

GUIDES FOR EVALUATION OF MASS-PRODUCED STORAGE UNITS  
AND COUNTER SPACE IN HOME KITCHENS

by

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## INTRODUCTION

As they strive to acquire the quality of housing desired, families often have difficulty in making wise choices because of inadequate information. Both the builders of family dwellings and consumers who purchase them could benefit from criteria for evaluating specific aspects of housing in relation to satisfactions sought and economic resources available. With more complete information, builders might reduce costs and augment profits through provision of more essentials and a reduction of non-essentials in dwellings built for sale. With criteria for evaluating particular aspects or component parts of dwellings, consumers could enter the housing market with less risk and uncertainty. To develop and disseminate useful housing information is a particular challenge to those who are concerned with housing as an influence on the quality of family living.

Information as a Resource in Decision-making  
about Housing

Information is one of the essential resources if consumers are to make wise choices relative to mass-produced storage units and counter space in the kitchen. This resource may be obtained from many sources and in many forms. In order to be able to analyze a situation, a consumer should know the facts relative to the various aspects of the problem. Then,

and only then, can he critically evaluate the conditions in the situation and determine which one of several courses of action should yield the maximum of satisfactions. With advancements in all areas of knowledge, the problem of obtaining information concerning all relevant aspects of a problem situation is becoming increasingly difficult. As the problem of obtaining information becomes more complex, the chances for less effective decision-making increase. The challenge to those who are interested in developing information as a resource in choice-making includes provision of information that is comprehensive and sound and the encouragement of consumers to make effective use of this resource.

#### Information Necessary for Evaluation of Mass-produced Storage Units and Counter Space

##### Technical and non-technical information needed

The kinds of information needed by builders and consumers as they make choices relative to mass-produced storage units and counter space are of both technical and non-technical nature. The technical consists of that which is related to the design, materials, construction, quantities and qualities of this space required for performance of activities in the kitchen. The non-technical gives consideration to family values and resources as well as to the processes by which wise

choices are made. These two types of information will be productive to the degree that they are integrated and become a part of consumer decision-making. As both technical and non-technical information are permitted to function simultaneously in the life of a consumer, the physical and social aspects of the problem of choice of mass-produced storage and counter space will be seen in their reasonable perspective.

The need for such information to be drawn from the social and physical sciences can be recognized only as one realizes the seriousness of the problem. Consideration of the following private and public conditions will enable one to appreciate more fully the significance of both types of information that may be used to guide the choices of consumers relative to mass-produced storage units and counter space.

Storage and counter space as  
components of housing costs

The costs involved in providing counter and storage space may be seen as a very small part of the total costs to the nation and the individual consumer as he makes his choices relative to this component of housing. The national picture portrays more vividly the true costs and reason for real concern.

Since non-farm dwellings comprise approximately one-fourth of our national wealth and almost one-fourth of the

personal consumption expenditures are allocated to housing, the economic resources involved in housing are proportionately significant.<sup>1</sup> Moreover, within the individual dwelling unit, the costs represented by storage and counter units in the kitchen are relatively high in proportion to total costs of the house. Builders in Ames, Iowa, estimate that approximately one-fourth of the total cost of the house is invested in space and facilities in the kitchen. Estimates made by the writer of the costs of mass-produced storage units revealed that they are relatively high in proportion to the total outlays for the kitchen area. As may be seen, these costs involve a considerable portion of consumer as well as of national resources. Any information which may lead to wise choice-making will conserve resources and augment satisfactions of individual families and the aggregate population.

Limitations to consumer choice  
of houses in the market

The limitation to consumer choice in the present housing market inhibits effective choice-making and restricts consumer sovereignty. The right of a consumer to go into the market and make his own choice from among the many alternatives available today is fast becoming overshadowed by mass-produced

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<sup>1</sup>Glenn H. Beyer. Housing: a factual analysis. New York, N. Y. Macmillan Company. 1958. p. 2.

housing, available at specified prices, which channels the lives and activities of all families down similar paths. Consumers are often forced to purchase a house in which such features as the storage units and counter spaces have been preselected, built-in, and made available as part of a "package" with little consideration for family needs. Moreover, permanency of installation usually limits rearrangement and adaptation by the family. Costs and profits usually guide different builders in their choices of quantities and qualities of storage units and counter space. This condition should not be permitted to continue when one realizes the significant proportion of the family's income which must go for housing and, more significantly, for the storage and counter units to be installed in the kitchen.

#### Changes in foods and equipment used by consumers

Technological changes in forms of foods and equipment in the market may influence significantly the amounts of storage and counter space needed. Partially or fully prepared foods may be found in most markets and require less preparation than those foods when made from basic ingredients. Such continuous technological change calls for frequent study of space and equipment requirements in the kitchen. In the past, this type of study has not kept pace with change.

## Review of Literature

Writers who give attention to storage units and counter space as used in the kitchen have seldom related principles and research findings from the social and physical sciences as they have presented their views on these aspects of housing. A review of the literature in this field revealed that most of the information relates to physical facts and principles. Information which will give a comprehensive coverage that may be used successfully by a consumer, as he evaluates mass-produced storage units and counter space, must integrate the findings from all areas related to the problems of choice of these aspects of housing. For the present study, selections from relatively current literature are reviewed.

### Literature from social sciences

Information from the social sciences relative to housing has come primarily from economic and political inquiries. Because family housing problems cut across such a wide range of specialized fields, other types of studies should be made. Family habits and needs change along with technological developments. Every thoughtful architect, builder, manufacturer, and financier in the housing field would probably admit that our knowledge of what constitutes a satisfactory dwelling, or more specifically the type of storage and counter space which best meets the needs of the consumer today, is

riddled with serious gaps and uncertainties. Such gaps are quite evident as one reviews the literature and finds that each source deals with only a small part of a tremendous problem and that there is little integration of information from relevant disciplines. With increased recognition of the fact that intelligent choice-making can be made only in light of family values and goals, greater use of the tools of anthropology and social psychology would be advantageous.

Writers in the discipline of economics have given attention to concerns of public interest in the field of housing. Such housing problems as those of the real estate market, public policies, costs of construction, personal financing, and public housing were considered. Of special concern in the present study was literature related to the possibility of reducing costs of housing construction. It was assumed that economies which were realized in housing in general, and more specifically with regard to the storage and counter space in the kitchen, would be in the general interest of the consumer.

Though such economies might be expected to result from a more careful analysis of the needs of the consumer, Ratcliff suggested that such obstacles as market uncertainties and archaic and inflexible building codes are strong deterrent forces. He proposed that certain economies could be realized by manufacturers in the field of housing.

Such manufacturers must be of sufficient size to command the highest technical and management skills, to carry on research in construction methods and materials to effect major economies in costs of materials and equipment by short-circuiting the present cumbersome and costly system of distribution, to form strong bargaining units for negotiations with labor, and to build in sufficient quantity to secure the efficiencies of standardization of operations.<sup>1</sup>

Other forms of action have been taken by the Federal Housing Administration<sup>2</sup> in establishing minimum requirements for kitchen storage and counter space. Since these requirements are not definite and give inadequate consideration to the needs of the consumer, the planner of kitchen storage and counter space must seek elsewhere among the social sciences for information as to the needs of families.

With the passage of the Research and Marketing Act of 1946, funds and stimulus were provided for research in the field of housing and procedures were defined for administering regional cooperative research in which federal-grant funds were to be used. The agricultural experiment stations of the North Central Region took advantage of the opportunity this act provided and developed a regional cooperative project to

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<sup>1</sup>Richard U. Ratcliff. Urban land economics. New York, N. Y. McGraw-Hill Book Company, Inc. 1949. p. 7.

<sup>2</sup>United States Federal Housing Administration. Minimum property requirements for properties of one or two living units. MPR Revision No. 48. Washington, D.C. U. S. Government Printing Office. 1954.

study the housing needs and preferences of farm families of the region. As provided by law, the study was directed by a technical committee which represented the 12 states of the region and the United States Bureau of Human Nutrition and Home Economics.\*<sup>1</sup> At the same time that this study was being conducted in the North Central Region, similar studies were being conducted in the northeastern, southern and western regions of the United States.

Findings from these surveys relative to the characteristics of the farm families, their houses, preferences, activities, and storage needs have been used as bases for intensive studies on selected problems, particularly those of storage and space requirements for specific activities, housing design and structure, and improvements in the housing of particular population groups. Information of these same types with respect to urban families would be of real value to the planners of urban houses.

Further understanding of the human factors in housing may be acquired from a sociological study by Festinger et al. Their study of families in a housing community near Massachusetts Institute of Technology was sponsored by the Bemis

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\*Now the Institute of Home Economics.

<sup>1</sup>Paulena Nickell, Marie Budolfson, Margaret Liston, and Elisabeth Willis. Farm family housing needs and preferences in the North Central Region. Ia. Agr. Exp. Sta. Bul. 378. 1951.

Corporation when it recognized that use of mass-produced techniques would call for new understandings of the needs of families in the housing market. As stated by Festinger et al.:

A true mass producer, who has a large investment in plant and can make a profit by years of successful operation, cannot safely rely upon intuition and opinion polls in designing products priced to sell in quantity; he will find it necessary to understand the way people live in a house, and the relationships between families in a neighborhood in order to predict the reaction of his potential purchasers.<sup>1</sup>

By the survey technique the homemakers were given an opportunity to express their feelings of satisfaction or dissatisfaction relative to their housing and their social life. The factors of ecology and homogeneity were found to have a definite relationship to group formation and, in turn, to have a bearing upon the kinds of satisfactions expressed by families relative to their housing. Such an understanding as to homogeneity is expressed in the statement:

In a housing community homogeneity promotes satisfactory social life. Satisfactions with specific aspects of housing may be a function of the satisfactions from social life.<sup>2</sup>

Dissatisfactions of the consumer with his housing which influence his decisions to move may result from the amount of space in the house. That this was the most important reason

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<sup>1</sup>L. Festinger, S. Schacter and K. Back. Social pressures in informal groups. New York, N. Y. Harper and Brothers. 1950. p. 7.

<sup>2</sup>Ibid., p. 32.

for moving was learned by Rossi in a social-psychological study of families in the city of Philadelphia, Pennsylvania.

He stated:

Among voluntary moves--where the household had a clear choice between staying and moving--the most important factor impelling households to move was dissatisfaction with the amount of space in their old dwellings. Other factors, in order of their importance, were complaints about their former neighborhoods, and about the costs of rent and maintenance in their old homes. No other category of complaints received any significant amount of mention as important factors in moving decisions.<sup>1</sup>

Further he found that the important things which consumers had in mind in choosing their houses were, by rank order, space in the dwelling, particular dwelling design features, dwelling location, and cost. However, costs appeared as the major consideration in the actual choice, followed by space, location, and neighborhood, in that order.

Further study to determine how the design features or space considerations in the kitchen influence choice or decisions to move would be of special interest to the writer.

#### Literature from physical sciences

The kinds of problems of a physical nature that have been studied relative to storage and counter space may be divided roughly into five groups:

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<sup>1</sup>Peter Rossi. Why people move. Glencoe, Ill. The Free Press. 1955. p. 9.

1. The storage required for specific activities.
2. The design of specific storage units.
3. Space requirements for articles to be stored.
4. Counter materials and installation.
5. Criteria of evaluation.

Storage required for specific activities. To determine the storage and counter needs in the kitchen, attention should be given to the activities performed in this area. Maximum satisfactions can be realized only when storage and counter space has been planned to meet the needs of the consumer. After many years of study of this problem, Wilson, a pioneer in kitchen study, developed a technique for arriving at the amounts needed. She recommended:

Maximum utility for a given cost can be achieved by listing the functions the kitchen will serve, assigning each function to a unit of the installation, and planning each unit to serve the function assigned to it.<sup>1</sup>

Further she stated,

Cabinets designed for specific functions constitute the accepted and justly popular means of providing work surfaces for kitchen processes, as well as space for utensils and dishes in regular use, small amounts of long keeping foods, and other articles stored in the kitchen.<sup>2</sup>

An understanding of types of activities which were performed in specific centers in the kitchen for which storage

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<sup>1</sup>Maud Wilson. Considerations in planning kitchen cabinets. Ore. Agr. Exp. Sta. Bul. 445. 1947. p. 5.

<sup>2</sup>Ibid., p. 7.

was required was central to the study reported by Pond in 1939. She stated:

A kitchen, like any other room of the house, should be planned according to the functions performed in it. Each operation would be analyzed to determine the equipment and supplies needed for the task.<sup>1</sup>

She interpreted the functions which are usually performed in the kitchen as those which conveniently group themselves around two work centers, those for food preparation and living. The functions performed in the food preparation center were grocery and vegetable delivery, vegetable preparation, meal preparation, salad preparation, cooking, dishing-up, dish-washing, and garbage disposing.

Analysis of the activities performed in the mix center in the kitchen has been made by the Small Homes Council at the University of Illinois. The mix center was interpreted as one:

. . . concerned with the activities of food preparation in which ingredients are combined (such as baked foods, salads and desserts). It contains storage space for mixing bowls and spoons, measuring cups, sifter, beater, grinder, and rolling pin; baking pans and casseroles; foods used in mixing (sugar, flour, shortening, spices). The refrigerator in which perishable foods are stored is used at this center.<sup>2</sup>

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<sup>1</sup>Eather Pond. Planning the efficient kitchen. Wash. Agr. Exp. Bul. 247. 1939. p. 4.

<sup>2</sup>Helen McCullough. Cabinet space for the kitchen. Circular Series, Index Number c5.31. University of Illinois. Small Homes Council. 1949. p. 4.

Laboratory determinations of space needs were reported by Heiner and McCullough in 1948.<sup>1</sup> They recognized the importance of planning to meet the needs of the homemaker as she performed her activities in the preparation area of the kitchen. Preliminary to development of a list of items to be stored, they compared local customs and traditions with national social trends and with check lists of 20 common cooking methods and 57 operations involved in the preparation of food. Food and equipment items were then allocated to activity centers of first use and cabinets were designed to keep all supplies and equipment within the maximum work-radius\* reach of a woman of average height. This scheme brought the shelves for the most used supplies within a 24-inch radius from the worker's elbow.

The storage required for the different activities to be performed in the kitchen is determined, in part, by the equipment necessary for performance of these activities. An investigation of this type was conducted in a cooperative project carried out in 1946 by the Bureau of Human Nutrition and Home Economics and experiment stations in California,

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<sup>1</sup>Mary K. Heiner and Helen E. McCullough. Functional kitchen storage. N. Y. (Ithaca) Agr. Exp. Sta. Bul. 846. 1948.

\*The normal work-radius or elbow circle, may be determined as the homemaker is seated or stands at the work area and establishes a maximum depth in front and to the sides to which she can reach comfortably.

Nebraska, and Rhode Island.<sup>1</sup> The purpose of this study was to develop a minimum and a more desirable set of kitchen utensils for farm families based upon their meal patterns and the utensils needed in preparing the meals. From the data obtained, two sets of utensils were established. In the minimum set were 50 utensils, each of which was used at least once a week by 50 percent or more of the 90 families interviewed in the three states. The more desirable set included all those in the minimum set, plus 22 additional pieces used at least once a week by 25 percent of the homemakers.

Hood et al.<sup>2</sup> reported a study of the equipment required for baking activities in 1954. Analysis of these activities in the homes of southern farm women provided data which served as the basis for developing lists of the minimum and adequate utensils required for the task. Storage arrangements to accommodate these items were developed in cabinets of varying dimensions.

The interrelatedness of activities should be analyzed when determining space needs. According to the Small Homes Council:

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<sup>1</sup>A. Woolrich, A. Barager, B. Kuschke, J. Warren, E. Phipard and L. Fincher. Cooking utensils based on meal patterns. J. Home Economics. 40: 305-308. 1948.

<sup>2</sup>Maude P. Hood, R. Rutherford and Jessie Mize. Baking center storage. Ga. Agr. Exp. Sta. Bul. 6. 1954.

