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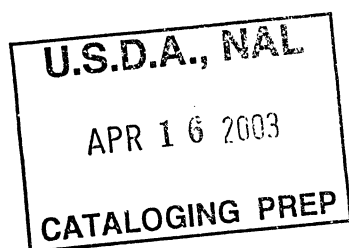
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Food Demand and Consumption Behavior  
Selected Research Topics

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## DATA SYSTEMS ON FOOD DEMAND AND CONSUMPTION: PROPERTIES, USES, FUTURE PROSPECTS

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The purchase and consumption of food products is probably one of the most extensively catalogued behavioral patterns of our generally well documented society. As in most other informational fields, the Federal Government devotes a considerable amount of its statistical resources to this end. However, unlike other subject areas such as employment, health, education, or crime, this is one sector where the sheer volume of activity in the private arena is undoubtedly even greater.

In addition to a plethora of sources, there may be an ever greater diversity of techniques associated with data systems in this field. In some cases, the methodologies are dictated by the objectives of specific endeavors, but perhaps more often, they may represent primarily the predilections of the respective practitioners.

In the remainder of this report, an attempt will be made to identify and describe at least the more significant efforts of this kind and to provide some appraisal of their utility and significance from the standpoint of analyzing food demand and consumer behavior.

### COMPREHENSIVE AGGREGATE SOURCES

As might be anticipated, the only comprehensive aggregate sources of data on food purchase and consumption are compiled by the Federal Government. Two of these will be examined briefly for purposes of this report--the Personal Consumption Expenditure (PCE) estimates compiled by the Commerce Department in conjunction with the Gross National Product accounts and the estimates of expenditures by the U.S. civilian population for farm-produced foods prepared by the Economic Research Service (ERS) of the Department of Agriculture.

The PCE estimates start with production aggregates--from the Department of Agriculture for fresh foods and from the Censuses of Manufactures for processed foods--and convert these by means of a complex series of transformations to a final expenditure basis. A description of the procedures occupies a hundred or more pages of text and will not, for obvious reasons, be repeated here (U.S. Dept. of Commerce, 1954). Essentially, the process entails the use of input-output matrices to follow the flow of commodities from the production

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stage through the various channels in the economy with estimated cost and profit margins appended at each step. On a current basis, the PCE food estimates are produced in only 4 broad categories—food purchased for off-premise consumption (primarily for home use), purchased meals and beverages, food furnished government (including military) and commercial employees, and food produced and consumed on farms. For benchmark (quinquennial economic census) years, however, they are prepared in considerable product detail.

The ERS estimates also start with production data from the Department of Agriculture adjusted for imports and exports and non-civilian use (U.S. Dept. of Agriculture, 1975). The base data are converted to a civilian expenditure basis using consumer price indexes from the Department of Labor, where available, or from the Agricultural Marketing Service in other instances. The current annual estimates at the consumer level are prepared in 15 broad categories. For about 7 groupings, representing combinations of these 15, a split is provided between food expenditures for home use and meals purchased in restaurants and other eating places.

Although the production data which underlie these constructed aggregate series are probably among the more reliable of our statistics, there is no way of assessing the validity of the numerous transformations required to convert to a final expenditure basis. A more serious limitation for our purposes may be the absence of geographic, demographic, or socio-economic detail associated with the data. Nevertheless, such series are of value from a number of standpoints. For one thing, they provide the only available sources of information on consumption of specific food products combining both the content of meals at home and the ingredients of those purchased in restaurants and other eating places. Information on detailed foods is ordinarily available from survey sources only for consumption at home; there is usually no reliable way of ascertaining the specific content of meals eaten out. Secondly, the aggregate sources can serve as a standard against which to compare survey data or even possibly to derive adjustment factors to apply to usually deficient survey results. Finally, the data are available on a more-or-less continuous basis, albeit in limited detail.

#### DISTRIBUTION SOURCES

A more direct way of measuring final consumption of food products is through various distribution sources, of which the principal examples are the following:

##### Retail Trade Censuses and Surveys

The most comprehensive of these, but probably the least relevant for our purposes, are the retail censuses and surveys of the Bureau of

the Census. On a current basis--and even for the main body of census statistics--the data are classified only by the "kind of business" of the retail establishments; that is, whether they are food stores, drug stores, clothing stores, etc. which obviously provide only a general picture of the products sold. In the quinquennial Census of Business, however, an effort is also made to obtain a distribution of sales by merchandise lines (U.S. Dept. of Commerce, 1975). For all establishments, information is requested on total sales of food products at retail and for receipts from meals or snacks served on the premises. For the kind of establishments likely to sell food products, a further distribution of sales by broad categories is solicited--meat, poultry, and fish; produce; frozen foods; dairy products; bakery products; and all other foods. Reporting of this information is less complete than for most other aspects of the census but still approximates 80-85 percent. The Bureau adjusts the reported figures to allow for non-response.

There are some conceptual and coverage differences which affect the usefulness of these data as a measure of consumer demand. On the one hand, the retail sales data include sales to businesses, institutions, and other nonprivate users although these are not likely to be large for food products. On the other hand, the census probably excludes many seasonal and intermittent enterprises, such as fruit and vegetable stands and other non-retail source of consumer purchases. As for the aggregative series, however, probably the greatest limitation is the absence of data on the characteristics of the purchasers.

