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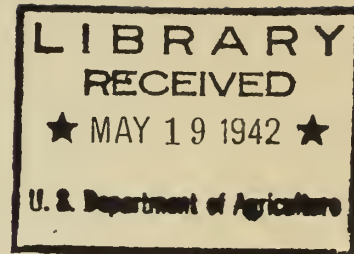
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GUIDE FOR INCOME BASES OF ISSUANCE IN THE WESTERN,
MIDWESTERN, AND NORTHEASTERN REGIONS

by

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Economic Analysis Section
May 1, 1942

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UNITED STATES DEPARTMENT OF AGRICULTURE
 Agricultural Marketing Administration
 Distribution Branch

GUIDE FOR INCOME BASES OF ISSUANCE IN THE WESTERN,
 MIDWESTERN, AND NORTHEASTERN REGIONS/1

Significance of the Orange Stamp Formula

People in low-income groups need more of almost everything - more food and clothing, better shelter, increased resources for transportation, greater expenditures for recreation. They carry budgeting to a high degree of scientific effort by making inadequate resources do the job of partially meeting very pressing needs. Under the Food Stamp Program we are seeking to raise food expenditure levels. The blue stamps are a special type of currency for this purpose - they successfully achieve the purpose for which they are made available only if they increase food purchases substantially and by more than would be achieved if an equivalent amount of cash were distributed to the families. For this reason, the orange stamp basis of issuance has been developed. By requiring families to invest their normal food resources in orange stamps we are making certain that the blue stamp funds do their full job. The orange stamp formula is the heart of the Food Stamp Program. This device for preventing substitution of the Federal funds for cash expenditures that would be made in the absence of the program, is a major development in domestic food disposal programs as well as in the general application of Federal funds to achieve desired social and economic objectives. Getting the formula right is one of the most challenging administrative tasks that we have assigned to us.

JAN 21 1943

Results of Food Purchase Studies

As a result of the food purchase studies made in the field during the past two years, an increasing amount of precise knowledge is being made available on food purchase habits of public assistance and low-income families. The precise information necessary to fix orange stamp purchase requirements by family size and in accordance with relatively small changes in income, can only be secured from studies of this type. Up to February 1, 1942 food purchase studies had been made among 9,500 families eligible to take part in the program in the Western, Midwestern, and Northeastern Regions. Information on food expenditures by income as well as category and family size was obtained from 5,290 families in the pre-program period. In addition, studies have been made among the 1,300 non-participating families in areas in which the program has been opened. This is the largest collection of information on food purchases of low-income families available in any country and provides the best available information for guidance on food stamp formulas.

1 Reference should be made to Distribution Branch Letter No. 4 - "Guide for Income Bases of Issuance in the Western, Midwestern, and Northeastern Regions". This memorandum presents all of the substantiating evidence used in arriving at the conclusions contained in this letter.