. . . centers which are closely related in function, appliances used or counter space needed may sometimes be combined to save space. The most usual combinations are those of mix-sink and range-serve. Centers may also be combined in other ways. The mix center may occur alone, and the sink center may be combined with the range-serve.<sup>1</sup>

Studies related to the design of specific storage units.

An understanding of activities performed in the kitchen and the equipment to be used in performing these activities was basic to the studies of the designs of storage units to meet the needs of the consumer. The design of the storage unit determines the use which will be made of the available space.

In 1948, Heiner and McCullough<sup>2</sup> recommended functional dimensions for cabinets based upon the requirements of supplies to be stored. Each device incorporated the principles of motion economy and was based upon an average woman's reach. The characteristics of the units to be used in the mix or preparation center included: shallow over-counter shelves; two shallow storage doors for packaged supplies; open storage panel for hanging the measuring, blending, testing, and cutting devices; under-counter section divided into compartments for flour and sugar; full shelves for mixing bowls, measuring equipment; file drawer for baking utensils. Such units were

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<sup>1</sup>Small Homes Council. Handbook of kitchen design. Urbana, Ill. University of Illinois. Small Homes Council. 1950. p. 6.

<sup>2</sup>Heiner and McCullough, op. cit.

so designed that items could be allocated to the activity centers of first use and all supplies were kept within the maximum work-radius reach of a woman of average height. This scheme brought the shelves for the most used supplies within a 24-inch radius from the elbow.

In "The Cornell Kitchen", Beyer<sup>1</sup> reported criteria for the design of kitchen cabinets that take into account both human and technological requirements. The space dimensions incorporated in the kitchen units were developed from requirements which were established through a federally-sponsored project entitled "Study of Space, Facility, and Structural Requirements for Farm Houses in the Northeast Region". As stated by Beyer:

. . . the design of kitchen cabinets is merely the design of one aspect of the kitchen. As such, it calls for a thorough examination of the equipment with which the cabinets are to be used. The goal of the kitchen designer is to coordinate storage areas with equipment and utility services as to give the maximum efficiency to work patterns in the preparation and clean-up of meals.<sup>2</sup>

According to his report, as these kitchen units were developed an attempt was made ". . . to rationalize their shape and structure in the interest of convenience and sound kitchen

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<sup>1</sup>Glenn H. Beyer, ed. Cornell kitchen. Ithaca, N. Y. Cornell University. New York State College of Home Economics. 1952.

<sup>2</sup>Ibid., p. 57.

practices."

The objective of economy of space, labor, and materials guided Wilson as she made kitchen design suggestions contained in two publications.<sup>1,2</sup> Suggestions for space use were derived from the results of studies of space requirements for the various kitchen processes, inventories of articles stored in kitchens of representative homes, inquiries into the customs and preferences of homemakers as they concern specific details of cabinet planning, physical measurements of homemakers and older girls, storage space requirements of the various groups of articles that are stored in the kitchen, step-saving kitchen arrangements, and similar inquiries.

After study of storage requirements of various kinds of household articles, McCullough<sup>3</sup> reported on the storage of kitchen utensils:

Kitchen utensils, which vary greatly in size and shape, can be stored in more types of storage units than any other class of household articles. Shelves, drawers, files, racks, and hooks may be used for utensil storage.

Further information was given on possible arrangements of

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<sup>1</sup>Maud Wilson. Considerations in planning kitchen cabinets. Ore. Agr. Exp. Sta. Bul. 445. 1947.

<sup>2</sup>Maud Wilson. Patterns for kitchen cabinets. Ore. Agr. Exp. Sta. Bul. 446. 1947.

<sup>3</sup>Helen E. McCullough. Space design for household storage. Ill. Agr. Exp. Sta. Bul. 557. 1952. p. 46.

units in the kitchen and total depths of the units which should make for most effective work in these areas.

To increase the amount of storage space between rooms or within a room, Heiner and Steidl<sup>1</sup> suggested the use of a storage wall. Such a wall was designed to replace a non-load bearing wall and could have many features incorporated into the storage space.

Studies related to space requirements for the articles to be stored. To be able to plan effectively the space required for articles which the homemaker may use as she performs the food preparation activities, one must have an understanding of the space necessary for the specific articles. Inventories of equipment and foods may be found in several sources. While the report of the survey, Farm Housing in the Northeast,<sup>2</sup> is concerned primarily with family activities and the location of activity areas, with prevailing and preferred house construction features, and with patterns of ownership and furniture, the Appendix contains extensive tabulation of inventory data. Some tabulations present the liberal and limited amounts of shelf space required for groceries at the mix center. The foods stored consisted of those stored by 20

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<sup>1</sup>Mary K. Heiner and Rose E. Steidl. Guides for arrangement of urban family kitchens. N. Y. (Ithaca) Agr. Exp. Sta. Bul. 878. 1951.

<sup>2</sup>Beyer, Farm housing in the Northeast, op. cit., pp. 94-109.

percent or more of the families included in the study.

Gassett,<sup>1</sup> after studying the space allowances for meal preparation and service in the Southern rural home, recommended the following space for storage of utensils:

Space at two different centers is desirable if utensils are to be stored at "place of first use". Skillets should be stored in or near the range. Other utensils with exception of casseroles are more often first used at the sink. Utensils reported as "frequently used" by families of the low socio-economic group having seven or more members were stored in a drawer 15 x 8 1/2 x 21 1/2 inches plus 22 inches of 12-inch shelving.

An analysis of the space required for food preparation revealed that:

. . . little use was made of the corner counter space. Supplies and utensils were kept within the limits of the 32 inches of counter space. The counter was rarely entirely covered. The full 24-inch depth of the counter was used when pie crust or biscuit dough was rolled out. Counter space is most crowded just before a meal when food is being put into serving dishes. Eighteen inches at right of sink was adequate for stacking soiled dishes but more space is needed to work freely.<sup>2</sup>

In a study of space use conducted by the Small Homes Council in cooperation with the Illinois Agricultural Experi-

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<sup>1</sup>Lorna J. Gassett. Space allowances for meal preparation and service in the Southern rural home. Tenn. Agr. Exp. Sta. Bul. 274. 1957. p. 5.

<sup>2</sup>Ibid., p. 5.

ment Station,<sup>1</sup> investigators developed storage space requirements for kitchens in which liberal supplies might be stored either in ample space or in minimum space; and limited supplies could be accommodated in a minimum space. Such requirements were established for the serve-range and the sink-mix centers.

Study related to counter materials and installation. The problem of choosing a counter surfacing material is becoming a more complex one. The variety is increasing and each has features which are desirable for work counter surface finishes for kitchens and utility areas. In a study of the chemical and physical properties of 24 counter surfacing materials, Weaver and Everhart<sup>2</sup> reported that a good grade of laminated plastics might come as closely to the desired characteristics as any material studied. These plastics had splendid resistance to stain, heat, moisture, impact, abrasion and color retention. The main disadvantage of this material, as pointed out by these authors, is that the costs are beyond that permitted by the average family budget.

Other materials studied included vinyl, which can be

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<sup>1</sup>Small Homes Council, op. cit.

<sup>2</sup>Elaine K. Weaver and Velma V. Everhart. Work counter surface finishes for kitchens and utility access. Ohio Agr. Exp. Sta. Bul. 764. 1955. p. 44.

considered as a good product at moderate cost, and linoleum which is the least expensive of the three materials but by nature of its composition can hardly be expected to last as long as some of the more durable and expensive materials. This study revealed that estimates for the costs of the materials above were from 50 to 75 percent of the installed cost.

Criteria of evaluation. A criterion for evaluating different factors such as storage, counter, and distances between appliances in the kitchen has been developed by the Small Homes Council at the University of Illinois.\* This score sheet was chosen by the writer for study as it is one of the current forms of information which is available and may be used by the consumer to guide his choices of kitchen storage units and counter space. The score sheet, based on recommended planning principles, was devised by the Small Homes Council as a guide for judging kitchen designs. The standards which are adaptable to any kitchen in a house using factory-made storage cabinets, resulted from a cooperative investigation conducted by the Small Homes Council and the Agricultural Experiment Station under a research grant made to the University of Illinois by Hotpoint, Inc.

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\*See Appendix for selected sections of Small Homes Council score sheet.

## Purpose of the Present Study

Sources of information which integrate findings and principles from the various disciplines are essential for consumers if they are to make wise choices relative to mass-produced storage units and counter space. As revealed in the review of present literature that is available to consumers for guidance of this type, the sources of this nature are very limited. The desire to develop such a source of information motivated the writer to design the present study with the following objectives in mind:

1. To interpret the social potential of guides for choice of mass-produced storage units and counter space.
2. To develop guides that may be used by builders and consumers in the evaluation of mass-produced storage units and counter space.

It was also hoped that problems could be pointed out on which research seems particularly urgent.

## PROCEDURE

Three distinct research methods were used for accomplishing the objectives of the present study concerning development of guides for choice of mass-produced kitchen storage units and counter space. First, the logical method was used to interpret the social potential of guides for choice. Next, the standards of the Small Homes Council Kitchen Score Sheet were evaluated according to data from both survey and experimental methods. In light of the findings and the judgment of the writer, revised guides for choice were developed and problems for further research were selected.

Interpretation of Social Potential  
of Guides for Choice

An interpretation of the social potential of guides for choice of mass-produced storage units and counters in the kitchen was developed from principles in social psychology and economics. Understanding of these principles and of information based upon them may enable builders and consumers to consider more critically the benefits to be derived from mass-produced storage units and counter space.

The social-psychological principles chosen for consideration were among those that can lead to a better understanding of the values which guide consumer behavior and of the function of these values in decision-making. Principles

of economics provided criteria for interpreting the efficiency of resource allocation in mass-produced kitchen storage and counter space.

The importance of choice-making as a phase of the decision-making process was emphasized. Choice-making will be effective to the degree that needed information concerning all aspects of a problem is available and criteria of choice from alternative possibilities for resource use are utilized. Information on the physical aspects of mass-produced storage units and counter space is essential for intelligent consideration of alternatives by consumers as they select such units. Interpretations were made of potential gains in family levels of living which could result from utilization of economic principles in choice-making. The social significance of improved choice with respect to kitchen storage and counter space was pointed out.

#### Development of Guides for Evaluation

The need for information which may be used by the consumer to evaluate and make a wise choice of mass-produced storage units and counter space for the kitchen has been established earlier by the writer. The guides were developed from data which were obtained by two methods: survey and experimental.

Collection and use of survey data  
from homes of Ames, Iowa

As one method of evaluating the Small Homes Council Score Sheet survey data relative to existing amounts and qualities of storage and counter space in the kitchens of 87 homes in Ames, Iowa, and information on the preferences of the homemakers for more counter and/or storage space in the kitchen, were compared with the score sheet.

The survey data used were collected under project 1290 of the Iowa Agricultural and Home Economics Experiment Station, "Factors Related to Ease of Performance and Satisfaction in Homemaking". A 28-page survey questionnaire had been designed to obtain information on the families, their houses, activities performed in the kitchen, present and preferred conditions in the kitchen, physical measurements of the kitchen and its facilities and equipment, and inventories of equipment and foods stored regularly in kitchens.

The sample for the survey had been drawn by the Iowa State College Statistical Laboratory from records of the Story County assessor as to the single-dwelling building permits which had been issued in the city of Ames, Iowa, during the period, January 1950 to January 1954. From this list of 549 permits, 100 completed houses were chosen by use of a table of random numbers. The sample was stratified according to the four wards of the city. Urban families were studied for

greater uniformity of pattern and because public utilities could be presumed available. The accessibility of running water and gas or electricity are factors basic to decisions on the distribution of supplies and equipment within the kitchen.

Interviewing took place in the months of September, October, November, and December of 1955. The three women responsible for the interviewing were homemakers who were sensitized to the attitudes and interests of homemakers relative to their kitchens. Eighty-seven completed schedules were obtained. Records were not obtained from 13 families because of absence from home when the interviewer called, refusals, and miscellaneous reasons.

For the purposes of the study reported here, data were taken from two parts of the survey: (1) the preferences of the homemakers for more counter and storage space were taken from questions 89 and 90 as they appear in the questionnaire under the section headed "Preferred Conditions", and (2) the amounts of counter and storage space in the kitchens were determined by physical measurements of these aspects of the kitchens. These two types of information were used:

1. To rate the kitchen storage and counter space found in these kitchens by the scale.
2. To evaluate the Small Homes Council Score Sheet as a rating device for these aspects of the kitchen.

3. To evaluate the Small Homes Council Score Sheet by the preferences of the homemakers for more storage or counter space in their kitchens.

In the present study, only parts A and B of section I of the Small Homes Council Score Sheet were used for judging the storage and counter space in the kitchen. These parts were chosen for study as they related specifically to the evaluation of storage and counter.

Experimentation to determine storage and counter space requirements for meal preparation activities

From the experimental phase of the study, information was obtained relative to amounts of counter and storage space needed in the mix area of the kitchen for the preparation of meals for a family of four. This space requirement was determined when the mass-produced storage units were located in three arrangements. The findings were used to evaluate the Small Homes Council Score Sheet. Advantages and limitations of mass-produced storage units and counter space were also considered.

Design of the experiment. The laboratory experiment was designed to evaluate the counter space requirement of "3 feet or more for the mixing area" as established by the Small Homes Council and to study the limitations and advantages of mass-produced storage units and counters. The area between the

refrigerator and sink was chosen as the mixing area due to the numbers of food preparation activities which require food from the refrigerator and water from the sink. The following aspects were considered in designing an experiment to measure the amounts of counter and storage space required for the food preparation activities:

1. Menus and food supplies.
2. Cabinets and equipment.
3. Base cabinet arrangements.
4. Evaluation of mix-way cabinets.
5. Utensils and small equipment.
6. Meal preparation activities.

With the cooperation of the Food and Nutrition Department of Iowa State College, menus were planned for two week periods for each of the four seasons of the year. From this group, one week's menus from the autumn season were chosen for more intensive study. From this week's menus a further selection was made to insure that meals prepared included all of the representative types of food preparation activities that may be performed in the area between the sink and refrigerator. A comparison of the test menus with menus from six other representative sources indicated that they were sufficiently complex to provide a rigid test of the adequacy of the available counter and storage space.\*

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\*List of food preparation activities and menus in Appendix.