As noted, even these limited merchandise line data are available only for quinquennial census years. There has been considerable discussion concerning the possibility of obtaining similar information on a current basis as part of the Bureau's current retail trade surveys. The growing tendency for larger establishments, at least, to broaden or even generalize their merchandise lines renders the traditional "kind of business" classification increasingly obsolete. The obstacle has been the concern of the Bureau regarding the validity of merchandise line data and the difficulty of obtaining them on a current basis. There is no question that the feasibility of such an undertaking would be rather dubious from the standpoint of the monthly retail sales statistics, which are used primarily as current economic indicators. However, there is also an annual retail trade survey, now devoted primarily to inventory data, which would appear to be a suitable vehicle for this purpose. The continued development of automated checkout systems in retail outlets, associated with the "universal product codes" now appearing on most packaged and canned items (and likely to extend to numerous others in the future), could constitute a turning point in the ability to obtain reliable and detailed merchandise line sales data on a reasonably current basis and without excessive cost.

## Warehouse Shipment Data

Another type of distribution data source is represented by the information on warehouse shipments to supermarkets and other food stores compiled by Selling Areas - Marketing, Inc. (SAMI), an affiliate of Time Magazine. These statistics are assembled through automated data systems in 33 metropolitan areas constituting some 70 percent of national food sales. At 4-week intervals, shipment data are compiled for each area for over 300 dry, frozen, and packaged food products and a substantial number of nonfood items carried in those stores. Fresh meat and perishables such as milk and bread are not covered. National projections are also prepared annually or for other periods based on the data for the covered markets.

One advantage of this system over the retail trade data discussed earlier is in the wide range of detail and the frequency of compilation. As such, they would be of major value to food manufacturers and distributors in charting the flow of their products. The omission of some rather important food items and the lack of data on the characteristics of the purchasers are among the more evident limitations for demand analysis. The validity of national projections based on 33 areas, even though representing all of the largest ones, creates some additional uncertainty.

## Store Audits

Without doubt, the most exhaustive approach to data collection through distribution sources is exemplified by the so-called "store audits" conducted on a bi-monthly basis by A. C. Nielson Co. in a national sample of grocery and drug stores and by Audits and Surveys, Inc. covering a range of products of different kinds. The complexity of this approach requires lengthy personal visits by field agents of the audit firms. The objective is to calculate sales data for a reporting period through an actual physical shelf and store room inventory of the products involved and a tally of invoices received during the reporting period. Applied against the inventory count at the previous visit, this approach provides information on the number of units of a given product which were sold (or otherwise disappeared) during the reporting period. The physical count is converted into dollar sales by using the shelf price stipulated for each product.

The main practitioners appear to use carefully designed samples and highly trained field staff and the output, for what it represents, is probably comparable in quality to even the better designed Government sources. One problem is that the understandably high cost of the undertaking limits the product coverage of the periodic canvasses and probably precludes ever extending the procedure to the full range of

food items, especially those for which no strong sponsorship is likely to be forthcoming from manufacturers. Also, like the other distribution sources, the system provides no information about the purchasers of the products. In an effort to overcome this limitation, Nielson has been experimenting with correlating the locations of its sample stores with Population Census tract areas, to explore the possibility of attributing the characteristics of the tract residents, perhaps through regression techniques, to the clientele of the establishments. Although hardly a complete solution to the problem, this exercise may represent a useful step in the direction of possible integration of establishment and household data.

### CONSUMER PANELS

This genre, which is most typically found in the market research field, was perhaps at one time regarded as the ultimate form of data collection for food purchases and other aspects of consumer behavior. The essential characteristic of these operations is the collection of data from the same respondents on a continuing basis over a lengthy or indefinite period of time. There are numerous examples of current or prior operations of this kind although the number appears to be diminishing as a consequence of the increasing cost and difficulty of maintaining such systems. Although variations abound, two general types will be examined for purposes of this report.

#### Panels With Limited Product Coverage

Few, if any, consumer panels in the commercial field cover more than a limited range of products, understandably those for which they have immediate or prospective clients. The coverage in such panels is hardly ever complete even within specific categories such as food products. Perhaps the best example of a commercial operation is the long-standing National Consumer Panel conducted by the Market Research Corporation of America (MRCA). This example is selected for illustrative purposes because of its scope and longevity and because published research findings, at least in earlier years, provide us with a little more insight into its operations than in the case of more restricted endeavors (Sudman 1959, 1964).

The primary objective of the MRCA panel is to serve the interests of manufacturers and distributors in measuring the size and composition of their market and in studying market trends. The results are also a basis for evaluating the effectiveness of advertising campaigns and special marketing policies, such as special sales and premiums. Major interest is also focused on the proportion of sales occurring in various kinds of outlets, and in changes in product and brand preferences over time and among different population groups.

The operation uses a "fixed" panel, that is, one which is not automatically rotated on a periodic basis. Of course, some replenishment is needed to reflect newly formed households and replacement is required for those discontinuing cooperation. The information is collected by means of diaries maintained by the respondents on a weekly basis for food products and other supermarket items and on a monthly basis for other items, mainly clothing and household textiles. Aside from initial recruitment of households, virtually all contact between MRCA and respondents is by mail. (In fact, during periods of rapid sample expansion, even recruitment may be by mail or telephone.) The general procedure is to mail respondents a set of blank diaries who return the completed ones weekly or monthly, as the case may be. The respondents receive a certain number of "points" for their participation, with special bonuses for prompt and complete cooperation, which are redeemable in merchandise.

Although the content changes, the present weekly diary contains about 72 itemized food products and about 15 other items. (The monthly diary covers about 34 non-food products.) A separate section in the diary form (the weekly diary is about 30 pages in length) is set aside for each product. An example of a product for this purpose would be "Juices-canned or bottled" which contains many sub-categories. Each product class calls for a number of special descriptive items; for the above example, these include type of fruit juice, brand used, whether concentrated or ready to serve, and whether in metal can or glass bottle (or other container). In addition, there are the standard questions on quantity purchased, weight or size of unit, price paid, whether bought on special sale or offer, and where purchased.