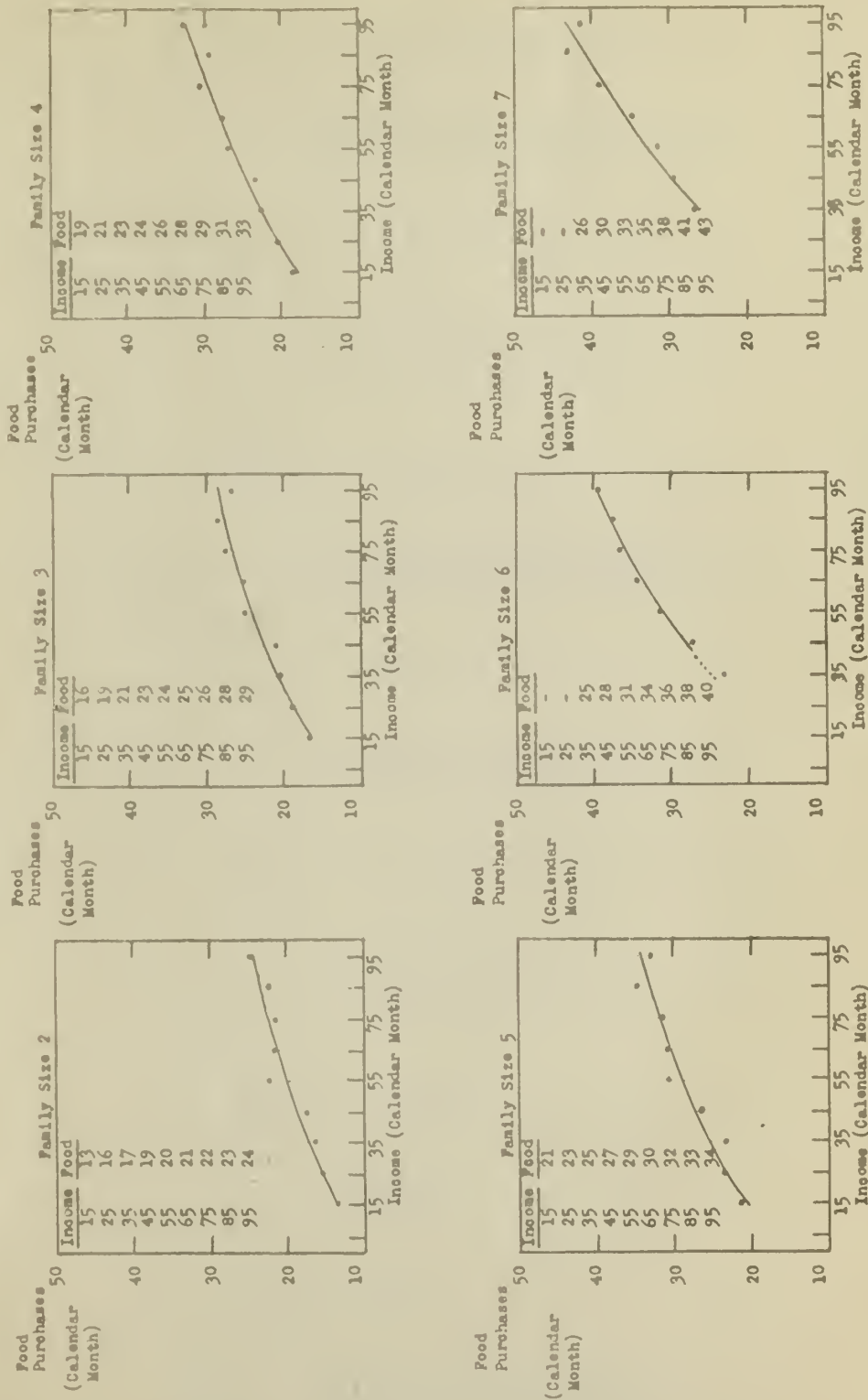
Table 1 summarizes the information on total food purchases from pre-program purchase studies in the three northern regions by income groups and family size, and Figure 1 summarizes the results of these data and indicates the average food expenditure curve suggested^{/1}. In general as family income varies from \$10.00 to \$100.00 per month, total food expenditures per month vary as follows:

| <u>Family Size</u> | <u>Food Expenditure</u> <u>dollars</u> |
|--------------------|---|
| 2 | 13.47 - 24.08 |
| 3 | 16.46 - 28.54 |
| 4 | 18.56 - 32.68 |
| 5 | 20.97 - 34.49 |
| 6 | 24.18 ^{/2} 39.73 |
| 7 | 26.33 ^{/2} 43.19 |

^{/1} Appendix A gives detailed information on the method of obtaining these curves, including adjustments for food reserves and donated commodities.

^{/2} Incomes of \$30.00 to \$100.00 per month.

Figure 1
Relation Between Monthly Normal Food Purchases and Income by Family Size in the Western, Midwestern, and Northeastern Regions



This chart shows the relation between food purchases and family income based on studies made in the Western, Midwestern, and Northeastern States. The individual dots are the actual averages, adjusted for denoted and home-grown foods, from all available pre-program Food Purchase Studies. The curves represent the average relationship between income and food purchases. The close relationship between the fitted curve and the actual observations indicates that the Food Purchase Studies provide a solid foundation for the establishment of adequate orange stamp formulas.