A list of the food supplies to be stored in the three arrangements of storage units was obtained from three sources:

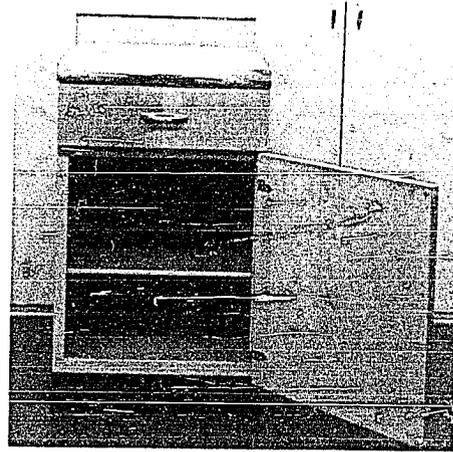
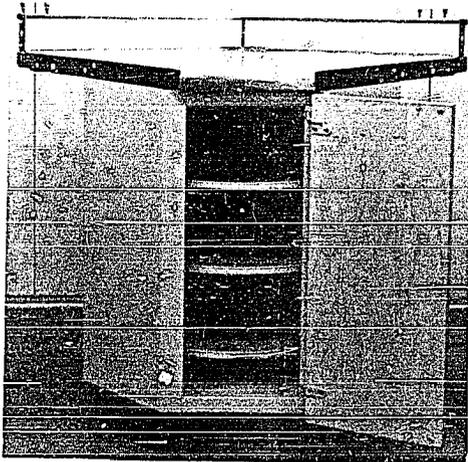
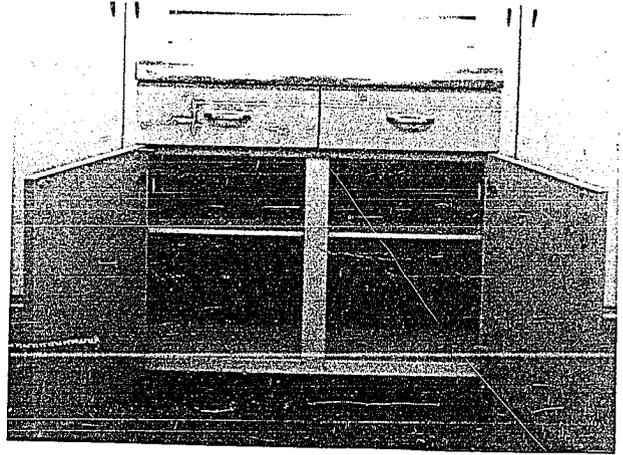
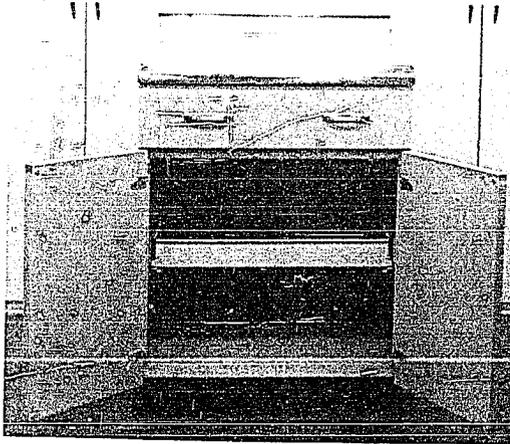
1. The foods required for the preparation of the week's menus for the autumn season. The one week storage was used because many homemakers do a large share of their marketing once a week.
2. A list of basic staple food supplies which was stored by 20 percent or more of the homemakers interviewed in the (Northeast Housing) study
3. A list of the basic staple food supplies stored by the 87 homemakers in the Ames survey.

The major equipment needed for the laboratory problem was obtained by consignment from manufacturers. The equipment and cabinets to simulate a kitchen arrangement included a refrigerator with a two-way opening door, five "mid-way" cabinets of different size and design, six base cabinets of different sizes, one corner base cabinet with revolving shelves, counters for the cabinets, a built-in oven and surface burners.

The six base cabinets were of typical size and design. The cabinets measured 21, 24, 27, 30, and 36 inches in length, 24 inches in depth, and 36 inches in height. The corner base cabinet measured  $33 \frac{1}{3}$  inches along each wall (Figure 1).

To simulate wall cabinets, strips were placed on the walls to support wall brackets and boards. The strips and

Figure 1. Mass-produced storage units used in experimental phase of study



brackets were so installed that the boards used as cabinet shelves could be mounted at different heights, in different locations, and could simulate varying amounts of total wall cabinet in different locations.

Each base storage cabinet was a complete unit with its own attached counter top. Hence, base cabinets of different sizes could be placed in various arrangements. Food preparation activities were performed with three arrangements of units as follows:

1. Two base storage units, 24 and 27 inches, placed in straight line.
2. One 27 inch base storage unit and a corner unit with revolving shelves.
3. Three base storage units, 18, 24, and 27 inches, arranged in an L-shape.

The mid-way cabinets were studied both in the laboratory and in the homes (Figure 2). They were located in the kitchen arrangements and evaluated by specific criteria as to their effectiveness as storage units.\*

The list of utensils and small equipment was determined by the food processes to be performed in the area between the sink and the refrigerator.

In each of the three arrangements of kitchen cabinets,

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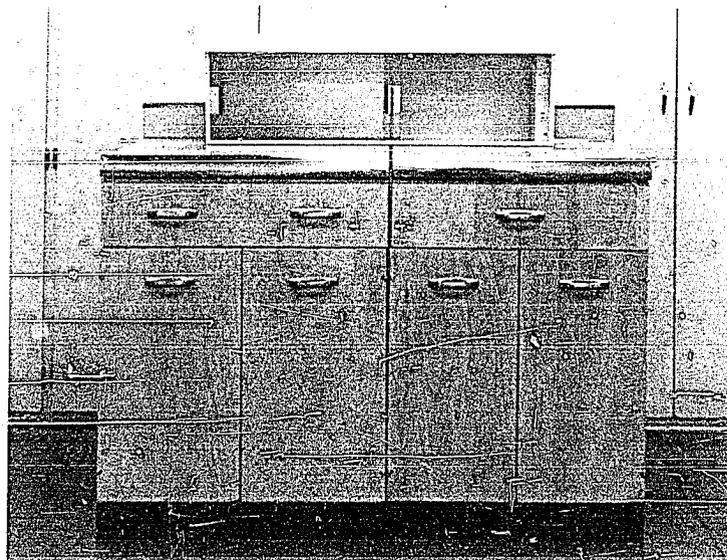
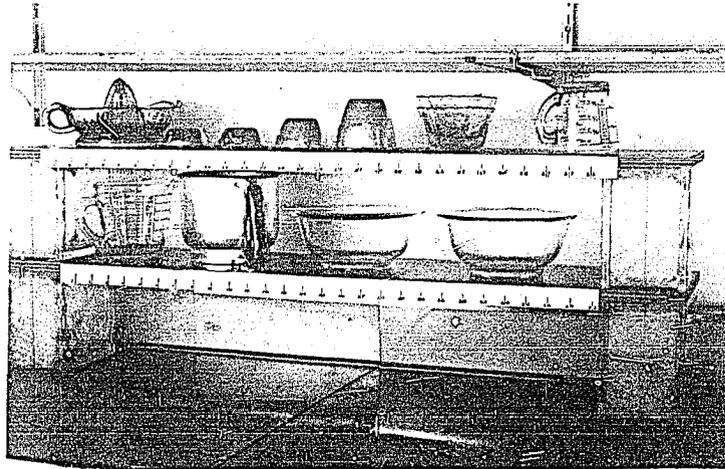
\*Criteria for evaluating mid-way units in Appendix.

Figure 2. Mid-way units

Top - Open shelf storage simulating the mid-way unit--possible alternative way of using unit

Center - Open shelf storage simulating mid-way unit--possible alternative way of using unit

Bottom - Mass-produced mid-way storage unit used in laboratory phase of study



a study was made of the counter and storage facilities. The six menus were prepared in each arrangement and the following observations were made:

1. Adequacy of counter space provided for the preparation of the menus.
2. Adequacy of the space for storage of foods and supplies.
3. Ease of use of specified storage units.
4. Alternative arrangements of foods, supplies, and equipment.

Measurement of space requirements. The following kinds of measurements were recorded from the laboratory experiments:

1. Counter space required for the preparation of the six menus in each of the three combinations of storage units.
2. Storage space required for the storage of the foods and supplies needed for the preparation of the week's menus.
3. Storage space provided by the three arrangements of storage units.
4. Storage space provided by the mid-way units.

The linear measurements by inches were taken with the use of ruled strips of cardboard. As the space was used for the meal preparation activities the ruled strips of cardboard were adjusted for the linear and the depth measurements. The

measurements were taken when each menu was prepared in each of the three arrangements of storage units.

Use of experimental data. Data obtained from the laboratory experimentation were used to:

1. Determine the amounts of storage and counter space needed for performance of meal preparation activities in the area between sink and refrigerator by measuring the amounts of space actually used in performing the food preparation activities. These measurements were both of the linear frontage and the depth of the counter used.
2. Evaluate the recommendations of the Small Homes Council as to the optimum amount of space required for the preparation area by comparing the optimum amount of space for the mix center as established by the Small Homes Council with the amounts of space used in the laboratory phase of the study.
3. Evaluate the advantages and limitations of the mass-produced storage units by studying those features which were incorporated in the design of the units.

Evaluation of features on mass-produced storage cabinets and counters. The mass-produced cabinets used in the laboratory phase of the problem were evaluated as to their convenience properties. Each cabinet was studied as a separate unit and when in combination with other units as this unit

would be when arranged in a home kitchen. The features on these units were compared to a list of 26 features which were found to be present on mass-produced base storage units studied in a review of manufacturers' literature on cabinets.

Recommended guides for evaluation. Guides for choice of kitchen storage and counter space were developed by the writer, as she drew upon the findings of the present study and incorporated, when necessary, her own insights from training and experience.

## SOCIAL POTENTIAL OF GUIDES FOR CHOICE

Guides for choice of mass-produced kitchen storage units and counter space may be envisioned as having unlimited influence on the quantity, quality and arrangement of such units in homes in the United States. With the prospect of the formation of 25,000,000 new households by 1982<sup>1</sup> and the possibility that many kitchens in present houses will be remodeled, such guides may contribute significantly to the satisfactions derived from the storage and counter space installed in these homes.

To stress further the importance of such guides, one needs only to consider the resources which are invested in storage units and counter space in kitchens. If such guides are not developed, resources may be allocated in ways that yield much less than the optimum in terms of satisfactions, resulting in personal loss to individual consumers and waste of national significance.

Whether such guides are to contribute significantly to the satisfactions of consumers of mass-produced storage units and counter space will depend upon the completeness of the knowledge and the judiciousness of the decisions of those who plan kitchens. Exploration into facts and principles of the

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<sup>1</sup>Look 25 years ahead great changes coming. Changing Times. June, 1957.

social as well as the physical sciences reveals behavior that may guide builders and consumers in choice-making. Furthermore when social and physical science principles function simultaneously, the satisfactions derived from given investments in mass-produced kitchen storage units and counter space should increase observably.

#### Factors Involved in Decision-making Related to Storage Units and Counter Space in Home Kitchens

As the various scientific principles are integrated into a scheme of workable knowledge by the consumer, certain factors should be given consideration. Basic to an understanding of consumer behavior is an understanding of the processes employed in decision-making. If the consumer is helped to recognize the steps taken in making decisions relative to housing and, more specifically, to storage and counter space in the kitchen, it is assumed that he would recognize that a logical method which gives full recognition to all aspects of a problem yields optimum satisfactions in the long run and that he would be willing to use this method. Although it is recognized that there is a logical process which should be taken as one makes wise decisions, one should acknowledge also that there are other processes which are followed by many as decisions are made.

Writers in different disciplines of social sciences have given much attention to the manner in which people make deci-

sions. As suggested by Linton,<sup>1</sup> an anthropologist, the consumer is concerned with two behavioral patterns as he makes decisions: (1) the selection of forms of behavior most advantageous to him under the conditions imposed by his environment, and (2) other things being equal, the establishment of advantageous behavior with a minimum of delay and effort. Further, individual action may be characterized as comprising three operations:

1. The development of adequate behavioral responses to various situations.
2. The reduction of these responses to habitual terms.
3. Utilization of the habitual responses already established.

The importance of habit as a factor in decision-making is emphasized further by Linton:

Human beings always and everywhere, live mainly by habit, employing intelligence only when no habitual response will serve. We can even go a step further and say that the normal response to a new situation is to try to utilize the habit connected with some other situation which resembles it in one way or another. It is only when this automatic response fails to work that people turn reluctantly to thinking about what ought to be done . . . .<sup>2</sup>

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<sup>1</sup>These functions and the operations that follow were proposed by Ralph Linton. *The cultural backgrounds of personality*. New York, N. Y. Appleton-Century-Crofts, Inc. 1945. pp. 86-87.

<sup>2</sup>Ralph Linton. *Potential contributions of cultural anthropology to teacher education*. In *culture and personality*. Washington, D.C. American Council on Education. 1941. p. 9.

Thus, much of consumer behavior results from habitual reaction rather than conscious decision-making.

The way people make decisions and behave belongs to the discipline of psychology. Knight, an economist, recognized the psychological nature of the problem when he wrote:

So when we try to decide what to expect in a certain situation, and how to behave ourselves accordingly, we are likely to do a lot of irrelevant mental rambling and the first thing we know we find that we have made up our minds, that our course of action is settled. There seems to be very little meaning in what has gone on in our minds, and certainly little kinship with the formal processes of logic which the scientist uses in an investigation. We contrast the two processes by recognizing that the former is not reasoned knowledge but "judgment", "common sense", or "intuition". There is doubtless some analysis of a crude type involved but in the main it seems that we "infer" largely from our experience of the past as a whole . . . .<sup>1</sup>

These operations imply two principles of individual behavior:

(1) without a subjective registration of a situation to evoke a response, the individual acts automatically on the basis of responses that have proved adequate in the past; and (2) with a subjective registration of a new situation, a new behavioral pattern is introduced. Knowledge of these processes will enable planners of storage and counter space in the kitchen to better understand the decision-making behavior of the consumer. However, granted that these may be processes by which the individual ordinarily makes decisions, it is to be

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<sup>1</sup>Frank H. Knight. Risk, uncertainty, and profit. New York, N. Y. Houghton-Mifflin Company. 1921. p. 211.

hoped that with more adequate information which may be used in the evaluation of mass-produced storage units and counter space the consumer may follow a more logical procedure in making decisions relative to these aspects of housing.

In recent years the science of decision-making has been examined thoroughly by economists and mathematicians. Certain aspects of the economic approach will be used in the present study.

#### Steps in decision-making process

Decisions which result from logical thinking and involve facts and principles of both social and physical sciences should place consumers closer to maximization of the satisfactions they desire. As such a process is employed in decision-making relative to mass-produced storage units and counter space in kitchens, more satisfying qualities, quantities, and arrangements of such units should result. The steps in the decision-making process may be interpreted as follows:

1. Recognize the problem.
2. Analyze the problem.
3. Consider values, goals, and resources of the consumer.
4. Search for relevant alternative solutions of the problem.
5. Predict probable outcomes of each alternative

solution.

6. Choose from among the alternative aspects.

Further examination of selected aspects in the decision-making process will reveal their significance in the decisions to be made by consumers.

### Values and goals

As families make choices relative to their housing, they are motivated<sup>1</sup> by their values and goals. The values held by an individual are ultimate ends toward which all behavior, conscious or unconscious, is directed. They are the intangible forces which guide the individual and provide the drive necessary for the accomplishment of his many wants and desires.

From many lists of values which have been proposed as important to the individual, Cutler<sup>2</sup> has found ten related especially to a home: hobbies, friendship, convenience, comfort, location, privacy, beauty, health, economy, and safety. These are expressed in many ways as the consumer chooses and

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<sup>1</sup>Motive interpreted to be that within the individual, rather than without, which incites him to action. Motivate interpreted - to provide with a motive. W. A. Neilson, Ed. Webster's collegiate dictionary. 2nd ed. Springfield, Massachusetts. G. and C. Merriam Company. 1947. p. 651.

<sup>2</sup>Virginia F. Cutler. Personal and family values in the choice of home. N. Y. (Ithaca) Agr. Exp. Sta. Bul. 840. 1947.- p. 6.

uses mass-produced storage units and counter space in the kitchen. To satisfy the value of convenience, cabinets with adjustable shelves would be chosen and arranged so that foods and equipment might be easily reached and readily accessible for use. The value of beauty may be expressed as cabinets are chosen with specific types of materials, finishes, and trim. Economic values are reflected when storage and counter units are chosen with concern for the needs of the family and most effective use of resources.

To satisfy a specific value or group of values, one sets a goal, which is defined by Webster's dictionary as ". . . an object or end that one strives to attain; aim."<sup>1</sup> Goals stem from one's values and are reflections of values. Goals constitute a hierarchy in which almost every goal stems from a lower goal and leads to a higher one. They are the means to higher ends which finally culminate in ultimate ends or values. For example, the consumer may value safety in his home. He will then set goals which will ultimately lead to a safe environment in the house. Specific activities to accomplish these goals might be to put guard rails on the stairs, or use non-skid wax on floors.

The goals and values of a consumer may originate from

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<sup>1</sup>Joseph H. Friend and David B. Guralnik, eds. Webster new world dictionary for the American language. College ed. New York, N. Y. The World Publishing Company. 1954. p. 640.

within the family and from without. Those from without the family may be of a social, economic, physical, and technological nature. Among the many social influences which play a part in shaping the values of the consumer is the reference group that the consumer wishes to be identified with. As he identifies himself with a specific person, group or phase of life, that reference then influences his values and behavior. This reference group interaction could have unlimited influence upon the values held by the consumer relative to his housing, and more specifically the mass-produced storage units and counter space in the kitchen.