The sample is a multi-stage probability design, currently consisting of about 7,000-7,500 households nationally. The first stage is selection of primary sampling units (psu's) consisting of all large metropolitan areas and a probability selection of smaller urban and rural areas from strata consisting of all such areas in the country; the number of sample psu's is about 250. Within selected urban psu's, specific households are selected systematically from telephone directories (thus omitting those without telephones); in rural areas, area sampling methods are used. In preparing estimates, sample household counts are weighted up to independent estimates of households projected from the most recent census data in about 400 cells, reflecting geographic location, city size, and size of household, among other variables.

These details are cited above to illustrate that an effort is made to maintain a probability design in spite of the difficulties. The main problem, as in nearly all other such panel operations, is achieving adequate levels of cooperation and avoiding the biases inherent in underrepresenting various segments of the population. In order to recruit new members, it is usually necessary to contact



several households in order to obtain an acceptance. Turnover in the continuing panel can amount to 25 percent or more a year because of drop-outs alone (even though an effort is made to follow movers). It is obviously difficult to locate and recruit the proper proportion of newly formed families. Comparisons of panel characteristics reveal that the cooperating panel has a lower-than-average proportion of one-person households and of those in lower income brackets. The weighting scheme can only partially compensate for these various kinds of biases. Perhaps even more important, weighting can do little to counteract the probability that continuing panel survivors are more likely to be the better organized and more price-conscious families within each population class.

MRCA, of course, makes continuing comparisons between aggregates derived from the panel and production and sales data from its clients. The comparisons are regarded as proprietary and not usually revealed except to the relevant clients. Limited data made available to this writer indicates there is apparently a considerable shortfall in the level of purchases reported in the diaries especially for the monthly products but even for food and other of the weekly items.

In this system, we have for the first time the ability to analyze expenditures for geographic, demographic, and socio-economic population groups. The frequency of collection and the exhaustive detail for those products covered in the diaries represent other advantages. Also, although this is not apparently pursued to a major degree, there is the theoretical ability to link together the observations for the same respondents over time for purposes of longitudinal and long-term analysis.

The limited product coverage of even the more comprehensive of these commercial panels obviously limits the value of the data for demand analysis. Also, the biases of nonresponse, selectivity in panel membership, and possible conditioning of buying habits among long-term panelists create considerable uncertainty concerning the representativeness of the data. Although this problem may not severely impair the principal commercial objectives of the system, provided the biases are reasonably constant over time, data on the level of demand could be materially affected. The apparent understatement in reporting even among cooperators would intensify this deficiency.

Mention might be made, in passing, of a related activity associated with the MRCA panel, the so-called periodic "Menu Census". At about 5-year intervals (the most recent in 1972-73), a subsample of something over half of the regular panel is asked to participate in this activity, with the selected group balanced by family size, age of

homemaker, city size, region, and income group. The participation is spread uniformly over a 12-month period with each household asked to keep a daily record of all foods used at home for a 14-day period. For each food product used-and this is covered on a meal by meal basis-the information to be recorded is a description of the product in some detail (e.g., margarine - diet whipped; syrup - maple flavored; beefy noodle fry - home prepared dish, etc); how served (main dish, side dish, etc.); who ate the food (identifying household members specifically and guests by age); equipment or appliance used; brand name of product, etc. For mixtures (such as the above "beefy noodle fry"), a list of ingredients is also requested.

The main objectives of the menu census are to illustrate how various foods are used in the home, for what occasions, and by whom consumed, information which could be of considerable value to manufacturers for planning, marketing, and advertising purposes. Unlike the main MRCA operation, all food products are covered in this periodic canvass. Also, we have here, for the first time, information on consumption by individuals in contrast to the usual data for the household as a whole. The problem is that no information on quantities used is requested, on the assumption that this would be too difficult for respondents. Instead, the units of measurement are the number of occasions on which a product is used and/or the number of portions consumed (as determined from the number of persons involved). Some transformations, therefore, using some assumed average consumption values, would be needed to convert the data to a more usable form for demand analysis. Since the samples used are drawn from the main panel, the resultant data are presumably subject to the same general kinds of biases. In fact, it is likely that even greater respondent selectivity bias could prevail in this case, in view of the complex and laborious nature of the undertaking.

#### Panels With Comprehensive Product Coverage

This second kind of consumer panel is found primarily in the academic or non-profit field. Specific examples are the small localized consumer panels operated by Michigan State University in the 1950's covering all food products and the similar operations by the University of Georgia in Atlanta (1958-62) and recently revived (1975) in Griffin, Ga. The Michigan State panel which was operated in Lansing between 1951 and 1958 will be used as the illustration as it was the model for the subsequent endeavors and because a good deal of information has been published about the details (Quackenbush and Shaffer).

The Lansing panel averaged something under 300 households who completed and mailed in weekly diaries covering all food products. Highly trained field agents were used to recruit the respondents and

for continuing visitation and follow-up of problem cases. Initial recruitment of panelists and replacement of dropouts was a laborious and costly affair, requiring an average of 4 field visits and 2 hours of time for each successful case. Relatively large-scale field canvasses were made at the outset and periodically during the life of the panel to establish a master list of households classified by demographic and a variety of other characteristics from which potential recruits could be selected. In replacing dropouts, households with similar characteristics as indicated on the lists were solicited. In addition to periodic field visits to solve problems or instill morale, various other public relations devices were used such as newsletters and sending panelists Christmas cards. Respondents were compensated for cooperation using various incentive plans to promote continued participation. The actual payment for this purpose averaged 50 cents per completed weekly diary.