Source of data: Economic Analysis Section
Agricultural Marketing Administration
May 1, 1942



Table 1
Average Monthly Food Purchases Per Family by Income Class and Family Size for All Public Assistance Categories Combined
Regions I, II, and III Combined

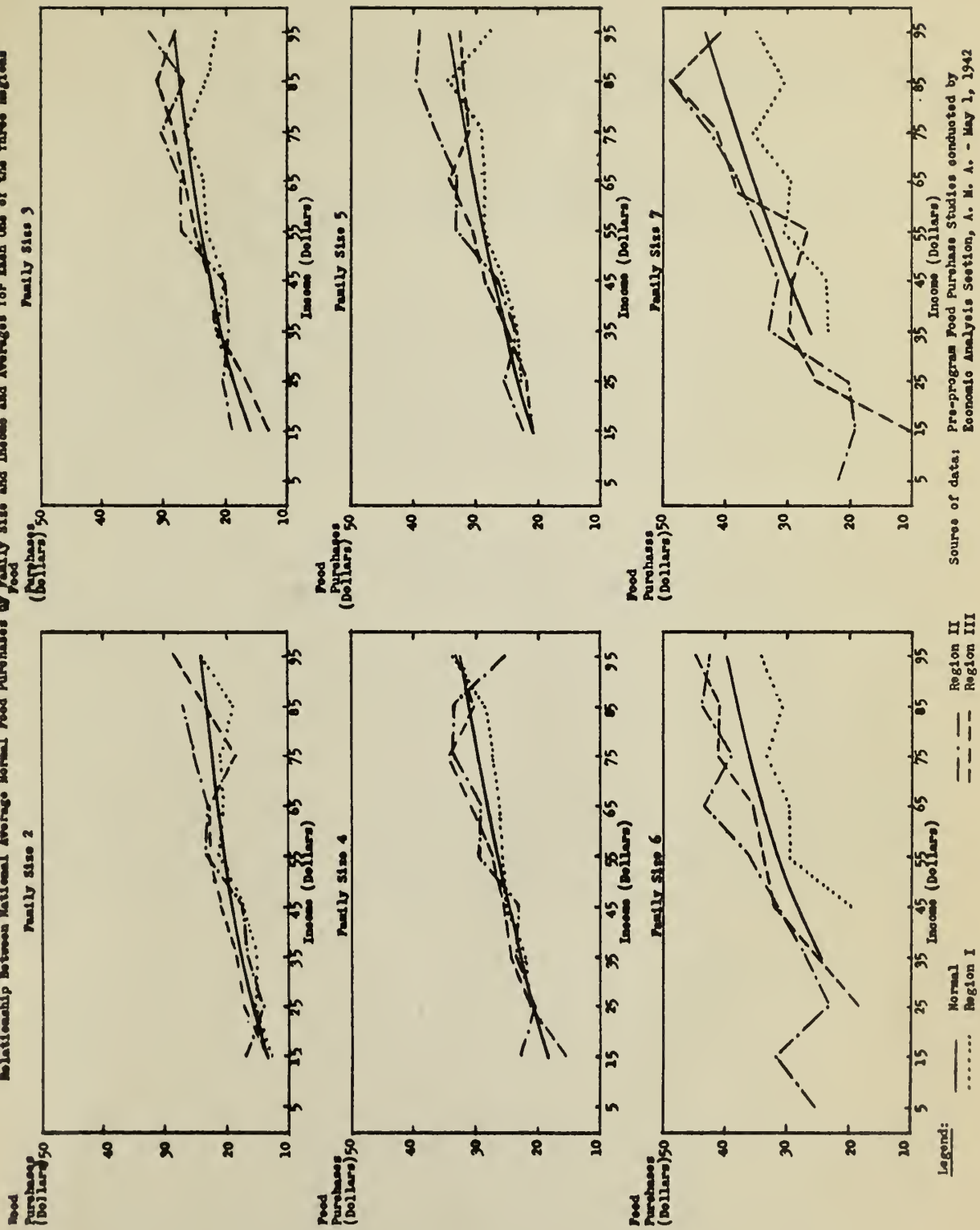
| Monthly Income Interval | Family Size | | | | | | |
|-------------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| | Number : of : Cases : | Number : of : Cases : | Number : of : Cases : | Number : of : Cases : | Number : of : Cases : | Number : of : Cases : | Number : of : Cases : |
| 0- 9.99 | 51 | 41 | 7 | 9 | 9 | 2 | 1 |
| 10- 19.99 | 170 | 178 | 58 | 28 | 16.74 | 18.95 | 18.84 |
| 20- 29.99 | 48 | 242 | 177 | 130 | 18.31 | 21.06 | 24.68 |
| 30- 39.99 | 22 | 12.10 | 261 | 167 | 20.24 | 20.88 | 16.76 |
| 40- 49.99 | 3 | 7.49 | 382 | 325 | 21.42 | 23.54 | 20.57 |
| 50- 59.99 | | | 158 | 163 | 24.57 | 27.93 | 24.51 |
| 60- 69.99 | | | 63 | 72 | 25.80 | 28.05 | 28.74 |
| 70- 79.99 | | | 29 | 49 | 28.55 | 28.65 | 31.27 |
| 80- 89.99 | | | 12 | 30 | 27.52 | 32.30 | 33.86 |
| 90- 99.99 | | | 7 | 12 | 30.83 | 30.47 | 34.83 |
| 100-109.99 | | | 4 | 6 | 30.64 | 30.14 | 36.47 |
| 110-119.99 | | | 6 | 3 | 27.77 | 34.14 | 41.66 |
| 120-129.99 | | | 1 | 3 | 26.27 | 26.84 | 26.68 |
| 130-139.99 | | | 1 | 4 | 27.71 | 32.80 | 42.92 |
| 140-144.99 | | | 1 | 2 | 28.75 | 35.29 | 33.17 |
| 145 & over | | | 1 | 5 | 31.18 | 35.72 | 41.31 |
| Total | 294 | 1,314 | 989 | 1,005 | 24.38 | 26.89 | 29.87 |
| | | | | | 825 | 519 | 341 |
| | | | | | | | 32.69 |

