, respectively) and sustained over time.

Application/conclusions Purchase records from large, nationally representative panels of shoppers, such as those maintained by major market research companies, might be used to accomplish detailed longitudinal epidemiologic studies or surveillance of national food- and nutrient-purchasing patterns within and between countries and segments of their respective populations. *J Am Diet Assoc.* 2003;103:445-453.

Accurate longitudinal measurement of nutrient intake continues as a sought after, but elusive, goal of epidemiologists because repeated, detailed registries of food consumption are required to account for the effects of intraindividual variation, seasonal and socioeconomic factors, and influences of social interventions (1). Debate continues over the merits and limitations of current methods for quantifying (over time) food and nutrient intake of individuals and groups (2-7). Unfortunately, current methods of determining longitudinal patterns in individual dietary practices are complicated and expensive (8-11).

Potential for using marketing research data, collected from regional supermarkets or national shopper panels, in measuring nutrient availability or monitoring changes in food-purchasing behavior at the household or population level has been suggested but not fully developed (12-21). It is possible that the nutrient content of food purchases, used as proxy measures of nutrient availability, might provide useful information

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regarding long-term dietary habits and their association with health status and evaluating behaviorally based programs designed to alter dietary habits (22-28). Improved methods of estimating food and nutrient availability may be of value in nutrition surveillance, development, and evaluation of nutrition intervention programs and understanding the relationship between diet and health.

A study utilizing marketing research data from an urban community in Texas was undertaken to explore development of a method for determining long-term nutrient availability patterns. Dairy product purchases were selected because (a) they are the source of significant quantities of several important nutrients (calcium, vitamins A and D, fat, and cholesterol) in the US diet (29,30), (b) nearly all dairy items have a Universal Product Code (UPC) number assigned, (c) dairy products represent a category of foods large enough to explore realistically the strengths and limitations of the proposed methodology, (d) dairy products are relatively distinct in their definition, and (e) Hispanic household purchases of dairy products were expected to be lower as a result of the relatively high prevalence of lactose intolerance among Hispanics (31). For the purposes of this study, dairy products were defined as products or by-products of the milk of domesticated animals, excluding butter, processed for human consumption.

MATERIALS AND METHODS

The H.E. Butt Grocery Company (HEB) operates supermarkets in communities throughout south and central Texas. The company developed the Select Circle Program (SCP) to examine the results of HEB's advertising on supermarket sales. Customers participating in the program received incentives of frequent shopper bonus points, a small discount on purchases, and a plastic identification card marked with a bar code unique to each individual and household. This bar code was scanned at the checkout stand along with the UPC number of each item purchased. In the case of items such as fresh fruits, which carry no bar code, product numbers were keyed in at the checkout stand using a code assigned by HEB. The date and time of each scan were also recorded and archived for each item purchased. Because the purpose of this study was to develop a new survey method, we used data from records of purchases made by members of the SCP during the 13-week (91 days) period July 31, 1988, through October 29, 1988.

The SCP database at that time included 12,516 households located in Victoria, Texas, and surrounding communities. Application for membership in the SCP captured both identification and demographic information for the applicant and residents of the applicant's household. A sample of these households was selected by demonstrating that HEB stores were a major source of their food purchases. Criteria for inclusion in the sample were the following: (a) the family spent at least 60%, but not more than 130%, of the weekly food expenditure average for families of that size as estimated by the National Consumer Expenditure Survey (32), and (b) sample households had enrolled in the SCP prior to the 13-week study period. Two thousand one hundred sixty-one households in this dataset met inclusion criteria. Determining the viability of using household characteristics, ethnicity for example, in explaining differences in purchase patterns was an important element of the research. However, in this dataset, ethnicity of SCP households had not been recorded and was instead imputed for sample households using the customer's surname

(33-39). Of 2,161 SCP sample households, 406 households (883 residents) were assigned Hispanic ethnicity, and 1,755 households (4,031 residents) were assigned non-Hispanic ethnicity.

Improved methods of estimating food and nutrient availability may be of value in nutrition surveillance, development, and evaluation of nutrition intervention programs and understanding the relationship between diet and health

Household and customer identification numbers were used to extract all purchases recorded for the SCP study population for a 13-week period. A computerized file of UPC numbers was used to extract dairy item purchase records from the file of 195,210 purchases made by SCP sample households during the study period. Dairy UPC numbers were linked with appropriate food codes from a United States Department of Agriculture (USDA) standard reference of food composition (40,41), and the total nutrient content of each of the 39,408 dairy product purchases was aggregated via the customer number to the household level.

Characteristics of sample households, their dairy product purchases, and dairy item nutrient aggregates (39,408 purchases) were analyzed using analysis of variance routines available in SPSS (SPSS for Windows, Rel. 10.0.0. 1999 SPSS Inc., 233 S. Wacker Drive, Chicago, IL).

RESULTS

Feasibility of using marketing research data to estimate nutrient availability over time in a cohort of shoppers was evaluated by assessing the process and subsequent quantitative results of transforming large volumes of household and general purchase data into an enhanced research database, aggregating information regarding household and food purchase characteristics, and estimating differences in nutrient purchases associated with household characteristics over time.

Transforming and Enhancing Data

Data from SCP membership and purchase files (390MB) were transformed into a normalized relational database. A total of nine supporting relational database tables were created to effect the assignment and aggregation of dairy product categories and nutrient content of those purchases. These tables included attributes of HEB stores, SCP customers, SCP households, dairy product categories (Table 1), actual purchase records, dairy product UPC and USDA food code linkages, HEB item category codes, standard reference code numbers for dairy products, and USDA dairy product descriptions and code numbers. Because customer number information was well maintained by HEB and each purchase record included a customer number for each UPC item, purchases for the entire sample of households were efficiently retrieved for analysis.

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