The weekly diary forms were something over 30 pages in length and itemized some 500 or more detailed products, with blank spaces provided for entering miscellaneous items under each broad product class. Varying types of detail were requested depending on the product class but the quantity bought, the size or weight of each package or item, and the price per unit and the total cost were common elements throughout. Although entries were presumably to be made as items were purchased, only one line was provided for a given itemized product so that there was actually only space for a weekly summary if purchases were made at different times.

As might be anticipated, the panel gradually comprised a more dedicated group of reporters as the years progressed, with the less assiduous elements falling by the wayside. In the first year (1951), hardly any panelists returned 52 weekly diaries; by the final year (1958), the proportion participating each week had risen to two-thirds. Over 100 panelists dropped out in each of the first two years, but this number declined to 30 or 40 per year in the latter stages. More than 50 households remained in the panel throughout the 7½ year period and a similar number were panelists for 6½ to 7½ years. Special inquiries toward the end of the cycle indicated that the surviving panelists were more price conscious than prior to their participation, purchased larger and more economical packages, and were generally more aware of their expenditures. The actual impact of this conditioning was difficult to assess but respondents did not believe it affected their actual expenditures by more than a percentage point or two.

Some limited appraisals were attempted of the validity of the data. Expenditure data obtained on a few occasions by personal or telephone interview for particular weeks exceeded by a considerable

margin the diary data for the same periods, but interviews typically produce higher levels partly because of "telescoping" (that is, including some expenditures which actually were made prior to the reference period). Comparisons with the few available independent sources also suggested shortages in the diary results but the former were also subject to errors and biases of various kinds.

As would be rather evident, the principal advantage of this second kind of consumer panel is its attempted coverage of the full range of food products. Otherwise, the problems and biases are similar to those for the selective commercial panels. Moreover, the complexity of the more comprehensive diaries, with the multitude of listings, could result in greater confusion as to where to make entries and increase the likelihood of omissions. Possibly because of this complexity, a substantial proportion of panelists, according to a special inquiry, did not enter their purchases as they were made but kept rough notes and summarized these at the end of the week. Finally, the cost and difficulty of maintaining a comprehensive panel of this kind probably precludes any widespread use of the method.

#### CONSUMER EXPENDITURE SURVEYS

Consumer expenditure surveys, or as sometimes called, family budget surveys, have a long history in this country and abroad. Although initially inaugurated because of social welfare concerns--primarily to study the standard of life of the poor and disadvantaged--their main emphasis in modern times has been to provide the underpinning for construction and maintenance of consumer price indexes (Pearl). The distribution of expenditures as derived from such surveys provides the relative weights needed in order to combine the indexes for specific products and services to obtain summary measures. These distributions are also the basis for selecting the samples of items to be priced--the so-called "market basket"--with the probability of selection of a given item proportionate to its relative importance in the family budget. These data are also used, among other things, in constructing "standard budgets" depicting the cost of maintaining various levels of living and in carrying out econometrical analyses of consumer behavior.

Comprehensive consumer expenditure surveys have been conducted at roughly 10-year intervals in the U.S., corresponding to the frequency with which the weights and "market basket" have been revised and updated for the official Consumer Price Index. The most recent of these surveys, in 1972-73, used a substantially different methodology than that employed by the Bureau of Labor Statistics (BLS) which conducted the surveys in the past. In the prior surveys (the last in

1960-61), the procedure followed was the so-called "annual recall" method. In extremely lengthy interviews, lasting up to 8 to 12 hours although obviously completed in more than one visit, an effort was made to determine the expenditures of the family, large and small, for the entire preceding calendar year. A modified procedure was followed for food expenditures. First, an effort was made--by asking about overall average expenditures per week or per month--to build up an annual aggregate for the family. In addition, questions were asked about expenditures for specific food products in the week preceding the "annual recall" interview. At the tabulation stage, the detailed food expenditures derived in this manner were forced into agreement, for each population group, with the overall annual totals, which were used as control figures. It might be noted that the interviews were mostly conducted in the early months of the year so that the information on detailed expenditures (for the previous week) related only to that period. Also, these detailed expenditures covered a period of weeks in the year after the reference year for the annual control totals.

The new approach used in the 1972-73 survey attempted to take account of the experience in other survey undertakings aimed at controlling response errors. A number of the techniques were borrowed from the methodologies in use in expenditure surveys in other countries and in university and market research in the U.S. For the first time, responsibility for the survey was shared between the Bureau of Labor Statistics as the sponsoring agency and the Bureau of the Census as the data collector. This is the same arrangement which exists for the labor force and unemployment statistics from the Current Population Survey.

The survey procedures are described in detail in various publications (U.S. Dept. of Labor) but the two major components were the following:

a. An interview panel consisting of about 10,000 households each year which was visited on a quarterly basis primarily to obtain the larger items of expenditure and certain repetitive items (rent, utilities, etc.). Particular categories were covered either quarterly or on a semi-annual or annual basis, depending primarily on expenditure size.

b. A diary operation consisting of about 200-250 households per week asked to keep a diary or record of all expenditures for the subsequent two-week period. Although the main focus of the diary was the smaller items of expenditure, the fact that all categories were covered provided various options in compiling estimates as well as many research opportunities.

As in prior expenditure surveys, an effort was made to obtain overall estimates of food expenditures in the quarterly panel, although

this time on a quarter by quarter basis. This was done partly to establish some link with the past, but principally so that some measure at least of overall food expenditures would be available for individual families for purposes of microanalysis.

The diaries, however, as might be expected, were the primary focus for deriving food expenditures both in the aggregate and in detail. The diary operation was conducted in essentially three steps. An interviewer visited the household to obtain a wide range of demographic, socio-economic, and other background information and to place the diaries for the first 7 days. A second visit was made at the end of that period to pick up and check the first diaries and to place those for the second 7 days. A final visit was made a week later to collect the second diaries. Since only one diary form was provided for a given week, it was likely that only one person, usually the homemaker, kept the record for the entire family.