Source of data: Pre-program Food Purchase Studies conducted by
Economic Analysis Section
Agricultural Marketing Administration
May 1, 1942

Figure 2 shows the relationship between the national average food purchases by family size and income, and averages for each one of the three regions. The separate samples in the three regions were relatively small ^{/1} so that considerable fluctuation was to be expected. The significant characteristic is, however, that in each of the regions, the fluctuation appears to be rather consistently on both sides of the national average line. This means that there is some reason to believe that a single basis of income certification would be satisfactory for the three northern regions.

^{/1} As indicated in Table 1, for some income groups, the number of cases studied to date, even on a national basis, is too small to give great assurance of the reliability of the averages for those income groups.

Figure 2
 Relationship Between National Average Normal Food Purchases by Family Size and Income and Averages for Each One of the Three Regions



Source of data: Pre-program Food Purchase Studies conducted by Economic Analysis Section, A. M. A. - May 1, 1942

Legend:
 — Normal
 Region I
 --- Region II
 - · - · Region III

Establishing Guides for Lower and Upper Limits for Orange Stamp Formulas

Any orange stamp minimum must

- 1) seek to minimize substitution of blue stamp expenditures for cash expenditures that would otherwise be made, and at the same time
- 2) make it possible for a large proportion of the needy people to participate without serious dislocation in the budgeting of all other living costs that the families must meet.

Characteristically, food purchases for any group of families of the same size vary considerably even though income is the same. Individual families make different food choices and budget their total resources differently. This means, therefore, that some families characteristically and even necessarily spend less than the average indicated for all families and others spend more. Our studies have indicated variations of 40 percent from the average in the different family sizes.

The problem of setting a minimum is as follows: If the formula is set at the average, probably 50 percent of the families will normally be spending less than this. Consequently, they would have to either increase their expenditures for food or not participate. On the other hand, if the formula were set considerably below the average it would then be possible for practically all families to participate. However, if they purchase at the minimum, this would mean that a very large proportion of the families would be spending considerably less for orange stamps than their usual amount for food, and the result would be a very great substitution of blue stamp funds for regular food purchases. Detailed consideration of the problem indicates that a highly satisfactory degree of participation can be secured, while at the same time adequate effectiveness in terms of increases in total food purchases will be obtained, if a minimum basis of issuance is established one-quarter of a standard deviation below the mean/1.

While such a minimum gives substantial protection against substitution, it can not be effective in keeping substitution to the lowest possible level. The problem of minimizing substitution is not only a matter of an orange stamp formula but also of education and understanding. There is evidence to indicate that families can be induced to increase their purchases of orange stamps above the minimum. Special educational drives developed with the case-workers and others have almost uniformly resulted in substantial increases in purchases by participating families. If families are not permitted to buy more than the minimum, wherever that is established, substitution by families normally spending more than that minimum is bound to be large. Even where formulas

/1 At the conference of regional economists and field operations section heads held in Washington, January 12 - 14, the details were presented in a series of charts showing the estimated participation and net increases in food purchases that would take place with varying orange stamp minimums.

are established one-quarter of a standard deviation below the average, increases of purchases by as little as 10 percent above that minimum greatly increase the effectiveness of the program. Consequently, it is believed that in every instance there should be a maximum established above the minimum.