From within the family, they may be influenced by the maturation and the different phases of the family life cycle. These factors may lead to differences among family members as to what is important, and differences as to the goals or values that should be pursued at a point in time or over time. In his interpretation of the foundations of personality, Young advanced the idea that one's values arise out of an hierarchy of desires:<sup>1</sup>

Because values are of a dynamic nature and are experiences, not objects or things, they will mean different things to different people. As one experiences a certain set of circumstances, he develops a set of values each of which will change in importance as there are changes in the character of the situation.

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<sup>1</sup>Kimball Young. Social psychology. New York, N. Y. Appleton-Century-Crofts, Inc. 1956. p. 81.

The values of an individual are defined differently in different disciplines, such as philosophy and economics, but they always mean something very important to the individual and are found at the root of human motivation . . . .

When recognition is given to the origins of goals and values of consumers by those who are responsible for planning and building houses, and more specifically the storage and counter units in kitchens, increased satisfactions should be achieved from the final decisions.

Though the value pattern of an individual is recognized as a powerful influence directing his behavior, the relative importance of a single value may be tempered greatly by the resources available for use at a specific time. This is especially true for the consumer as the categories of consumption compete for each unit of a resource.

### Resources

Economic resources are those which are scarce, can be used for alternative purposes, and can be transferred or exchanged from one person to another.<sup>1</sup> They may be human or non-human in character. The human resources include time, energy, interests, abilities, skills, and attitudes which are inherent in the individual. Non-human resources include

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<sup>1</sup>J. J. Bowman and G. L. Bach. Economic analysis and public policy. New York, N. Y. Prentice-Hall, Inc. 1949. p. 17.

money and material goods. In addition both human and non-human resources are to be found in the community. They include services related to protection of life and property, information, education, health and consultation as well as material resources such as highways and parks.

To achieve economic efficiency, the individual tends to use his resources in such a manner as to attain a maximum of the goals which are important to him. When making decisions relative to storage and counter space in the kitchen, the consumer may make use of the resource of information as it comes from his own experience and as it may be available from many sources in the community. This is the challenge as seen by the writer - to provide such information which may be made available to the consumer as he seeks out this resource in the community.

The degree to which the consumer is successful in accomplishing his complex of values (all of which he considers to be important) will depend upon the amounts of resources available and his ability to make wise use of them. A limitation of one of the most important of the resources, money, may influence significantly the decisions made by the consumer relative to the purchase of mass-produced kitchen storage and counter units. Irrespective of the values and goals held by the consumer, such a limitation will of necessity influence the kinds of choices to be made in this situation.

### Choice-making criteria

Choice-making criteria are essential for the consumer as he searches for relevant alternative solutions to his problem and attempts to predict the probable outcomes of each alternative solution. These criteria will help him to determine the best combinations of resources to achieve his objectives. Such criteria may be found in the economic principles of diminishing returns, equi-marginal returns, and indifference analysis. If a consumer behaves in a manner consistent with these principles, he will be more nearly able to maximize the satisfactions to be derived from his resources.

The principles of diminishing returns may be examined to interpret the best use of one's resources. As one increases the units of resource to be invested, the satisfactions to be derived will increase; but after a point the extra satisfactions resulting from the same additions of resources will become less and less. In Figure 3, the total satisfactions are shown in relation to the number of square feet of storage space in the kitchen. The length of each bar shows the total satisfactions that may be assumed to be realized from the unit of space. With one unit of six square feet of storage space, 15 units of satisfaction are assumed, with 18 square feet of storage space, 55 and with 36 square feet the total results are 85 units of satisfaction. Hence, up to six units of six feet of storage space, one sees that each is higher

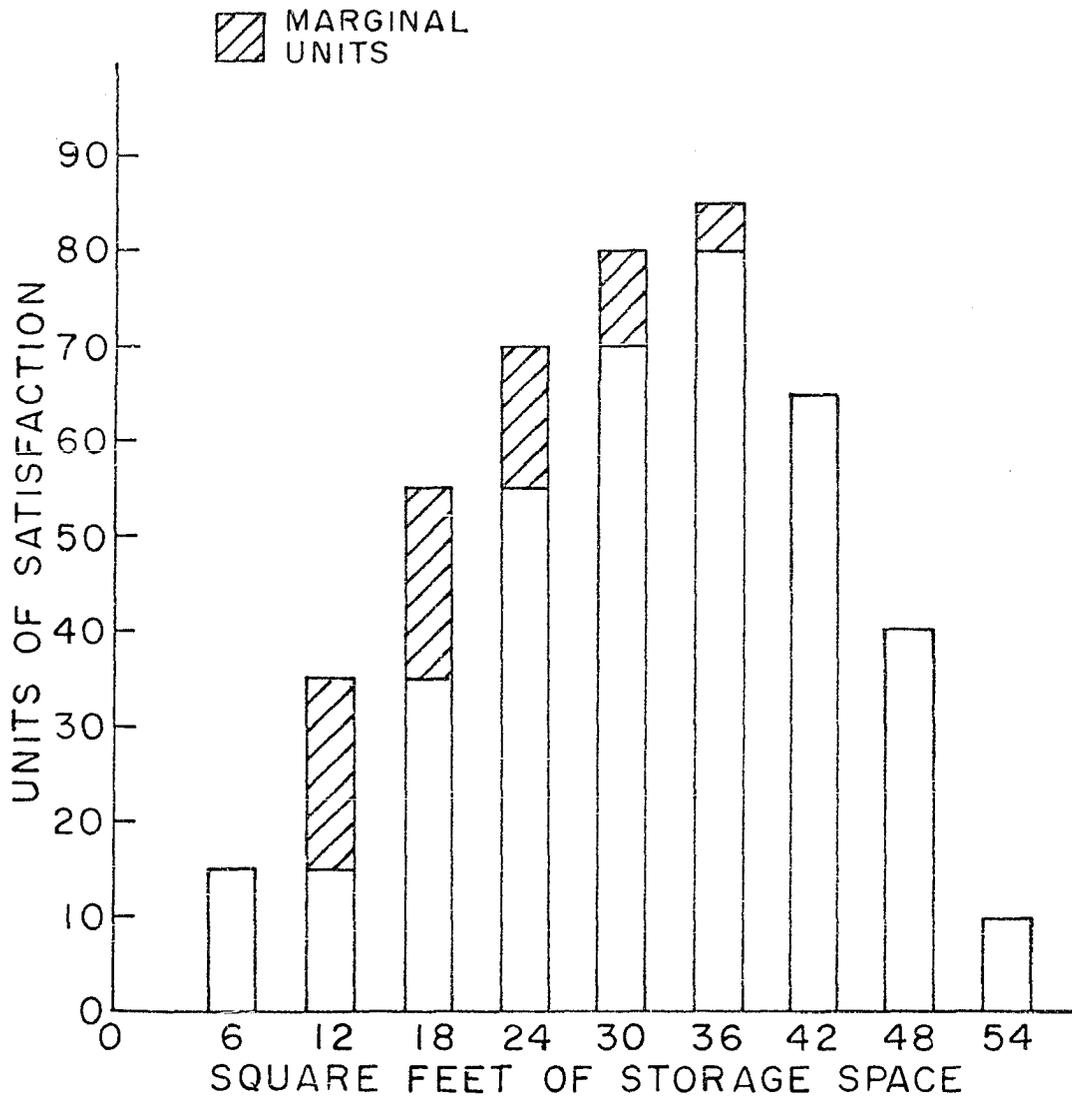


Figure 3. Hypothetical situation depicting the total and marginal units of satisfaction associated with specific amounts of storage space

than the previous one denoting that total satisfaction increases with more storage space. Diminishing returns are encountered because the difference in the length of the bars, as shown by the shaded portion of each becomes less and less. The shaded area represents marginal satisfaction. The second, third, and fourth marginal units of storage space add 25, 20, and 15 units of satisfactions, respectively.

Diminishing returns are obvious. Such diminishing returns may be accompanied by the realization that the resources invested in all units of space which do not yield satisfactions should then be invested in other ways. Other feelings that should be included are those that are associated with the time and money costs of extra space; inefficiencies in storage practices due to surplus space, and less efficiency which may be due to disorganized storage.

If a consumer is maximizing his satisfactions, the principle of equi-marginal returns, or opportunity costs will be operative. Two conditions are essential for satisfaction: (1) the last unit of any given resource when used in each category of consumption will yield equal satisfactions and (2) when the last unit of all resources are allocated to the categories of consumption they will yield equal satisfactions. Accordingly, the principle states that the best combination is attained when the resources are so allocated that one can not change a single unit of resource without reducing total

satisfaction. This principle is sometimes called opportunity cost because it involves the giving up of one satisfaction in order to have another.

Because his resources are limited, the consumer must consider the categories of consumption together, an addition of resources to one category of consumption requires an equivalent contraction in another and the question is one of which category will give the greatest satisfaction relative to the costs involved. The principle is illustrated in Table 1 and Figures 4 and 5. Table 1 was adapted from a proposed budget

Table 1. Income allocated to specific categories of consumption

Category of consumption	Income	
	Percent	Amount
Food	32.5	1,462.50
Housing	13.02	585.00
Clothing	13.02	585.00
Transportation	9.7	436.50
Medical	6.5	292.50
Household operation	4.3	193.50
Recreation	4.3	193.50
Furnishings and equipment	3.8	171.00
Insurance and savings	3.25	144.00
Other	8.7	391.50
Total		4,500.00

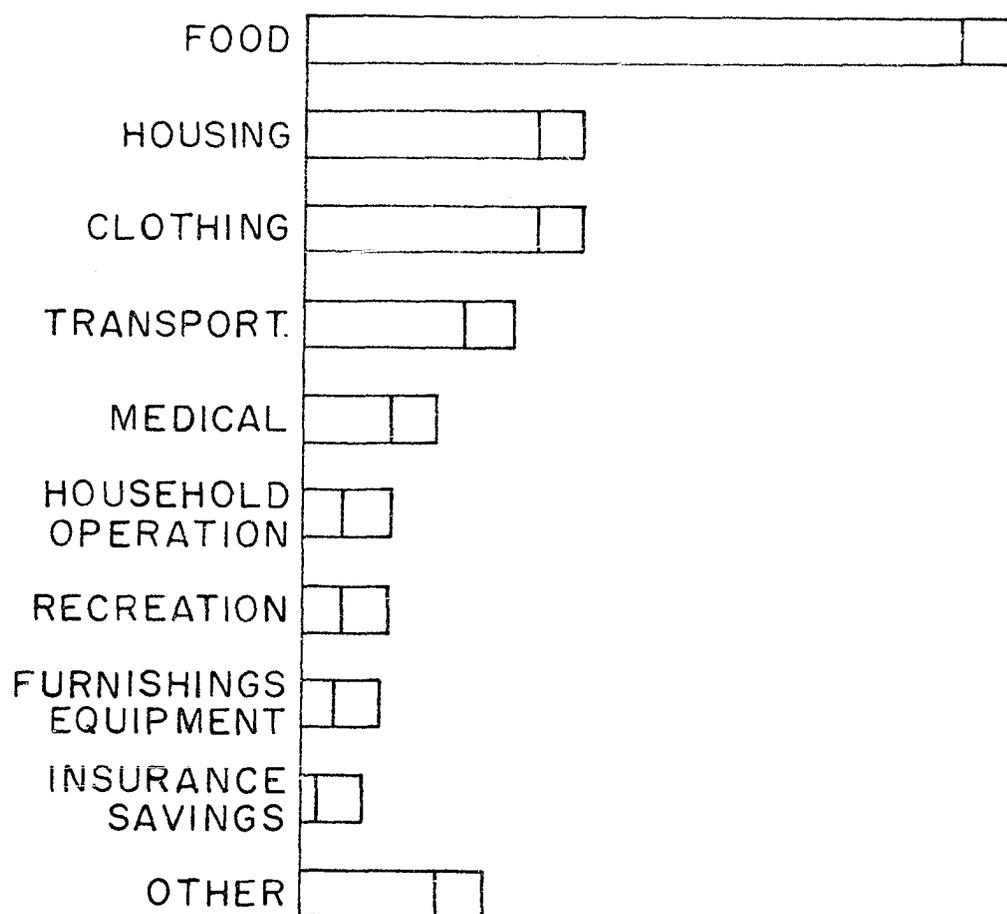


Figure 4. Hypothetical situation depicting amounts of disposable income allocated for specific categories of consumption with the square at the end of each bar representing the last unit of \$100 allocated to each category of consumption

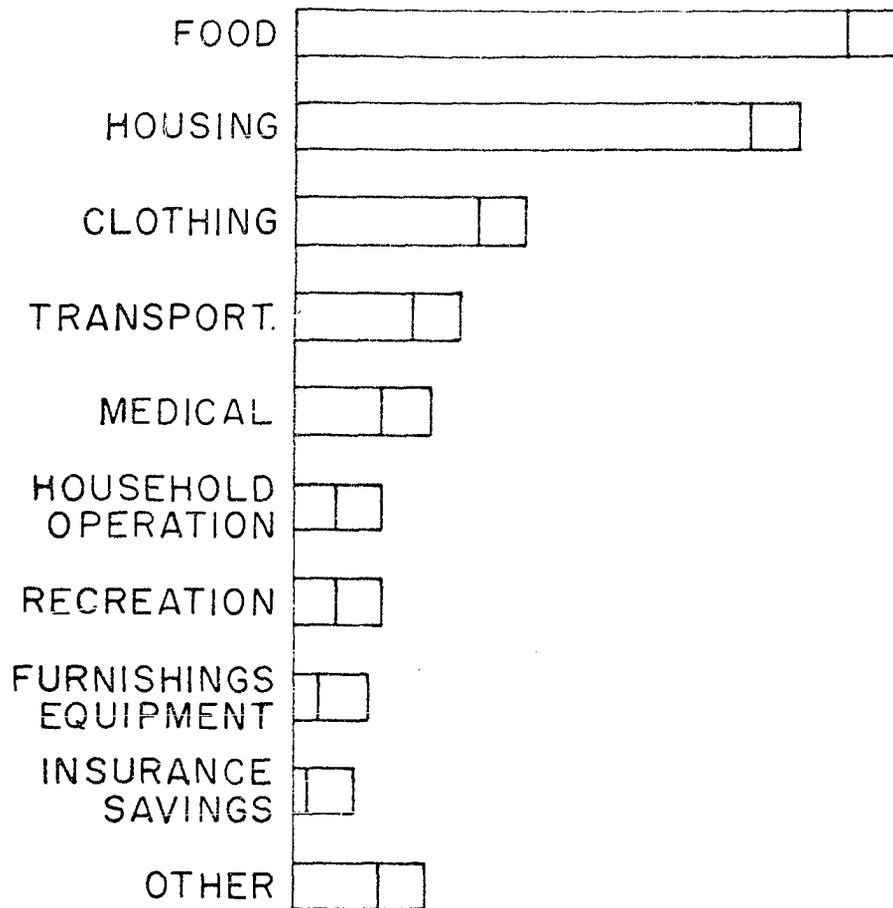


Figure 5. Alternative hypothetical situation depicting the amounts of disposable income allocated for specific categories of consumption

established by the Heller foundation<sup>1</sup> for a family of four of the white collar worker group: man, wife, boy 13, and girl 8. The amounts of income allocated to each of the categories of consumption were based upon the disposable income of a family which totaled \$4,500 for one year. Figure 4 shows the distribution of the disposable income among the categories of consumption with the last unit of \$100 allocated to each use yielding equal returns to satisfactions. Under these circumstances, all other things being equal, the family should move in the direction of maximization of satisfactions.