The diary books provided a set of two facing pages for each day of a 7-day period. The left-hand page was devoted entirely to food purchases for home use and was subdivided into separate sections for broad categories--"dairy and bakery products", "meat, poultry, and fish", fruits or vegetables, etc. Several blank lines were provided for making entries under each section. The detail requested consisted of a description of each purchase; the number of cans, bottles, packages, etc. purchased on a given occasion; the net weight or volume per unit; whether the item was purchased in fresh, frozen, canned, or other state; and the total cost excluding sales tax. On the right-hand page for each day, a section was provided at the top for expenditures for meals or snacks purchased in restaurants, carry outs, or other eating places. The remainder of the right-hand page was divided into small sections for entering outlays for various categories of non-food products and services. Obviously, not all items could be mentioned so that many were relegated to a catch-all section.

The samples were typical of the multi-stage probability designs used by the Census Bureau for its household surveys. The first stage consisted of the selection of primary sampling units (psu's) comprising either standard metropolitan statistical areas (SMSA's) or county groupings outside of SMSA's. The final sample covered over 200 psu's with the largest SMSA's included with certainty and the remaining areas drawn from various strata with the probability of selection proportionate to their respective sizes. A somewhat more refined than usual procedure was used in selecting household's within psu's. The first step was to stratify all 1970 census addresses according to various characteristics of the occupants at that time, including household size, race, and income level, which are highly correlated with expenditures. A systematic selection was then made within each such stratum on a proportionate basis. Although there would, of

course, be some changes in occupancy since the census date, the overall correlations in characteristics over time were regarded as sufficiently high so that appreciable gains would result from the stratification. The usual Census procedures were followed to reflect the appropriate proportion of housing units built since 1970 in the sample.

One of the major concerns in instituting the new system related to the degree of cooperation that could be obtained in so seemingly complex an operation. This was one concern that was entirely allayed. The response rate in the quarterly panel started at close to 95 percent and dipped only slightly under 90 percent by the final quarterly visit, even though the interviews ranged from 1½ to 3 hours in length depending on the phase of the cycle. In the diary operation, the response rate started at only around 75 percent, partly because of initial administrative and resource problems, but gradually increased to and held at almost 90 percent once the problems were resolved (Walsh). These rates, incidentally, represent a major improvement over the experience in the prior BLS surveys. In 1960-61, for example, only about two-thirds of the initially selected sample produced usable results. Substitutes were thrown into the breach in sufficient numbers to increase the sample of usable cases, but the true response rate, of course, is the degree of success with the initial sample. The rather unprecedented success (for this type of operation) in the 1972-73 survey represented another affirmation of the Census Bureau's ability, as witnessed in its many other survey programs, to achieve a rather remarkable degree of cooperation even under difficult circumstances.

Because of the initial uncertainty about cooperation particularly in the diary phase, consideration was given to offering cash incentives for participation. There was considerable reluctance to take a final step in this direction, however, for fear that a precedent might be established for other survey programs. Instead, a limited experiment was conducted in the first 8 weeks of the diary operation wherein the sample was divided into three systematic parts, with one group offered \$10 for completing diaries for the two weeks, a second offered \$5, and the third offered no cash incentive. Although the observed response rates were slightly higher numerically for those offered cash incentives, especially for the second week of cooperation, the differences were not statistically significant and the inducements were dropped. A further analysis is in progress to assess whether the completeness of the diaries, in terms of amount of expenditure reporting, was affected by the incentives.

A full-scale evaluation is currently underway, in which the writer is engaged, for assessing the validity of the 1972-73 survey results. In the preliminary phase, which is nearing completion, the procedure has been to compare the quarterly panel estimates with the diary

results, where the same subject was covered on both, and to relate either or both to various independent estimates of expenditures. The findings to date can only be regarded as tentative in view of considerable uncertainties concerning the reliability of the independent data used as a standard of comparison and because adequate detail was often lacking to explore the subject in sufficient depth. Any initial conclusions, therefore, may be modified as additional information becomes available.

Turning briefly to a comparison between the overall food purchase estimates derived from the quarterly panel and a summarization of the detailed data from the diary operation, the characteristic differences between these two varying approaches were observed; that is, the panel estimates for both survey years were about 5-10 percent higher. In the main, this higher level can probably be attributed to the inclusion in the interview panel results of some non-food items such as cleaning and paper products which are frequently purchased together with food, in spite of efforts to exclude such items in the questioning.

In appraising the detailed diary estimates of food expenditures, comparisons were made with two independent sources mentioned earlier in this report--the Personal Consumption Expenditure (PCE) estimates prepared in conjunction with the GNP accounts and the annual estimates of the Economic Research Service (ERS) of the Department of Agriculture. A major problem in using the PCE data was that estimates for detailed food items, as previously noted, are prepared only for benchmark (quinquennial census) years and the most recent available at the time the evaluation was started were for 1967. In order to permit more detailed comparisons, the writer was impelled to update the 1967 PCE detail to 1972 using comparable Census of Manufactures and related data as the basis for computing rates of change. For comparison with the survey data, it was also necessary to determine what proportion of PCE estimates for each food category represented purchases for home consumption, using factors provided for this purpose (of unknown reliability) by the Department of Commerce. The ERS data were more directly usable but were available in considerably less detail.

In spite of these difficulties, certain consistent patterns emerged from the comparisons which pointed in rather specific directions. Overall, the diary-based aggregates for food purchases for home use corresponded reasonably well with the independent totals, falling at most some 10 percent or so below the PCE and ERS levels. The fact that the homemaker is primarily responsible for these expenditures was undoubtedly a positive factor in this showing. The allocation of maximum space on the diary record to this category of expenditures probably contributed as well.