Especially in the earlier part of program operations, lack of attention to the point at which the maximum was established created specific compliance problems. Thus, there was a fairly uniform practice of not requiring WPA families to spend more than 50 percent of their monthly wages in stamps, whereas the maximum was established at \$6.00 per person per month. Consequently this could result in a 10-person family being allowed to spend a minimum of \$25.00 per month and a maximum of \$60.00. The large spread between the minimum and the maximum could then induce conspiracy between retailers and clients to purchase more than the minimum and present a portion of stamps for redemption without exchange of food. This situation has been corrected in most of the areas and should be corrected in all others at once. Maximums to be realistic should take into account not only the compliance aspects of the problem, but also the characteristic food purchases of families in the given income group. The maximum upper limit for food purchases is approximately three-quarters of one standard deviation above the average. This range will not be large since the standard deviation does not exceed \$13.00 for any family size.

It will be noted that on this basis, the guide for income bases of issuance in the three northern regions presents a range from one-quarter standard deviation below the mean to three-quarters of the standard deviation above the mean. This range does not represent a minimum and maximum formula for every area throughout the three northern regions. Within these limits, however, no orange stamp formula should have a minimum lower and no maximum should be higher than that indicated here. In other words, this is a range for the minimums and maximums. Table 2 gives for each family size the actual range of food purchases at one-quarter of the standard deviation below the mean and three-quarters of the standard deviation above the mean/1.

/1 Appendix B gives detailed information on the calculations involved in establishing these minimums and maximums.

Table 2
 Actual Range of Food Purchases Measured in Terms of One-Quarter Standard Deviation
 Below the Mean and Three-Quarters Standard Deviation Above the Mean/1

| Monthly Income Interval | Family Size | | | | | | | | | | | |
|-------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|
| | 2 | | 3 | | 4 | | 5 | | 6 | | 7 | |
| | Value : Below : Mean : | Value : Above : Mean : | Value : Below : Mean : | Value : Above : Mean : | Value : Below : Mean : | Value : Above : Mean : | Value : Below : Mean : | Value : Above : Mean : | Value : Below : Mean : | Value : Above : Mean : | Value : Below : Mean : | Value : Above : Mean : |
| 10.00-19.99 | 11.74 | 18.67 | 14.32 | 22.89 | 16.22 | 25.57 | 18.37 | 28.76 | | | | |
| 20.00-29.99 | 13.78 | 20.71 | 16.76 | 25.33 | 18.32 | 27.67 | 20.62 | 31.01 | | | | |
| 30.00-39.99 | 15.45 | 22.38 | 18.71 | 27.28 | 20.03 | 29.58 | 22.57 | 32.96 | | | | |
| 40.00-49.99 | 16.89 | 23.82 | 20.36 | 28.93 | 22.05 | 31.40 | 24.35 | 34.74 | 21.26 | 32.95 | 22.99 | 36.33 |
| 50.00-59.99 | 18.16 | 25.09 | 21.80 | 30.37 | 23.79 | 33.14 | 26.00 | 36.39 | 25.14 | 36.83 | 26.28 | 39.62 |
| 60.00-69.99 | 19.33 | 26.26 | 23.11 | 31.68 | 25.48 | 34.83 | 27.56 | 37.95 | 28.32 | 40.01 | 29.31 | 42.65 |
| 70.00-79.99 | 20.40 | 27.33 | 24.21 | 32.78 | 27.13 | 36.48 | 29.06 | 39.45 | 30.98 | 42.67 | 32.15 | 45.49 |
| 80.00-89.99 | 21.40 | 28.33 | 25.39 | 33.96 | 28.74 | 38.09 | 30.50 | 40.89 | 33.23 | 44.92 | 34.83 | 48.17 |
| 90.00-99.99 | 22.35 | 29.28 | 26.40 | 34.97 | 30.34 | 39.69 | 31.89 | 42.28 | 35.15 | 46.84 | 37.39 | 50.73 |
| | | | | | | | | | 36.79 | 48.48 | 39.85 | 53.19 |

1 See Appendix A and B for method used in determining normal purchases and the standard deviations.

Source of data: Food Purchase Studies conducted by
 Economic Analysis Section
 Agricultural Marketing Administration
 May 1, 1942

Exclusion Points - Upper and Lower

As we have learned more about food purchase habits and welfare budget practices, we have recognized widely different levels of adequacy of income of the low-income families. Some families can and do spend enough money to provide an adequate diet in terms of nutritional standards and customary purchase habits. It seems clear that no useful purpose could be served by seeking to subsidize the food purchases of families already amply able to buy an adequate diet. Moreover, to attempt to do so would probably require relatively large blue stamp expenditures for such families, and with the limited funds this would keep us from reaching other more needy families.