Suppose the family decides to remodel its kitchen and purchase mass-produced storage and counter units. Figure 5 illustrates an adjustment the family could make. The quantity of money required for the purchase of the cabinets amounts to \$500. An addition of this amount of money to the category of housing requires an equivalent contraction from other categories of consumption. A contraction has been made in those categories which are most responsive to an income reduction. Income has been added to the area where satisfactions to be derived are great, and income has been subtracted from those areas where satisfactions are decreasing rapidly. As shown

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<sup>1</sup>Heller Committee for Research in Social Economics. Quantity and cost budgets for three income levels. In I. H. Gross and E. W. Crandall. Management for modern families. p. 158. New York, N. Y. Appleton-Century-Crofts, Inc. 1954.

in the figure, the contractions have been made in the categories of food, clothing, transportation, and "other". Two units of \$100 each have been subtracted from food as it is assumed that the consumer can, by various means, feed the family adequately at less cost. One unit has been subtracted from clothing as the consumer could reduce the amount of money required for this category by taking advantage of sales, through more economical care of clothes, and by making garments at home. One unit was subtracted from transportation as that cost for a vacation had been included in Plan I but was given up in Plan II for the improvement in the kitchen.

The "other" category included items such as music lessons, personal care, fees for organizations, magazines, books, and newspapers. A subtraction of one unit was effected in this category.

After the foregoing adjustments, the last unit of \$100 invested in each category would yield satisfactions equal to all other \$100 marginal units. If one should change the use of a single unit of \$100, satisfactions would be reduced.

Likewise, the equi-marginal or opportunity cost principle can be used in making choices between the use of resources for storage and counter space or for other features in the kitchen, other features in the house, other categories of consumption, income producing enterprises, or for

saving for the future.

In terms of the indifference analysis, the consumer considers carefully the commodity combinations he would be satisfied with at each level of money available. His indifference curve is composed of a series of combinations of commodities to which the consumer is indifferent, that is, he will be equally satisfied with any one of the combinations of commodities in the series. An indifference map may be composed of the individual indifference curves. Each curve represents a different level of money. Thus, a partial family of indifference curves could be envisioned such as those represented in Figure 6 where each curve, successively farther from the origin represents a higher level of satisfaction since more units of space both in the kitchen and in the dining area are indicated. The indifference curves are negatively inclined - slope downward and to the right. This must always be the case because to stay on the same indifference contour, the consumer in question must give up some units of space in the dining area every time a unit of space is added to the kitchen. Thus, the substitution of space in the kitchen for space in the dining area.

Given (1) the consumers indifference map, (2) costs of the space as allocated to the dining and kitchen area, and (3) total money available for these two commodities, then one can indicate the combination of space in the kitchen and

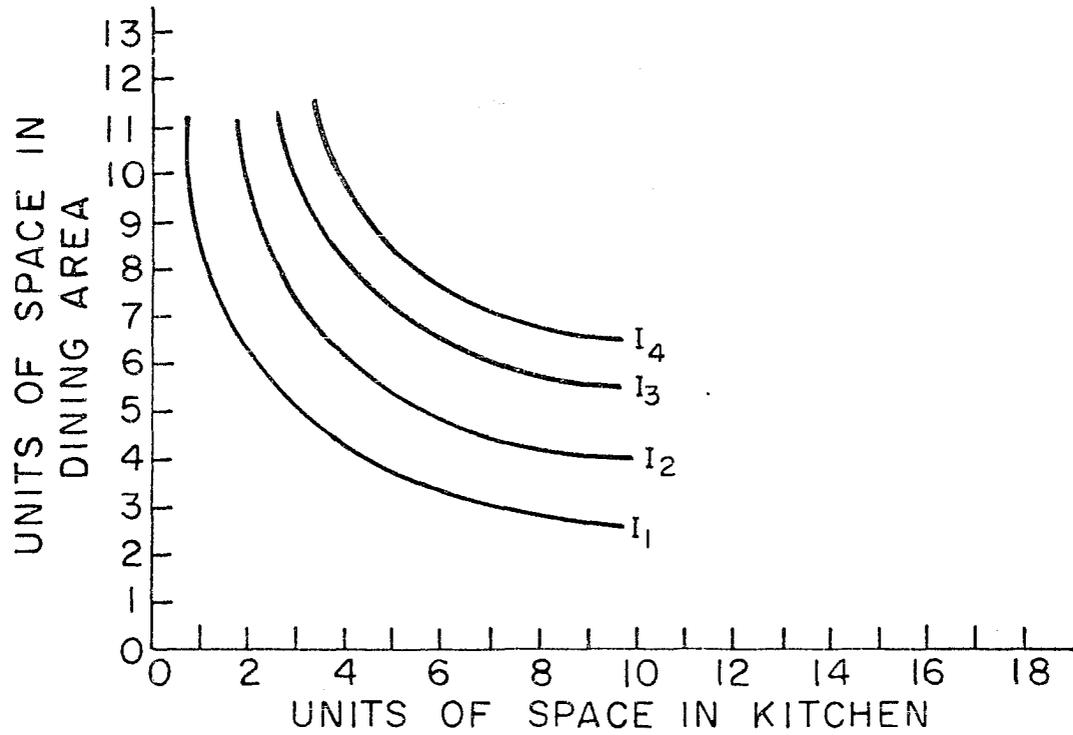


Figure 6. Hypothetical partial set of indifference curves

dining area that is best for the consumer. From the cost and money available, it is possible to construct the consumption-possibility line, Figure 7. From the relation of the CPC curve to the indifference map for dining and kitchen space emerges the solution to the consumer choice problem; the best combination of space in the dining area and space in the kitchen is indicated by this relationship. In Figure 5 for example, is shown a hypothetical situation in which the optimum allocation of money resources for space in the kitchen and space in the dining area is determined where the indifference curve is tangent to the consumption possibility line. With \$500 to allocate to space in the two areas, the optimum combination exists where \$200 is allocated to the dining area and \$300 to the kitchen.

A further utilization of the indifference analysis to interpret consumer choice is illustrated in Figure 8. It is concerned particularly with resource limitation. The consumption possibility curve in the absence of resource limitations is  $CPC_2$ . The consumption possibility curve when resource limitations are present may be represented by curve  $CPC_1$ . Removal of resource limitations would allow the consumer to achieve greater satisfaction. Thus, if a consumer is using his resources consistent with OX goods and services which yield indirect satisfactions and OY goods and services which yield direct satisfactions, any movement upward and/or

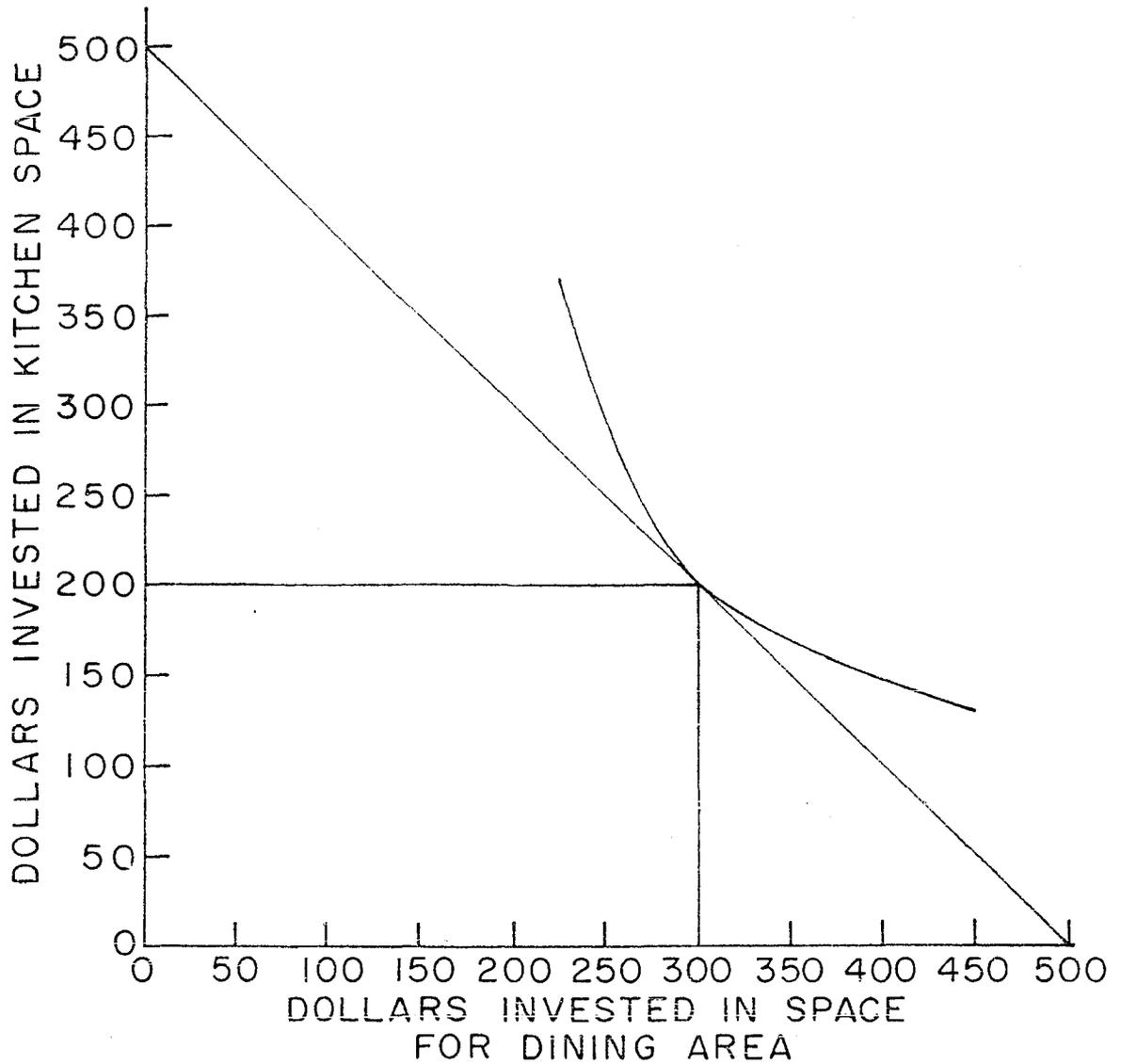


Figure 7. Hypothetical situation depicting the optimum allocation of money resources for kitchen and dining area

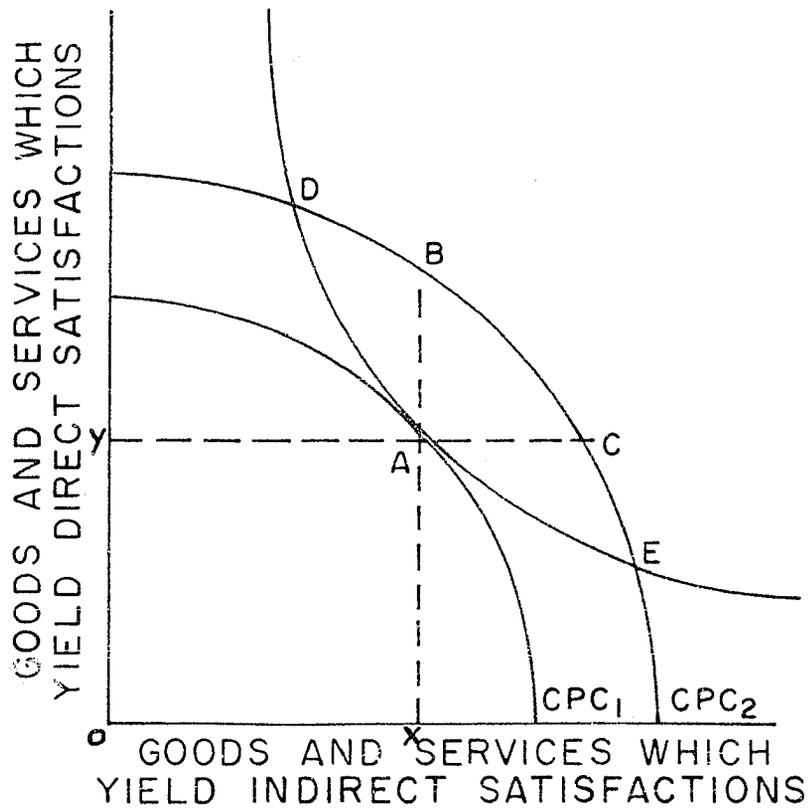


Figure 8. Hypothetical situation depicting the effect of resource limitations

to the right from point A allows the consumer greater returns. Thus, on curve  $CPC_2$ , any point at or between B and C can be said to be preferred to A without knowing anything about the consumers indifference system. If the consumers indifference system were known, the range of possible alternative combinations would be extended to someplace between D and E.

Information which may be derived from the application of these principles to the specific situation of the consumer may guide him in allocating resources to maximize satisfactions.

#### Information as a factor in choice-making

As consumers follow through the steps in decision-making outlined in a previous section, several types of information are essential. Particularly important to choice-making is information which will help in the selection of alternative modes of action and speculation as to their probable outcomes. As the consumer uses this information and integrates it into his experience, knowledge evolves which serves to guide his behavior. As proposed by Johnson and Haver,<sup>1</sup> there are five different knowledge situations in which the consumer might find himself: the learning situation, the risk situa-

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<sup>1</sup>Glenn L. Johnson and Cecil B. Haver. Decision-making principles in farm management. Ky. Agr. Exp. Sta. Bul. 593. 1953.

tion, the inactive situation, the forced action situation, the certainty situation.

In the certainty situation, the consumer feels that his knowledge is so perfect that he does not have to protect himself against error in his decisions, whereas in the forced action situation, the consumer takes action without seeking information.

With the inactive situation, the consumer's knowledge is not good enough to justify his going ahead and take a proposed action. Further, in this situation he does not value what he can learn at more than the cost of learning, and consequently does not act. The challenge here is tremendous for the person who is developing information which may be used to guide choice-making. It is not only a task to develop information but how does one deal with such inertia and ignorance? Relative to the choices made about storage and counter units, this consumer will permit the builder to make the choices as to the quantity, quality, and arrangement of storage and counter units irrespective of the needs of the consumer.

In the risk situation, the consumer knows that his information about a particular problem is incomplete but feels that it is adequate for action. He knows that lack of knowledge may cause him to make the wrong decision but nevertheless feels willing and able to run the risks involved.

In this situation, a man does not value what he can learn about this particular problem at more than its cost.

In the learning situation, however, the consumer values what he thinks he can learn at more than it will cost. This is the consumer who will analyze the needs of the family when making choice relative to the mass-produced storage units and counter space. He will actively and aggressively seek out information which will help him to make most effective use of his resources when acquiring these units.

With a knowledge of the aspects of decision-making as has been presented, one should be better able to develop information to help the consumer as he makes decisions concerning storage and counter space in his kitchen. But to develop information is only the first step in helping the consumer to make wise choices. One must also recognize that the consumer will make use of information depending upon the knowledge situation in which he finds himself. The goal of developing guides which may be used in evaluating mass-produced storage units and counter space may be achieved, but one must also be concerned with the approach which will be most effective in presenting this information to consumers in all knowledge situations. Two approaches have been suggested by Johnson and Haver<sup>1</sup> to increase the value which the

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<sup>1</sup>Ibid.

consumer places upon what he can learn and to lower the cost of learning. The value which the consumer places upon what he can learn may be increased by producing and extending information which is more important and more useful to him, and by motivating him to make wise use of this information. To lower the cost of learning, the information should be presented by methods which make it easier for consumers to absorb information, analyze it and make decisions.

## GUIDES FOR EVALUATION OF MASS-PRODUCED STORAGE AND COUNTER SPACE IN HOME KITCHENS

Information to be used in the development of guides for evaluation of mass-produced storage and counter space was derived from the following sources: comparison of the storage and counter space in the kitchens in the survey with the Small Homes Council standards, a comparison of these measurements in the kitchens in the survey with alternate optimums, a study of the homemakers' preferences for more counter and storage space in relation to the ratings of their kitchen by the score sheet and by alternate optimums, experimental determinations of the quantity of space required for the meal preparation activities which were performed in the area between the sink and the refrigerator, and an appraisal of the mass-produced storage cabinets used in the laboratory phase of the study.