Considerable differences emerged, however, in the apparent completeness of reporting (as measured against the independent estimates)



for specific classes of food products. The data appeared to be relatively complete for the more costly products such as meat and poultry and for those purchased and consumed on a frequent basis such as milk and other fresh dairy products and bread and fresh-baked items. The reporting appeared to be rather deficient, on the other hand, for staple food products such as flour, sugar, shortening, and the like which were bought relatively infrequently with each purchase used a considerable length of time. Among various possible explanations for these differences is the likelihood that many respondents do not, as requested, maintain their diaries on a daily basis, but skip some days and later attempt to reconstruct the omitted periods by memory. In doing so, they are more likely to recall accurately those items which constitute the main course in a meal or which are purchased on a frequent basis.

One of the surprises in the results was the relatively close correspondence between the diary and the independent estimates of expenditures for purchased meals and snacks. Since such outlays can be and usually are made by various individual family members besides the homemaker, it was anticipated that the diary reporting might be incomplete in this respect. It is possible that the relatively prominent positioning of a section for such expenditures on the diary form and some special checks on such outlays at the time of diary collection might have contributed to this outcome.

The main conclusion drawn from these preliminary findings is that diaries probably represent an effective means of collecting food expenditures and measuring food demand, but that some modifications and improvements are needed to eliminate some rather evident deficiencies. Some of the changes suggested by the findings are the following:

- a. Restrict the range of items that any one family would have to report, rather than asking everyone to record all expenditures. This change might be more directed at non-food items which were generally less adequately reported in the diaries. However, even for food items, there was a substantial undifferentiated residual class, consisting mainly of incomplete or inadequately described entries which could not be assigned to specific categories and which detracted considerably from the usefulness of the results. Also, although not directly affecting the expenditure data, such subsidiary but potentially useful information as weights, package sizes, and quantities purchased was quite incomplete. The fact that the interviewer, in collecting the diaries, had so many different product categories to examine probably precluded detecting all of these deficiencies and making corrections. Essentially, the modified proposal would be to ask one subsample of families to report only on food and other supermarket items, a second on only clothing and related items, a third on health expenditures, etc. It is recognized that there would be some practical

limit to the number of such subsamples that could be simultaneously operated and experimentation would be needed to strike a proper balance.

b. Institute special check questions and procedures for apparently deficient categories. The use of "specialized" diaries of the type mentioned above would make it more practicable to introduce special procedures of this kind. For example, probing questions might be asked, at the time the diaries are collected, about purchases of staple food items of the kind apparently understated, especially if no such expenditures had been recorded by the respondent. A more experimental approach might be for the interviewer to carry out a brief shelf inventory at the conclusion of the record-keeping period, in order to locate some items that may have been overlooked. The interest in assessing stocks on hand for emergency purposes could be used as a justification for taking such inventories.

c. Experiment with the ability of respondents to record the "universal product codes" appearing on most packaged and canned products. If successful, this procedure could be used to reduce the amount of detail respondents are required to enter. More importantly, it would permit much more precise, detailed, and consistent classification of products. A request to retain all cash register tapes and other evidences of purchases would be a corollary element.

d. Reconsider the matter of offering cash or other incentives for cooperation. Although the brief initial experiment cited earlier failed to produce statistically significant results, nearly every other practitioner has found that such inducements are effective both in achieving higher cooperation and more complete and accurate reporting of expenditures. If greater reliance is to be placed on diaries in future work in this field, such incentives could be an essential ingredient.

Perhaps the most clear-cut survey finding of all was affirmation of the traditional timing bias found in diary operations; that is, for a higher level of expenditures to be reported in the earlier as compared to the later stages of record keeping. For two-week diary operations, the pattern is for a higher level in the first as compared to the second week. Such differences were found for virtually every detailed category, food as well as non-food, in the 1972-73 survey. Various theories have been propounded concerning the reasons for these differences. One is that "telescoping" of purchases is the principal culprit. According to this theory, to which this writer incidentally adheres, respondents do not start their diaries promptly but later attempt to reconstruct the earlier period by memory. In doing so, they may include some expenditures made prior to the reporting period. A contrary theory is that the lower levels in later stages represent the

increasing fatigue or disenchantment of the respondents. Temporary changes in buying habits because a diary is being kept have even been suggested. In any case, further detail on these differences will be available later which, hopefully, will provide further insight into this matter and its implications from the standpoint of survey design and estimation.

Perhaps the most significant recent development from the standpoint of researchers concerned with charting consumer demand is the current plan to institute a continuing national consumer expenditure survey in the reasonably near future, in lieu of the intermittent decennial operations which have characterized this field in the past. If this plan materializes, and if some of the indicated procedural improvements are made, there would be available for demand analysis and related purposes an unprecedented range and quality of statistics on a continuing basis. One limitation which remains in the system as currently constituted is the absence of any significant body of information about individual families. Provision for some longitudinal features in a continuing survey program could add this useful additional dimension.

#### FOOD CONSUMPTION SURVEYS

Another major Government data system in a state of metamorphosis is the long-standing Food Consumption Survey program of the Agricultural Research Service (ARS), U.S. Department of Agriculture (U.S. Dept. of Agriculture, 1976). Like the expenditure surveys, these have been conducted at roughly 10-year intervals, in this case usually around mid-decade. The most recent completed study took place in 1965-66 and another is about to get underway this year. For various reasons, some of them rather obscure, the field collection and data processing for these surveys have traditionally been contracted outside the government, instead of using the services of a data gathering agency such as the Census Bureau.