To secure an upper exclusion point level we have to consider

- 1) The approximate cost of an adequate diet, price changes and food habits considered.
- 2) Normal food purchases in relation to income.
- 3) Administrative considerations affecting the exact point at which the exclusion points should be established.

Unfortunately none of these can be precise and adjustments have to be made from time to time. On August 30, 1941, the Assistant Administrator wrote to the regional offices establishing the following income levels at which families should be excluded:

| <u>Family Size</u> | <u>Income Exclusion</u> <u>Points</u> |
|--------------------|--|
| 1 | 40 - 46 |
| 2 | 55 - 60 |
| 3 | 65 - 70 |
| 4 | 90 - 100 |
| 5 | 100 - 110 |
| 6 | 100 - 130 |
| 7 | 100 - 130 |
| 8 and over | 100 - 130 |

Reconsideration of price changes since that time and adjustments in dietary adequacy suggests the desirability of some revision in the earlier estimate.

The exclusion points established have been interpreted in terms of orange stamp requirements plus blue stamps at a 2 to 1 ratio. Thus families are excluded whose orange stamp purchases plus blue stamps received at a 2 to 1 ratio would exceed the adequate diet level. For family sizes 2 - 7, these exclusion points were established in terms of the actual food purchase curves extended to the \$150.00 intervals. For

families of 8 and over an arbitrary top of \$150.00 was established, since if 40 percent of the income were spent for food this would make it possible for the families to reach two-thirds of the adequate level. It should be noted that a letter was sent from the Washington office in February 1942 which established exclusion points for families of 3 to 6 which are \$10.00 per month higher than those indicated from the purchase studies. Table 3 gives the basic material on upper exclusion points.

Table 3

Upper Income Exclusion Points in Relation to Adequate Diets

| Family Size | :Estimated: :Adequate :Diet/1 : | : . Income : Exclusion in : Maguire Letter : of Aug. 30, '41: | :Exclusion Points: : Based on : Purchases at : 2/3 Level : | :Exclusion Points : Sent Out : February 1942 | |
|---|---------------------------------------|--|---|--|-----|
| (dollars per family per calendar month) | | | | | |
| 1 | 16 | 10.66 | 40 - 46 | 40 and over | 40 |
| 2 | 30 | 20.00 | 55 - 60 | 60 " " | 60 |
| 3 | 40 | 26.33 | 65 - 70 | 70 " " | 80 |
| 4 | 50 | 33.32 | 90 -100 | 90 " " | 100 |
| 5 | 60 | 40.00 | 100 -110 | 110 " " | 120 |
| 6 | 70 | 46.66 | 100 -130 | 130 " " | 140 |
| 7 | 80 | 53.32 | 100 -130 | 150 " " | 150 |
| 8 & over | 90 | 60.00 | 100 -130 | 150 " " | 150 |

1 Maximum amounts necessary for an adequate low-cost diet as estimated by Hazel K. Stiebling, Senior Food Economist, Bureau of Home Economics, January 29, 1942.

Lower Exclusion Points

Families with incomes so inadequate that they must spend three-fourths or more of it for food are, of course, in the greatest need of assistance. Since, however, our major responsibility is not to grant relief, but to supplement the state and local effort it is necessary for us to insist that basic nutritional care for such families is the responsibility of the local and state welfare agencies. In the light of such considerations all income classes are excluded in which the minimum orange stamp purchase requirement exceeds 75 percent of the midpoint of the income interval. This means that the local welfare agency should assume the responsibility for providing adequate assistance to enable families with such insufficient incomes to participate at the higher income interval. The following table presents by family size the low est income interval recognized for certification and the lowest orange stamp requirement permitted.

| Family Size | Minimum Income : Certification | Minimum Food Purchase |
|--------------------------------|-----------------------------------|--------------------------|
| (dollars per family per month) | | |
| 2 | 20 - 30 | 14.00 |
| 3 | 20 - 30 | 16.00 |
| 4 | 20 - 30 | 18.00 |
| 5 | 30 - 40 | 23.00 |
| 6 | 30 - 40 | 25.00 |
| 7 | 40 - 50 | 29.00 |
| 8 & over | 40 - 50 | 33.00 |

In no case should the minimum be lower than the standard established for the General Assistance Program in that particular area.