### Evaluation of Small Homes Council Score Sheet

Two approaches were used to identify ways of improving the Small Homes Council Score Sheet and to develop recommendations for further research concerning most appropriate optimums for given situations. The first approach involved comparison of measurements from the kitchens surveyed in Ames, Iowa, with the Council's specified optimums and the testing of alternate optimums which might be better than

those of the Council. In the second approach, the preferences of the homemakers who said they needed more space were examined in relation to the ratings of their kitchens by the score sheet and by alternate optimums. Possible improvements in the Council's score sheet were sought with respect to optimums for base cabinets, wall cabinets, counters at right of sink bowl, counters at left of sink bowl, counters at the range area and counters for mixing at any point in the kitchen.

#### Kitchen measurements

It was presumed that the practices of the builders would tend to accommodate the "average" or "central tendency" needs of their consumer buyers and that a divergence of the central tendencies in builders' practices away from the optimums specified by the Small Homes Council might reflect desirable changes in the score sheet, at least for the city of Ames. Thus, identification of specifications for wall and base cabinet frontage which compare favorably with the central tendencies of the builders could be used for making recommendations for further research concerning improvement of the Small Homes Council score sheet as a guide for selection of cabinet and counter space by builders and consumers.

Standards which have the "open end" characteristic may prove to be ineffective as a guide for the planner of storage

and counter space in the kitchen. Such a recommendation fails to place limits which are reasonable and therefore places the planner in the position of making the decision which may or may not be based upon an intelligent analysis of the consumers' needs.

When the base cabinet frontages were rated by the score sheet, one-third (29) of the kitchens had less than 11 feet of frontage, one-third had the optimum of "11 feet to 13 feet 6 inches"<sup>1</sup> and one-third had more than this optimum. This distribution indicates the probability that the score sheet standard is an appropriate one. However, the base cabinet frontages in the kitchens were rated with an alternate and specific optimum of 13 feet 6 inches in contrast to the range of measurements specified by the Council. The alternate optimum at the top of the range was chosen on the assumption that the numbers of items now used by consumers and stored in these base units would require this amount of space. Of the 87 kitchens, one had a base cabinet frontage equal to the suggested standard, 29 exceeded the standard and 57 were below it (Table 2). This distribution indicated the probability that the standard is too high and that further study should be made of possible optimums between 11 and 13 feet 6 inches.

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<sup>1</sup>Throughout text, score sheet standards are set off by quotation marks.

Table 2. Distribution of houses by shortages and surpluses in storage and counter space frontage

Storage and counter space optimums and type of variation	Number of houses by inches of variation from specified optimum frontage												Total
	1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	101-110	111- or over	
Base cabinet optimum: 13 feet, 6 inches													
Surplus	7	3	4	1	3	1	3	0	2	3	1	1	29
Shortage	10	11	7	6	5	6	6	4	1	0	1	0	57 <sup>a</sup>
Wall cabinet optimum: 14 feet													
Surplus	1	0	2	1	2	1	0	0	1	0	0	0	8
Shortage	3	2	5	8	11	8	5	10	6	9	5	7	79 <sup>b</sup>

<sup>a</sup>One kitchen had the optimum frontage.

<sup>b</sup>No kitchen had the optimum frontage.

Table 2. (Continued)

Storage and counter space optimums and type of variation	Number of houses by inches of variation from specified optimum frontage												Total
	1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	101-110	111- or over	
Counter frontage at right of sink: 3 feet													
Surplus	19	23	2	3	0	1	0	0	0				48
Shortage	18	12	4	0	0	0	0	0	0				34 <sup>c</sup>
Counter frontage at left of sink: 2 feet, 6 inches													
Surplus	18	29	12	2	1	1							63
Shortage	16	3	1	0	0	0							20 <sup>d</sup>

<sup>c</sup>Five kitchens had the optimum frontage.

<sup>d</sup>Four kitchens had the optimum frontage.

Table 2. (Continued)

Storage and counter space optimums and type of variation	Number of houses by inches of variation from specified optimum frontage												Total
	1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	101-110	111- or over	
Counter frontage adjacent to range: 2 feet													
Surplus	13	8	14	6	2	2							45
Shortage	11	0	24	0	0	0							35 <sup>e</sup>
Counter frontage for mixing: 3 feet													
Surplus	17	16	13	12	4	4	1	1					68
Shortage	9	4	1	0	0	0	0	0					14 <sup>f</sup>

<sup>e</sup>Seven kitchens had the optimum frontage.

<sup>f</sup>Five kitchens had the optimum frontage.

In terms of the Council's optimum of "8 feet 6 inches to 14 feet" for wall cabinet frontage, 40 of the kitchens had less than the optimum, 39 had within the optimum range, and eight measured more than that amount. In order to avoid use of an open-end standard, an alternate optimum was tested, that of 14 feet, the upper limit of the score sheet range. By this standard, 79 of the kitchens had a shortage and eight had a surplus (Table 2). Since the number of kitchens with shortages was 10 times larger than the number with surpluses and since the amounts of shortages were well distributed along the entire range from less than 10 up to 110 inches, 14 feet of wall cabinet frontage appeared to be a higher optimum than is necessary. For this reason an alternate optimum of 9 feet was tested. The wall cabinet frontages in 43 of the kitchens were short of this standard, one had exactly this amount and 43 were above the standard. It would seem that further study should be made of the possibility that an optimum of 9 feet would be a better guide than the "8 feet 6 inches to 14 feet" of the Small Homes Council score sheet.

When the shortage and surplus concept is used to evaluate the base and wall cabinet frontage in kitchens, the economic importance of alternate resource investment looms large. The shortages may be considered as indicative of an under investment of resources where satisfactions may have been maximized

with a small increment of space. A surplus of such space should also challenge one's concern. This may be interpreted as an overinvestment of resources in the category of housing which essentially amounts to a waste due to high opportunity costs and may actually yield dissatisfactions in terms of care and maintenance.

Whether the amounts of space are really adequate for consumer needs will depend upon the design of the units and the ways in which they are used. If the surplus is a function of the storage under the sink or in the range, such a situation cannot be compared favorably with a kitchen which has a surplus in a mass-produced unit designed primarily for storage. The storage space provided in the range and sink units has characteristics which limit its usefulness. The amount and kind of storage space provided in the under-sink cabinet will depend upon the design of the sink trap and whether there is a waste disposer. Even with a minimum of interference, the unit may be too deep, front to back, for easy reach of items and space may be wasted due to the height of the unit, top to bottom. Moreover, the storage space provided in the range itself should be evaluated in terms of the cost and convenience of such storage as compared to that which can be provided by mass-produced units. Within-range storage tends to violate the principle that items be stored individually rather than stacked. Further, a questionable storage practice

at this location involves the stacking of skillets which are heavy to lift from drawer level.

According to the Small Homes Council score sheet, the optimum amount of counter space at the right of the sink is "3 feet or more". When the kitchens were rated by this optimum, 35 had a shortage and 48 had a surplus. This distribution suggested that the optimum of the Council may be too low. Consequently, alternate optimums of 3 feet 6 inches and 4 feet, respectively, were used to rate the kitchens. A better balance as to kitchens with surpluses and shortages was achieved when 3 feet 6 inches was considered the optimum (Table 3). Further study should be made of the relative appropriateness of this single-measure guide in comparison with other alternates involving ranges from 3 feet to 3 feet 6 inches or 3 feet 6 inches to 4 feet.

The amounts of counter frontage provided at the left of the sink bowl were adequate more often than at the right. Of the 87 kitchens, 66 had the optimum of "2 feet 6 inches or more" at the left of the sink bowl in contrast to 53 with the optimum of "3 feet or more" at the right of the sink bowl.

The measurements of the counter frontages of kitchens at the left of the sink bowl were compared with three alternate optimums: 2 feet 6 inches, 3 feet, and 3 feet 6 inches (Table 3). The distributions of the measurements indicated that the first two alternates were too low and that the third

Table 3. Distribution of houses by suggested optimum amounts of counter frontage

Location and suggested optimum amounts of frontage	Number of houses			Total
	Shortage	Acceptable	Surplus	
At right of sink				
3' 0"	35	4	48	87
3' 6"	43	3	41	87
4' 0"	62	8	17	87
At left of sink				
2' 6"	21	4	62	87
3' 0"	36	5	46	87
3' 6"	46	4	37	87
Adjacent to range				
2' 0"	37	11	39	87
Space for mixing				
3' 0"	14	1	72	87
3' 6"	24	4	59	87
4' 0"	36	4	47	87

was probably too high. Further study should be made of the probability that the most appropriate optimum is somewhere between 3 feet and 3 feet 6 inches.

Fifty of the 87 kitchens had "2 feet or more" of counter space adjacent to the range. No alternative optimums were examined because of the balance in numbers of kitchens with shortages and surpluses above and below this standard.

The fact that more kitchens met this optimum than did the other standards set for other areas may indicate greater concern by builders and consumers for this area. It may be assumed that the need for having counters on which to place hot foods as they come from the oven was more apparent to the planners of the counter spaces.

Of the 87 kitchens, 73 had the optimum of "3 feet or more" of counter frontage as specified in the score sheet for "mixing at any point in the kitchen". Thus, it appeared that the Council's standard is too low or that the range was inappropriate. Consequently, alternate optimums of 3 feet, 3 feet 6 inches, and 4 feet were tested. The distributions of the mix-area frontages in relation to each of these alternates indicated that the optimum standard may be between 3 feet 6 inches and 4 feet. Further study should be made of the most appropriate specification for guiding builders and consumers as they plan kitchen counter and storage space. In such studies, consideration should be given to the location of this counter space for mixing activities. For most efficient use, the counter should be located between the sink and the refrigerator in which are stored most of the items used for these activities.

Preferences of homemakers

Regardless of the amount of space that was considered as the optimum, the majority of homemakers did not prefer more of either counter or storage space (Tables 4 and 5). Those who did prefer more space were considered in relation to the ratings of the kitchens by: the optimum as recommended by the Small Homes Council Score Sheet and by lower optimums.

It was the general hypothesis that relatively more of the homemakers with kitchens classified under "shortage" would have expressed a desire for more storage or cabinet space than would others. Among the homemakers in the Ames survey whose kitchens were rated short of the Council's optimum, in all features and by all standards, the percentage who wanted more space was higher than when kitchens had been rated acceptable or above standard. Thus the general hypothesis was supported by the data obtained from the Ames homemakers.

Another hypothesis was examined in this study, "As the standard is set higher in each of the frontage areas, a relatively lower percentage of homemakers whose kitchens were rated short of the standard would prefer more storage and counter space than when the standard was lower." In light of the responses with the base frontage optimum at "11 feet to 13 feet 6 inches", the wall cabinet frontage at "8 feet 6

Table 4. Homemakers' preferences for space in kitchen by rating of cabinet frontage

Location and rating of frontage	Number of homemakers by preference					
	Wanted more		Did not want more		Total	
	No.	%	No.	%	No.	%
Base cabinet frontage rated by optimum of:						
11 ft. to 13 ft. 6 in.						
Shortage	9	31.0	20	69.0	29	100.0
Acceptable	8	27.6	21	72.4	29	100.0
Surplus	7	24.1	22	75.9	29	100.0
Total	24	27.6	63	72.4	87	100.0
8 ft. 6 in. to 10 ft. 11 in.						
Shortage	7	58.3	5	41.7	12	100.0
Acceptable	2	11.8	15	88.2	17	100.0
Surplus	15	25.9	43	74.1	58	100.0
Total	24	27.6	63	72.4	87	100.0
Wall cabinet frontage rated by optimum of:						
8 ft. 6 in. to 14 ft. 0 in.						
Shortage	11	28.2	28	71.8	39	100.0
Acceptable	10	25.6	29	74.4	39	100.0
Surplus	3	33.3	6	66.6	9	100.0
Total	24	27.6	63	72.4	87	100.0
7 ft. 0 in. to 8 ft. 5 in.						
Shortage	12	50.0	12	50.0	24	100.0
Acceptable	0	0	15	100.0	15	100.0
Surplus	12	25.0	36	75.0	48	100.0
Total	24	27.6	63	72.4	87	100.0

Table 5. Homemakers' preferences for counter space in kitchen by rating of counter space frontage

Location and rating of frontage	Number of homemakers by preference					
	Wanted more		Did not want more		Total	
	No.	%	No.	%	No.	%
Counter space rated by optimum of:						
8 ft. 6 in. or more						
Shortage	10	33.3	20	66.7	30	100.0
Acceptable	0	0	0	0	0	0
Surplus	14	24.6	43	75.4	57	100.0
Total	24	27.6	63	72.4	87	100.0
7 ft. 6 in. to 8 ft. 5 in.						
Shortage	10	43.5	13	56.6	23	100.0
Acceptable	0	0	7	100.0	7	100.0
Surplus	14	24.6	43	75.4	57	100.0
Total	24	27.6	63	72.4	87	100.0

inches to 10 feet 11 inches, and the counter frontage at "8 feet 6 inches or more", this hypothesis was verified (Table 4).

Slightly over one-half or 58 per cent of the homemakers said they wanted more storage space when base cabinets were rated by 8 feet 6 inches to 10 feet 11 inches, the lower standard set by the Council, while one-third preferred more when the optimum was set at 11 feet to 13 feet 6 inches, the preferred standard of the Council. However, due to the limited number of cases, the differences may be due to

sampling error. Therefore, further investigation is needed of possible optimum specifications.

A similar pattern was followed by analysis of preferences of homemakers who had shortages of wall cabinet and counter space. One-half of the women said they wanted more storage space when the wall cabinets were rated by the optimum ranging from 7 feet to 8 feet 5 inches, whereas only one-third preferred more when the optimum was set at 8 feet 6 inches to 14 feet (Table 4). Similarly, almost one-half of the homemakers said they preferred more counter space when the frontages were rated by the lower optimum of 7 feet 6 inches to 8 feet 5 inches, while only one-third preferred more when the standard was set at 8 feet 6 inches or more. Thus, it would appear that the most appropriate optimum lies between 7 feet and 8 feet 5 inches.

The distribution of space and not the amount may be the chief concern of those homemakers who prefer more space. Should the space be located at an inconvenient point, regardless of the amount, the homemaker may prefer more at a point of real need.

The satisfactions of homemakers who had shortages of storage and counter space should be given further consideration by those who are planning these aspects of home kitchens. Such satisfactions may be due to past experiences, the time spent in the kitchen while preparing food, and

the fact that all of the homemakers used some of the partially prepared foods which require less time and effort. A homemaker may be more tolerant of the inadequacies in these areas for a short period of time than she would be if she spent long periods of time in the kitchen.

In 75 percent of the homes, the major activities that were performed in the kitchen were food preparation, eating, and informal entertainment such as the coffee hour or snack. In 60 percent of the homes where these were the major activities, the homemakers spent 2 to 4 hours a day. Slightly over one-third of the homemakers interviewed spent from 4 to 6 hours a day in the kitchen.

#### Requirements for meal preparation activities

To further evaluate a specific phase of the Small Homes Council Score Sheet, experiments were conducted on the storage and counter space needs between the sink and refrigerator area for meal preparation activities. Although this space was treated as a separate item in the Small Homes Council Score Sheet, it does have a dual purpose in many space arrangements in kitchens. When located between the sink and the refrigerator, this space may serve for food preparation and for stacking dishes. This area was chosen for investigation because of the numbers of food preparation activities performed there. A similar procedure may be fol-

lowed by one as he attempts to determine the counter needs of the consumer in each of the other areas of the kitchen.

The storage and counter space required for preparing meals for a family of four was believed to be influenced by several factors including:

1. The number of food preparation operations performed.
2. The complexity of meal patterns.
3. The form and quantity of the foods used in preparation of the menus.
4. The quantity and versatility of equipment.
5. The management practices of the homemaker.

The number of food preparation operations\* performed in the sink-refrigerator area when preparing the six test menus was 38. The number of operations required would depend upon the foods included in the menus. Nine of the 38 operations were performed in the preparation of each of these meals, whereas, others were performed in the preparation of from one to five of the meals.