The principal difference, conceptually, between the expenditure and the ARS surveys is that the former relates to purchases during a specified period and the latter to use or consumption of food. These two measures, of course, should be roughly equivalent in the long run or for sufficiently large groupings of persons. For specific households, however, and for limited periods such as a week or two--and both programs use short reference periods--a considerable difference is possible. While use or consumption may vary only within moderate limits, considerable fluctuations in purchases may, of course, occur from week to week, depending on buying habits, storage capacity, special inducements (sales, etc.), and the like. Since one of the main objectives of the ARS surveys is the conversion of the survey

data to a nutrient basis, and to provide some such measures even for individual families, the use or consumption concept would represent the more appropriate and less variable approach.

The principal feature of the ARS surveys has been the exhaustive detail provided on food usage. These surveys over the years have mirrored the extensive dietary changes that have characterized the last several decades, influenced by such factors as increasing real incomes, virtually universal availability of refrigeration, advances in packaging, proliferation of prepared and convenience foods, etc. In more recent years, changing life styles including the growing proportion of women who work and the increasing freedom accorded teenagers have sharply boosted the tendency to take meals outside the home, perhaps ironically both in more elaborate restaurants and "fast-food" establishments. Among other important influences have been the increasing awareness of the relationship between diet and health and concern about the effect of pesticides, additives, and other non-natural substances on the safety of our food supply. The vast expansion of Federally assisted nutrition programs, especially the Food Stamp program, have added a further dimension. The need for accurate charting of these and other developments has created considerable pressure for continued expansion and improvement in the survey mechanism (Rizek, et. al.).

#### 1965-66 Survey

This most recently completed of the food consumption surveys represented the most ambitious of these undertakings up to that time. The sample was designed to be representative of housekeeping families in the U.S., that is, those in which at least one person had a minimum of 10 meals from home supplies (including lunches carried) in the preceding 7 days. A national probability sample of around 15,000 households was selected for this purpose, using a multi-stage design. The first stage (following the pattern described for other surveys) involved the selection of about 144 primary sampling units (psu's) by a random process from a similar number of strata representing different geographic regions and population densities. The second stage constituted the systematic selection of a total of about 2,000 clusters, each containing an expected 30 or so housing units, within the designated psu's. From field listings of these second stage clusters, sufficient numbers were selected to provide an average of 3 households per cluster to be canvassed in the period April-June 1965 and one household per cluster for each of the subsequent 3 quarterly periods through March 1966. The higher concentration in the first quarter was designed to permit more valid trend comparisons with the previous 1955 survey, which was carried out entirely in the April-June period. One of the noteworthy changes in the 1965-66 survey was coverage of food consumption, for the first time, for an entire 12-month cycle.

The survey constituted two related phases. First, and foremost, information was to be collected by personal interview on use of all food products in the home during the 7-day period preceding the visit to the household, and the number of meals eaten by household members outside the home during this period. Second, information was to be obtained for a subsample of household members on consumption of specific foods by each individual for a 24-hour period, whether at home or elsewhere. This individual "intake" information was obtained by leaving a diary or record form to be filled by the individual for the next full day and mailed in. The individual data were collected only for the spring (April-June) quarter.

An extremely detailed questionnaire was used to collect information on food used at home. There were about 350 principal food categories for which questions on use were asked specifically for the previous 7 days. For each such category, a lengthy list of sub-items was printed on the questionnaire. If the respondent indicated some use of the principal category, questions were asked about which specific kinds were involved and codes corresponding to those sub-items were entered. For each sub-item so identified, information was obtained on the form of the product (canned, frozen, etc.), the number of units used, the size or weight of each unit, and whether purchased or otherwise acquired (home produced, Government supplied, etc.). If bought, the number of units, the size per unit, and the unit price were recorded. Other information obtained included the number of meals eaten out by family members, the cost of these (if purchased), and the number of meals and snacks eaten in the household by guests. This additional information was used to derive estimates on total use or consumption by household members, whether at home or outside. For this purpose, the assumption was apparently made that meals consumed outside were equivalent in content, on the average, to those eaten at home. The questionnaires, of course, also contained the usual extensive array of questions on demographic and socio-economic characteristics.

The information on individual intake, as already indicated, was obtained by self-enumeration. The form used called for recording on consecutive lines, in some detail, each food eaten in a 24-hour period, the number and size of units consumed, whether there was fat on meat or skin on poultry, at what time the food was eaten, whether or not it was taken from home supplies, the type of place it was eaten if outside the home, and how much if anything was paid for it.

The comprehensive coverage of the survey and the inclusion, for the first time, of definitive information on individual food intake makes it an invaluable source of data for a variety of purposes. The attempt to reflect meals eaten out in the household consumption data, by assuming equivalent content to those eaten at home, can only be regarded as a rough approximation, but some direct measures of this

aspect were available from the individual intake data. The utility of the survey for demand analysis is, of course, limited because of the infrequency of the canvasses and, recently, because of some unpredictability about even the decennial scheduling. Also, although there are no direct measures of the difference, it would appear more difficult to obtain consumption than purchase data, which could possibly reflect on the relative accuracy of the two approaches for such analyses. For nutritional assessments, there might also be some question as to the validity of data on one-week's consumption for a household (or one-day's consumption for an individual, if so used) as a measure of nutritional intake on a microlevel, as opposed to the principal and more justifiable use of the data for computing averages for different population groups.

The response rates for the interview portion apparently averaged around 90 percent and similar cooperation was obtained for those requested to supply individual intake information, indicating there was probably no serious non-response bias. Comparisons with the Department's food "disappearance" data (representing the overall amounts attributed to civilian consumption) were inconclusive, with some substantial overstatements for certain items such as meat and fruit (using the aggregate data as the standard) and understatements for other products such as vegetables and sugar.