Each test menu included from five to eight food items which required some preparation that could be done in the area between the sink and refrigerator. The menus were relatively complex when compared to those listed in five commonly

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\*See Appendix for list of food preparation operations performed in preparation of test menus.

used cook books. The more complicated menus were chosen as it was assumed that they would provide a more rigid test of space requirements for the preparation of meals. The individual food items comprising the menus were also considered to be complex as they included more ingredients and required more food preparation activities than is ordinarily the case.

The forms of foods used influenced the amount of space needed for the preparation of the meals. When baked goods were prepared from basic ingredients, they required almost twice as much space as when they were prepared from the partially prepared mix or from a frozen state. The amount of space that was adequate for the meal preparation activities was also adequate for the baked goods which were generally prepared at another time.

The small equipment used in preparing the test menus consisted of a minimum to liberal set. The quantities and types used influenced the amount of space required for the preparation of a meal. When the mechanical mixer was used, greater space was required than when food was hand mixed.

Work habits of homemakers vary and will influence the amounts of space required for their food preparation activities. The writer was aware of time and motion practices but all activities were unstandardized. It was assumed that the work habits of individual consumers will be unstandardized as they work in this area. Each will have his own

pattern of behavior as he performs these activities.

Three-fourths of the menus, prepared primarily in the area between the sink and refrigerator, required between 26 and 36 inches of linear counter space (Table 6). The minimum counter space for the mixing area recommended by the Small Homes Council is 36 inches or more. Since three-fourths of the test menus were prepared within 36 or less inches of space, it seems reasonable to recommend a specific optimum of 36 inches. Any space over and above the 3 feet may tend to be a surplus.

The amount of linear counter space required for preparation of the test menus was not significantly different with the three arrangements. The overall range of linear space requirements when preparing the six menus in each of the three arrangements was from 24 inches to 48 inches. The average depth of the counter required was 15 inches. The smaller quantities of space are associated directly with the number of foods in each menu that may be obtained in the market in partially prepared form.

Analysis of the most frequently performed operations included in the test menus showed that in all six there were operations performed at the sink or at the range. Such a condition then places emphasis upon the distribution of the counter space as well as the quantity of space in the specific area between the sink and refrigerator.

Table 6. Counter frontage required between sink and refrigerator for preparation of meals in three combinations of mass-produced units

Combination of units <sup>a</sup>	Inches of counter frontage required for preparation of specified menus											
	Menu A		Menu B		Menu C		Menu D		Menu E		Menu F	
	L <sup>b</sup>	D <sup>c</sup>	L	D	L	D	L	D	L	D	L	D
I	33	15	27	15	39	15 3/4	48	15	27	15 1/2	30	15
II	32	15	24	15	36	15 3/4	38	15	36	17	29	16
III	34	16	26	15 1/2	36	15	36	15 3/4	30	17	31	16

<sup>a</sup>See page 33 of Procedure for description.

<sup>b</sup>L refers to length in inches.

<sup>c</sup>D refers to depth in inches.

The quantities of space required for preparation of specific foods when found in different forms in the market is influenced by the:

1. Kind and degree of preparedness of the food.
2. Equipment used to complete the preparation.
3. Quantity of food prepared.

The space required for preparation of the specified foods varied with the degree of preparedness of the food. When baked products were prepared from basic ingredients, the space required was frequently twice the amount required when food was prepared from a partially prepared mix. When vegetables were prepared from the frozen or canned form, greater counter space was required than when the vegetables were prepared from the fresh form. When the fresh form was used the greater space was required at the sink.

#### Evaluation of Mass-produced Cabinets and Counters

When planning the storage and counter space in the kitchen, many factors should be considered if resources are to be invested wisely, either in the initial outlay or in the use, care, and maintenance of these units. The quantities and qualities of this space determine the effectiveness of these units as they meet the criteria of convenient and functional storage and counters.

Convenient and functional storage is that which permits

the placing of frequently used articles at the point of first use, in such a location as to be easy to see, easy to reach, and easy to grasp from the homemaker's position at the work surface. The cost of the unit will vary with the design and the features incorporated. The challenge to consumers is to become better informed as to the function of each feature and then determine which will best meet their needs considering the available resources to be invested in this aspect of housing.

A first step in deciding which features are suitable should be an analysis of the amount and kind of space required for the food and equipment to be stored. Such an analysis will guide consumers in their choice of particular convenience features to be found in the units located in the preparation area. A list of those features which may contribute to the convenience of cabinets in the preparation area will serve to guide consumers in their analysis of this phase of the problem.\*

Features which are associated with the quantity of storage space must be determined by the consumer as he considers his storage needs. For example, the number and kinds of items to be stored will determine the amount of shelf

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\*See Appendix for list of features to be considered.

space needed to provide storage of articles one row deep on a shelf or stacking of like articles only.

Features which contribute to the ease of use of the cabinet may be a function of the base construction. Features such as sliding shelves or trays should roll easily. One means of accomplishing this is to mount them on nylon rollers. For shelves to be easy to adjust from one level to another, the provisions for adjustment must be well planned.

An examination and evaluation of six moderately priced storage units from the same manufacturer revealed that they had 13 of the 27 features considered as desirable for consumers. Their true value can be determined only by a consumer as he critically evaluates the contribution that each feature makes to the usefulness of the unit in meeting his storage needs.

The three aspects of counter tops which should be evaluated are those related to the characteristics of the counter surfacing material, the costs, and the installation of the counters.\* Consumers should become familiar with the characteristics of counter materials and determine which ones will best meet their needs for the money they have to invest.

Costs associated with counters include initial invest-

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\*See Appendix for list of characteristics of counter materials which should be evaluated.

ment, installation, use, care, and maintenance. Each of these costs should be analyzed carefully to determine whether it is justified in view of needs.

Installation costs will vary considerably with the type of counter material to be installed and amount and shape. Such costs should be investigated as they may determine the choice of material.

The test units came with a counter top (prebuilt) for each cabinet. In an installation, cabinets are fastened together with a sealing strip to cover the seam where counter tops join. Although cabinets were not fastened together in the laboratory because of the need for placing units in different arrangements, the importance of a smooth, tight joint was apparent. The particular counter surfacing used - porcelain enamel on steel - was found to be non-absorbent, easy to clean, and not affected by heat, grease, acids, or alkalis. However, this surface covering was easily scratched. An examination and evaluation of the various counter surfacing materials on the market would reveal that all of them have some advantages and some limitations. The consumer must decide on the counter surfacing material which best meets his needs with the available resources.

To study further the mass-produced storage units, three combinations of units were arranged and six test meals were prepared in each of these arrangements. The three arrange-

ments were only a few of many possible ones which might be analyzed more carefully by consumers as they choose units for their needs.

In Arrangement 1, there were two units of 24 and 27 inches placed in a straight line. This arrangement may be compared to one found in the one-wall or corridor type kitchen. Each unit had two shelves and a drawer. The counter space more than met the requirement of 36 inches for preparation as established by the Small Homes Council rating and verified in the experimental phase of the present study. However, the storage space for equipment was not adequate for those items required for the performance of meal preparation activities. From this finding, one cannot assume that adequate storage space always accompanies adequate counter space.

Arrangement 2 consisted of a 27-inch base cabinet unit and a corner unit with revolving shelves. This arrangement was similar to one that would be found in the L-shape or U-shape kitchen. The 27-inch unit had a drawer and two shelves and the corner revolving unit had three shelves. The counter space provided by these units was adequate for the preparation of the meals but the storage space was not adequate for the necessary equipment. The counter space in Arrangement 2 meets the requirements for the preparation activities, yet the space in the corner may not be used advantageously. Such space will permit storage of a mixer or

other appliances for which base or wall storage space has not been provided.

Among the limitations that should be considered by the consumer relative to the corner revolving shelf unit is the amount of space lost when this unit is installed in the kitchen. Regardless of the design of the unit, space is lost. A second limitation of the unit might be found in the size of the door opening which will determine the size of articles that may be stored and the ease with which they may be stored and removed from the unit. The shelves should have bands around the outer edges for protection against spillage of items if it is to be used for food storage. The interior frame of the unit should be curved to prevent the dropping of articles behind the shelves.

Each of these factors, coupled with the fact that this unit is a costly one to purchase, emphasizes the importance of weighing the advantages and limitations carefully when considering this unit for the kitchen.

Due to the fact that Arrangements 1 and 2 provided adequate counter space but not enough storage, Arrangement 3 was developed to determine the number of units which would be required for adequate storage. The required amount of storage was obtained with the combination of a 27-inch, an 18-inch, and a 24-inch unit, two on one wall and one on the

other. Such a group might well be part of an L-shape or U-shape arrangement in the kitchen. With this grouping, adequate drawer and shelf storage was provided for the equipment required for the preparation activities between the sink and refrigerator. Adequate storage and counter space was obtained without the use of the corner space.

The chief limitation when these units were arranged in a corner was loss of space at the corner, or inaccessability of storage space. This limitation might be overcome in house plans in which this space might be accessible from another direction.

In laboratory meal preparation, the average amount of space, front to back of counter, used in preparation was 15 to 16 inches. The remaining 8 or 9 inches at the back of the counter generally was not used. This could represent an unwise investment of resources.

Mid-way storage units, which were introduced to the market in recent years, could be used to provide a means of utilizing space at the back of the counter. The mid-way cabinet is installed between the wall and base cabinet and provides storage for items where they may be easily reached and grasped. These units may be attached to the bottom of the wall cabinet, set on the base cabinet, or two units may be stacked to occupy an 18-inch height between the wall and base cabinet and would be attached to both.

These storage units meet the criteria for convenient storage as items may be stored separately, and are easy to see, grasp, and reach. Items which otherwise would require space in wall cabinets may be brought down to a more accessible level, which conceivably might make it possible to reduce the amount of wall cabinets required.

An evaluation of five mid-way units was made in the experimental phase of the present study. Four of these were also placed in homes for evaluation by homemakers.

The lengths of the mid-way units used ranged from 2 to 5 feet. If greater lengths are desired, more than one unit may be used. The depth, front to back, ranged from 6 to 8 inches and the height from 9 to 16 inches. If a space of 18 inches should be available between base and wall cabinets, two 9-inch units might be stacked to make full use of this space.

Space arrangements are provided by one to three shelves. In two of the units a step shelf was provided for the storage of such items as spices. One manufacturer has made a unit in which the shelves may be adjusted to accommodate items of different heights.

An evaluation of the advantages of these units when used as designed revealed that this type of storage might be used by consumers to make full use of space that might be wasted otherwise. However, the homemaker who normally prefers to

use this counter space might be handicapped by the unit which rests on the counter.

When judging the mid-way unit by other criteria as stated in the Appendix, the adequacy of the units depends upon the amounts and kinds of items to be stored. The mid-way unit does bring items within the radius of the elbow-to-grasping-fingertip reach. It was found that the basic items of food needed for baking processes could be accommodated in three of the units. The kinds of items which were appropriately stored in the units, in addition to the basic ingredients, included bottled goods, canned goods up to a number 5 size of can, and packaged foods.

The mid-way cabinets which are attached to wall cabinets will leave free space beneath the unit varying with the height of the wall cabinet above the counter. When there was a height of 6 inches between counter and mid-way unit, the space was found to be usable for small equipment and food items as meals are prepared in this area.

Questions related to design were raised by both the writer and homemakers who used the units. The width of doors determines the amount of storage area accessible at one time. The greater the area exposed at one time, the more effective is the unit in the preparation area. The type and materials of tracks which are provided for the doors to slide in are to be questioned by the consumer. Tracks should be rigid,

sturdy, designed to fit the door, and easy to clean.

The depth of the unit may influence the ease with which one can see into the interior. If this depth is too great, provision for interior lighting will improve usefulness. The height of the homemaker may be a factor which will determine the ease with which she can see into the unit. Pulls on the doors should be easy to grasp and handle as one opens or closes doors.

Changes in the family's equipment and food inventory should be studied carefully by those who are interested in guiding families and in planning of their storage and counter space in the kitchen. As revealed in this study, adequate counter space is not accompanied by adequate storage space. This is contrary to the belief held by many in the field of kitchen planning. In fact, it would appear that the needs for counter space have moved in an opposite direction from the storage space needs. As this finding is more carefully evaluated, one is aware of the tremendous increase in the kinds and numbers of pieces of equipment which have deluged the market in recent years. An increase in the kinds of packaged foods has led to the need for greater amounts of storage space. Consumers have purchased both equipment and prepared foods, and now the problem is, "How and where shall they be stored?" This may explain the finding. It does bear further study.

## SUMMARY AND RECOMMENDATIONS

Consumers need information which integrates facts and principles from physical and social sciences to guide them in making wise choices relative to mass-produced storage units and counter space. This need coupled with the fact that information of this nature is very limited prompted writer to design the present study with the following objectives in mind: to interpret the social potential of guides for choice of mass-produced storage units and counter space, and, to develop guides that may be used by builders and consumers in the evaluation of mass-produced storage units and counter space.

Three distinct research methods were used for accomplishing the objectives: the logical method was used to interpret the social potential of guides for choice; the survey and experimental methods were used to evaluate the standards of the Small Homes Council Score Sheet and the features of mass-produced storage units and counter space. An interpretation of the social potential of guides for choice of mass-produced storage units and counters was developed from principles of social psychology and economics. By social-psychological principles the values and goals of consumers were interpreted as they are operative in decision-making and guide behavior. The principles of economics provided criteria for

interpreting the efficiency of resource allocation when choices are made relative to mass-produced storage and counter space.

The Small Homes Council Score Sheet exemplifies one type of information which would aid consumers in their choice-making of storage and counter space. However, applicability of score sheet for different types of family situations and for kitchens equipped with mass-produced units should be examined periodically. In the present study, survey data from the city of Ames, Iowa in 1955 were used to evaluate the Small Homes Council Score Sheet as a rating device for kitchens. Data relative to existing amounts and qualities of storage and counter space in the kitchens of 87 homes, and information on the preferences of the homemakers for more counter and/or storage space in the kitchen were compared with the standards for these factors as set by the Small Homes Council.

The sample for the survey was drawn by the Iowa State College Statistical Laboratory from records of the Story County assessor as to the single-dwelling permits which had been issued in Ames, Iowa, during the period, January 1950 to January 1954. From the list of 549 permits, 100 completed houses were chosen at random and the sample was stratified according to the four wards of the city.

From the experimental phase of the study, information was obtained relative to amounts of counter and storage space

needed in the mix area of the kitchen for the preparation of meals for a family of four. Space requirements were determined when mass-produced storage units were located in three arrangements. The findings were used to evaluate the Small Homes Council Score Sheet and develop alternate recommendations. Advantages and limitations of selected features of mass-produced storage units and counter space were developed as these units were used in the experimental phase of the study.

Based primarily on findings of the present study, the following recommendations are made for the general purpose of expanding information which consumers may use as they try to utilize their resources more productively in relation to their goals.

The environment in which consumers make decisions relative to mass-produced storage units and counter space should enable them to:

1. Make increased use of technical and non-technical information, including facts and principles from social and physical sciences.
2. Have opportunities to evaluate advantages and limitations of alternative arrangements of mass-produced units.
3. Learn the costs involved in order to consider probable opportunity costs of alternate satisfactions.

4. Take advantage of flexibility in storage arrangements and make adaptations to meet their needs.

Optimum amounts of storage and counter space which are consistent with the needs of consumers should be definite. Furthermore, within these limits consideration should be given only to storage units provided for the purpose. Based upon the findings of this study relative to frontage measurements of storage and counter space, the following optimums are recommended:

1. Base cabinet frontage, 12 feet to 13 feet 6 inches
2. Wall cabinet frontage, 9 feet
3. Counter at left of sink, 3 feet to 3 feet 6 inches
4. Counter at right of sink, 3 feet to 3 feet 6 inches or 3 feet 6 inches to 4 feet
5. Counter adjacent to range, 2 feet
6. Counter for mixing, 3 to 4 feet

Mass-produced storage units should be evaluated in terms of:

1. The alternative features and their costs to the consumer, including costs associated with initial purchase, installation, space use due to construction and installation, care of unit.
2. Storage space provided as compared to room space demanded by unit, including special consideration to the corner revolving-shelf unit.
3. Purposes for which they are designed.

4. Their effectiveness in meeting the criteria for good storage which permits:
  - a. Placing of frequently used articles at the point of first use.
  - b. Placing articles where they are easy to see, reach, grasp.
5. Areas of special concern such as:
  - a. Corner revolving-shelf unit which results in lost space, the storage space and its cost should be compared to units which make more complete use of space.
  - b. Mid-way unit that provides storage at an accessible level at back portion of counter which may be otherwise wasted.
6. Space that is well arranged and adequate in amount.
7. Counter surfacing materials including consideration of characteristics of materials and costs of purchase, installation, care, maintenance, and replacement.

Further research should be undertaken in the following areas in order to increase information which consumers may use when selecting mass-produced storage units and counter spaces.

1. Study mass-produced storage units and counter space with special reference to:

- a. Alternative arrangements and combinations of features and their costs.
  - b. Alternative meal patterns and equipment.
  - c. Different population groups.
  - d. Different areas of the kitchen and activities carried on in each.
  - e. Homemakers of different physical stature and age.
2. Observe ways that consumers adjust and react to kitchens which have surpluses and shortages of storage and counter space.
  3. Study conditions in which there are surpluses of storage and counter space in the kitchen to try to identify real evidences that satisfactions have been foregone because of the surplus space.
  4. Examine the values and goals held by consumers relative to the storage and counter space in the kitchen.
  5. Evaluate the storage and counter needs of consumers at a point in time and at different points in time.
  6. Determine ways of increasing flexibility in storage and counter space to provide for adjustment to changing family needs.
  7. Conduct longitudinal case studies to determine effects of changes within the family (such as changes in the family life cycle) and from without the family (such as those associated with technology) upon

reactions of consumers toward housing and its components of storage and counter space.

With refinement of the techniques and verification of the findings employed by the present study, it is believed by the writer that persons such as educators, architects, builders, materials dealers, mass communicators and others concerned with human welfare can provide and disseminate information which will be of real value to consumers.

## LIST OF REFERENCES

- Agan, Tessie. The house, its plan and use. New York, N. Y. J. B. Lippincott Company. 1948.
- Back, William B. Firm-household interdependence on low income farms, with particular emphasis on production decisions, capital accumulations and research methodology. Unpublished Ph. D. Thesis. Ames, Iowa, Iowa State College Library. 1952.
- Beyer, Glenn H., ed. Cornell kitchen. Ithaca, N. Y. Cornell University. New York State College of Home Economics. 1952.
- \_\_\_\_\_. Farm housing in the Northeast. N. Y. (Ithaca) Agr. Exp. Sta. Bul. 292. 1949.
- \_\_\_\_\_. Housing: a factual analysis. New York, N. Y. Macmillan Company. 1958.
- Bowman, J. J. and Bach, G. I. Economic analysis and public policy. New York, N. Y. Prentice-Hall, Inc. 1949.
- Cochrane, Willard W. and Bell, Carolyn Shaw. The economics of consumption. New York, N. Y. McGraw-Hill Book Company, Inc. 1956.
- Culter, Virginia F. Personal and family values in the choice of home. N. Y. (Ithaca) Agr. Exp. Sta. Bul. 840. 1947.
- Festinger, L., Schacter, S., and Back, K. Social pressures in informal groups. New York, N. Y. Harper and Brothers. 1950.
- Friend, Joseph H. and Guralnik, David B., eds. Webster new world dictionary for the American language. College ed. New York, N. Y. The World Publishing Company. 1954.
- Gassett, Lorna J. Some bases for recommendations for storage space allowances in the meal preparation and meal service area of Southern rural homes. Unpublished Ph. D. Thesis. Lafayette, Indiana, Purdue University Library. 1955.
- \_\_\_\_\_. Space allowances for meal preparation and service in the Southern rural home. Tenn. Agr. Exp. Sta. Bul. 274. 1957.

- Gross, I. H. and Grandall, E. W. Management for modern families. New York, N. Y. Appleton-Century-Crofts, Inc. 1954.
- Heady, E. O. Economics of agricultural production and resource use. New York, N. Y. Prentice-Hall, Inc. 1952.
- \_\_\_\_\_ and Jensen, H. R. Farm management economics. Englewood Cliffs, N. J. Prentice-Hall, Inc. 1954.
- Heiner, Mary K. and McCullough, Helen E. Functional kitchen storage. N. Y. (Ithaca) Agr. Exp. Sta. Bul. 846. 1948.
- \_\_\_\_\_ and Steidl, Rose E. Guides for arrangement of urban family kitchens. N. Y. (Ithaca) Agr. Exp. Sta. Bul. 878. 1951.
- Heller Committee for Research in Social Economics. Quantity and cost budgets for three income levels. In Gross, I. H. and Grandall, E. W. Management for modern families. p. 158. New York, N. Y. Appleton-Century-Crofts, Inc. 1954.
- Hood, Maude P. and Holmes, Emma G. Farm housing in the South. Tenn. Agr. Exp. Sta. Bul. 14. 1946.
- \_\_\_\_\_, Rutherford, R., and Mize, Jessie. Baking center storage. Ga. Agr. Exp. Sta. Bul. 6. 1954.
- Johnson, Glenn L. and Haver, Cecil B. Decision-making principles in farm management. Ky. Agr. Exp. Sta. Bul. 593. 1953.
- Knight, Frank H. Risk, uncertainty, and profit. New York, N. Y. Houghton-Mifflin Company. 1921.
- Kyrk, Hazel. Family in American economy. Chicago, Ill. Univ. of Chicago Press. 1953.
- Linton, Ralph. The cultural backgrounds of personality. New York, N. Y. D. Appleton-Century-Crofts, Inc. 1945.
- \_\_\_\_\_. Potential contributions of cultural anthropology to teacher education. In culture and personality. Washington, D. C. American Council on Education. 1941.
- Look 25 years ahead great changes coming. Changing Times. June, 1957.

- Maisel, Sherman T. Housebuilding in transition. Los Angeles, Calif. Univ. of California Press. 1953.
- McCullough, Helen E. Cabinet space for the kitchen. Circular series, Index Number c5.31. University of Illinois. Small Homes Council. 1949.
- \_\_\_\_\_. Space design for household storage. Ill. Agr. Exp. Sta. Bul. 557. 1952.
- Neilson, W. A., ed. Webster's collegiate dictionary. 2nd ed. Springfield, Massachusetts. G. and C. Merriam Company. 1947.
- Nickell, Paulena, Budolfson, Marie, Liston, Margaret, and Willis, Elisabeth. Farm family housing needs and preferences in the North Central Region. Ia. Agr. Exp. Sta. Bul. 378. 1951.
- Pond, Esther. Planning the efficient kitchen. Wash. Agr. Ext. Bul. 247. 1939.
- Ranney, Elizabeth M. Kitchen planning standards. University of Illinois. Bulletin. 47(19): 1-8. Oct. 1949.
- Ratcliff, Richard U. Urban land economics. New York, N. Y. McGraw-Hill Book Company, Inc. 1949.
- Rossi, Peter. Why people move. Glencoe, Ill. The Free Press. 1955.
- Samuelson, Paul A. Economics, an introductory analysis. New York, N. Y. McGraw-Hill Book Company, Inc. 1955.
- Small Homes Council. Handbook of kitchen design. Urbana, Ill. University of Illinois. Small Homes Council. 1950.
- United States Federal Housing Administration. Minimum property requirements for properties of one or two living units. MPR Revision No. 48. Washington, D. C. U. S. Government Printing Office. 1954.
- Weaver, Elaine K. and Everhart, Velma V. Work counter surface finishes for kitchen and utility areas. Ohio Agr. Exp. Sta. Bul. 764. 1955.
- Wilson, Maud. Consideration in planning kitchen cabinets. Ore. Agr. Exp. Sta. Bul. 445. 1947.

- \_\_\_\_\_. Patterns for kitchen cabinets. Ore. Agr. Exp. Sta. Bul. 446. 1947.
- Woolrich, A., Barager, A., Kuschke, B., Warren, J., Phipard, E., and Fincher, L. Cooking utensils based on meal patterns. J. Home Economics. 40: 305-308. 1948.
- \_\_\_\_\_, Beveridge, Elizabeth, and Wilson, Maud. Housing needs of Western farm families. Ore. Agr. Exp. Sta. Bul. 1. 1952.
- Young, Kimball. Social psychology. New York, N. Y. Appleton-Century-Crofts, Inc. 1956.

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APPENDIX

## SMALL HOMES COUNCIL SCORING SHEET

## A. STORAGE

1. Total base cabinet frontage (including undersink cabinet and range\*) \_\_\_\_\_ feet.

Base frontage	below 8'-6"	8'-6" to 10'-11"	11'-0" to 13'-6"	over 13'-6"
Points	0	20	25	20

BONUS If you have less than 8 1/2 ft. base frontage, but sufficient space is available to add cabinets to bring the total up to 8 1/2 feet, score 5 points.

2. Total wall cabinet frontage, including dinnerware \_\_\_\_\_ feet. (Do not include cabinets over the refrigerator or over the range.)

Wall frontage	below 5'-0"	5'-0" to 6'-11"	7'-0" to 8'-5"	8'-6" to 14'-0"
Points	0	10	20	25

over 14'-10"
20

BONUS If you have less than 7 ft. frontage, and there is room to add cabinets to bring the total up to 7 feet, score an additional 5 points.

## B. COUNTER

1. Length of continuous counter adjacent to the refrigerator \_\_\_\_\_ feet.

No. feet	below 1'-3"	1'-3" or more
Points	0	4

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\*Include only the storage section of the range and only if this section has a two-shelf or two-drawer storage section, 15 to 18 inches wide.

2. Length of continuous counter to right of sink bowl\*  
\_\_\_\_\_ feet.

No. feet	below 2'-6"	2'-6" to 2'-11"	3'-0" or more
Points	0	3	4

3. Length of continuous counter to left of sink bowl\*  
\_\_\_\_\_ feet.

No. feet	below 2'-0"	2'-0" to 2'-5"	2'-6" or more
Points	0	3	4

4. Length of continuous counter adjacent to the range  
\_\_\_\_\_ feet.

No. feet	below 1'-6"	1'-6" to 1'-11"	2'-0" or more
Points	0	1	4

5. Length of continuous counter for mixing at any point in kitchen \_\_\_\_\_ feet.

No. feet	below 3'-0"	3'-0" or more
Points	0	4

BONUS If counter is less than 3 feet but a table is conveniently located for mixing, score 4 points.

6. Total amount of counter in kitchen \_\_\_\_\_ feet.

No. feet	below 6'-6"	6'-6" to 7'-5"	7'-6" to 8'-5"	8'-6" or more
Points	0	3	7	10

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\*Assuming kitchen assembly is based on a right-handed sequence and dishwashing is done by hand.

FOOD PREPARATION ACTIVITIES

Activity	Number of meals in which activity was performed	Activity	Number of meals in which activity was performed	Activity	Number of meals in which activity was performed
wash	6	beat	4	grind	1
mash	2	strain	1	roll-out	4
peel	3	squeeze	1	pound	1
combine	6	stir	6	rice	1
grate	2	fold-in	2	sift	1
cut-in	4	pare	3	mince	1
measure	6	slice	5	scrape	1
cut	6	dredge	1	core	3
chop	4	knead	1		
open	4	grease	3		
season	6	mash	2		
weigh	6	drain	2		
flavor	6	section	2		
pour	6	grate	1		
mix	5	shred	4		

## MENUS

- I.                    Tomato Bouillon Soup  
                       Swiss Steak                    Gravy  
                       Baked Potato                Buttered Beets  
                       Buttered Corn with Green Pepper  
                       Shredded Carrot and Cabbage Salad,  
    Commercial Mayonnaise  
    Mincemeat and Apple Tort  
    Beverage
- II.                    Oven Fried Chicken  
                                  Riced Potatoes  
                                  Stewed Tomatoes  
                       Shredded Carrot and Cabbage and Nut Salad  
                       Green Pepper Sticks - Watermelon Pickles  
                                  Pumpkin Pie - Coconut Trim  
                                  Beverage
- III.                   Barbecued Spare Ribs  
                       Parsley Potatoes                Glazed Carrots  
                                  Creamed Onions  
                       Grapefruit, Pineapple, and Pear Salad  
                       Cornbread Sticks                Butter  
                                  Lemon Pie  
                                  Beverage
- IV.                    Cheese Souffle  
                       Scalloped Potatoes with Ham Cubes  
                                  Buttered Peas  
                                  Crabapple Pickles  
                       Pineapple-Pear-Grape Salad  
                       Date-Nut Bread                Butter  
                       Chocolate-Ripple Ice Cream
- V.                    Pan-Fried Pork Chops  
                                  Brown Gravy  
                       Stuffed Baked Potatoes  
                       Buttered Spinach  
                       Sauteed Egg Plant  
                       Orange-Grapefruit Salad  
                       Pumpkin-Custard Pie  
                                  Beverage

VI.           Frosty Grape Juice and Ginger Ale  
              Braised Pork Loin Chops  
Baked Yams Garnish Crumbled Blue Cheese  
Cole Slaw Bordered with Shredded Carrots  
Cranberry and Orange Relish  
Apple Dumpling with Custard Sauce  
              Beverage

## CRITERIA FOR EVALUATION OF MID-WAY UNITS

Mid-way units were judged by the following criteria:

1. Adequacy of space provided for frequently used supplies and foods within the radius of the elbow-to-grasping-fingertip reach.
2. Amount of space required for positioning of unit when it rests on the counter.
3. Adequacy of the space beneath the mid-way unit when it is one that is designed to be attached to the wall unit.
4. Storage height within the unit. The height within the unit should be sufficient so that items may be easily stored and removed from the unit.
5. Alternative possibilities of shelf arrangements.

## FEATURES THAT MAY BE FOUND ON MASS-PRODUCED STORAGE UNITS

1. Shelf supports that permit adjustment of shelf heights, for maximum utilization of storage space.
2. Revolving shelves for corner cabinets.
3. Shelves removable for easy cleaning.
4. Sliding shelves or trays in base cabinets.
5. Vertical partitions for storing shallow, flat utensils.
6. Vertical shelves removable for cleaning.
7. Provision for adjustment of space between vertical shelves.
8. Sliding trays in deep drawers.
9. Dividers or partitions in drawers.
10. Drawer partitions adjustable.
11. Drawer partitions removable for ease of cleaning.
12. Utensil drawers with low sides for ease in removing utensils.
13. Vertical half-drawers for storage of utensils - utensils hung on sides of drawers by hooks.
14. Shelf in base cabinet for electric mixer.
15. Plain-surface doors and drawer fronts.
16. Streamlined hardware for ease of cleaning.
17. Minimum trim to avoid dust collection and for ease of cleaning.
18. Narrow drawers.
19. Door handles placed within easy reach rather than in the middle of the door edge.
20. Metal-lined drawer for storage of bread and cake.
21. Toe space at base of cabinets.

22. Solid base for lower cabinets, to prevent collection of dust.
23. Drawers on nylon rollers.
24. Narrow, hanging shelves for storage of small items.
25. Stepped shelves for storage of small items.
26. Cut-back shelves for ease of grasping articles.
27. Interchangeable shelf widths.

## FEATURES TO BE CONSIDERED ON COUNTERS

1. Hardwood chopping board built in or as part of counter space.
2. Hardwood mixing board built in as part of counter space.
3. Work surfaces which possess characteristics desired by the homemakers.
4. Beveled corners to permit greater ease of cleaning.
5. Seams.
6. Top rounded at back and at front - no seams.

## DESIRABLE CHARACTERISTICS OF COUNTER MATERIALS

Non-absorbent

Non-abrasive

Will not scratch

Heals easily when scratched

Easy to clean

Not affected by heat, grease, acids,  
alkalies

Quiet

Durable

Resilient