#### Recent Experimentation

As part of the planning for the impending 1977-78 survey, a number of methodological variations for collection of food consumption data were tested in three locations (Detroit, Minneapolis, and Pittsburgh) under contract with Response Analysis, Inc., Princeton, N.J. Actually, 9 different versions in all were tested in the spring of 1976, using samples of 70-80 cases, on the average, for each.

For our purposes here, however, it will be sufficient to examine three general approaches which were explored. The first was similar to the 1965-66 procedure whereby respondents received advance notice of the survey with the interviewer arriving at some point to conduct interviews covering detailed food use during the previous 7 days. The second represented a considerable departure with interviews visiting the households to train respondents to keep diaries of food usage for the following 7 days. The diaries, in this case, were of the "open" variety with respondents expected to enter the foods used on consecutive lines. The third general approach called for notifying respondents by mail or other means that a survey was being taken, arranging for an appointment for this purpose about 7 days hence, and asking them to make informal notes of food usage until that time and to keep cash register tapes or other evidences of purchases. The interviewer

called at the appointed date and collected usage data by interview for the previous 7 days, but presumably with the option of referring to any notes or purchase records maintained by the respondent. For all versions, in addition, an individual intake inquiry was included, generally accomplished by interview for the just previous 24-hour period, with diary forms left on which each person was to record individual food usage for the two subsequent days.

Analysis of the results revealed some rather sharp and statistically significant differences in reported consumption among the procedures. The first (1965-66 style) procedure provided by far the highest levels with the diary-based estimates, in contrast, as much as 40 percent lower. The third, "guided-interview", procedure fell roughly half-way in between. On the basis of these findings, the contractor, apparently concerned with avoiding extremes, recommended the third procedure, although noting there was no sound basis for assessing the validity of any of the three.

Actually, the seemingly arbitrary choice of the contractor, which was largely endorsed by ARS, had a reasonably sound and logical basis. Many studies in a variety of fields suggest that short-term, open-ended interviews are likely to be exaggerated because of "telescoping" of some acquisitions made prior to the reference period. The sharply higher level for the first procedure, in contrast to any of the others, was consistent with this experience. The diary procedure, on the other hand, was possibly foredoomed to failure for this particular application. As indicated for the expenditure survey and supported by a good deal of other experience, diaries appear to be reasonably satisfactory for obtaining data on food purchases or expenditures. For this product class, most of the shopping is usually done by the homemaker and may be accomplished in only one major trip or at most on a few occasions in a given week. Food usage, on the other hand, is an almost continuous process in normal family life and the demands of diary keeping are likely to be inordinately greater and more subject to lapse. Moreover, individual members, of course, are prone to take snacks or even to prepare some of their own meals without the knowledge or particular notice of the homemaker. The third procedure, while based on only limited experience, appears to have the merit of focusing the attention of respondents on food usage, which could serve as a memory aid, and could also have the effect of setting some bounds on the reference period in order to reduce the likelihood of telescoping.

#### 1977-78 Survey

This long awaited survey will be inaugurated in April of this year with collection continuing through March 1978. The overall sample size (and presumably the manner of selection) will be about the

same as previously (15,000) but this time will be distributed uniformly over the four quarters. The basic sample which is confined to the conterminous U.S. will be supplemented by samples of 1,200 in each of Hawaii and Alaska to be interviewed in the January to March 1978 quarter and 3,000 in Puerto Rico to be covered in the 6-month period, July-December, 1977. A special national sample of another 5,000 households containing at least one elderly person, selected from Social Security records, will be interviewed uniformly over the 12-month cycle specified for the main sample. Consideration is also being given to a similar supplementation for low income families. Finally, to provide some linkage with the past, a separate sample of 1,500 will be canvassed using the 1965-66 procedures.

The basic procedure for the main samples will be a somewhat modified version of the "median" (third) experimental approach described above. Advance letters will be mailed to respondents by ARS advising them of the general purposes of the survey and explaining that an interviewer from the contractor will contact them directly for this purpose. The interviewer, by telephone or personal visit, will provide a further explanation of the procedure and ask the respondent to keep notes of food usage, grocery store tapes, etc. until the scheduled interview date, when the information on usage will be collected by interview for the previous 7-day period. The household questionnaire will be similar, in its essentials, to the detailed form used in 1965-66. At the same interview, information will be obtained from a subsample of persons who happen to be present at that time on their individual food intake (at home and away) during the preceding 24 hours. These persons will also be asked to keep a diary of their intake for the subsequent 2-day period. For persons not at home, forms will be left for a subsample on which to record their consumption for the same 3-day period covered for the others. The interviewer will return at the appropriate time to pick up the completed individual diaries. Some small gifts, such as stainless steel measuring cups or spoons, plus a nominal \$1 per person payment, will be offered for cooperating in the individual intake phase.

Essentially, since the concepts are basically unchanged, the 1977-78 results, from the standpoint of demand or nutritional analysis, should have about the same strengths and limitations as cited previously for the earlier survey. The uniform allocation of the sample over all quarters this time and, especially, the extension of the individual intake coverage from one day to three days currently represent significant methodological advances. Also, the modified, guided interview procedure will, hopefully, result in some general improvements. At the same time, a rather pessimistic forecast of the likely response rate (75 percent or so), based on the generally less cooperative public attitude toward surveys recently, could if it materializes offset some of these anticipated gains.



SUMMARY

As exhibited in the previous discussion, there is an abundance, if not a superfluity, of data sources on food purchase and consumption. Many of these are designed for limited and rather specific purposes and are of only peripheral value from the standpoint of comprehensive demand analysis. At the same time the recent expansion and improvement of the two principal Government data sources--the Consumer Expenditure Survey and the Food Consumption Survey--should considerably enhance analytical opportunities in this crucial sector in the future.

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