Prescribed Lower and Upper Limits Compared with Regional Food Purchase Studies and Present Regional Formulas

Based on the considerations set forth in the preceding sections, Table 4 gives range for orange stamp purchases at a lower and upper level between which bases of issuance in the three northern regions should be established. In examining this range two inquiries appear to be important.

- 1) How do the food purchase results for each region compare with the prescribed range?
- 2) How does the prescribed range compare with existing or proposed formulas in the regions?

Table 4
 Prescribed Limits Within Which All Bases of Issuance Should be Established in the Western,
 Midwestern, and Northeastern Regions/¹

| Monthly Income Interval | Family Size | | | | | | | | | | | | | | | | |
|-------------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--|
| | 1 | | 2 | | 3 | | 4 | | 5 | | 6 | | 7 | | 8 and over | | |
| | Upper : Limit : | Lower : Limit : | Upper : Limit : | Lower : Limit : | Upper : Limit : | Lower : Limit : | Upper : Limit : | Lower : Limit : | Upper : Limit : | Lower : Limit : | Upper : Limit : | Lower : Limit : | Upper : Limit : | Lower : Limit : | Upper : Limit : | Lower : Limit : | |
| 10.00-19.99 | 15 | | | | | | | | | | | | | | | | |
| 20.00-29.99 | 17 | 14 | 21 | 16 | 24 | 16 | 27 | 18 | 23 | 33 | 25 | 37 | 29 | 42 | 31 | 44 | |
| 30.00-39.99 | 18 | 16 | 23 | 17 | 26 | 18 | 29 | 20 | 25 | 35 | 27 | 39 | 31 | 44 | 33 | 46 | |
| 40.00-49.99 | | 17 | 24 | 20 | 28 | 20 | 31 | 22 | 27 | 37 | 29 | 41 | 31 | 44 | 33 | 46 | |
| 50.00-59.99 | | 18 | 25 | 22 | 30 | 22 | 33 | 24 | 29 | 39 | 31 | 43 | 33 | 46 | 35 | 48 | |
| 60.00-69.99 | | | | 24 | 32 | 24 | 35 | 26 | 31 | 41 | 33 | 45 | 35 | 48 | 37 | 50 | |
| 70.00-79.99 | | | | 26 | 34 | 26 | 37 | 28 | 31 | 41 | 33 | 45 | 37 | 50 | 39 | 52 | |
| 80.00-89.99 | | | | 30 | 39 | 30 | 39 | 30 | 33 | 43 | 35 | 47 | 37 | 50 | 39 | 52 | |
| 90.00-99.99 | | | | 31 | 40 | 31 | 40 | 31 | 35 | 45 | 37 | 49 | 39 | 52 | 41 | 54 | |
| 100.00-109.99 | | | | | | | | | 36 | 46 | 39 | 51 | 41 | 54 | 43 | 56 | |
| 110.00-119.99 | | | | | | | | | 37 | 47 | 41 | 53 | 43 | 56 | 45 | 58 | |
| 120.00-129.99 | | | | | | | | | | | 42 | 54 | 44 | 57 | 46 | 59 | |
| 130.00-139.99 | | | | | | | | | | | 43 | 55 | 45 | 58 | 47 | 60 | |
| 140.00-149.99 | | | | | | | | | | | | 46 | 48 | 59 | 48 | 61 | |

¹ The lower limits indicated above are established approximately 1/4 standard deviation below the mean and the upper limits approximately 3/4 standard deviation above the mean. See Appendix A and B for method used in determining normal purchases and the standard deviations.

Source of data: Economic Analysis Section
 Agricultural Marketing Administration
 May 1, 1942

Comparison with Food Purchase Results

Figure 2, on page 6, compared the regional averages with the averages from all northern studies and it was noted that a number of the deviations were the result of the fact that the studies in each region did not result in enough cases to reliably establish an average. Using all pre-program studies and non-participant studies in which twenty or more cases were available in a given region, the following conclusions are reached:

In the Western Region average purchases for 2-person families appear to be \$3.00 to \$4.00 below the lower limit for the range. Practically all 3-, 4-, and 5-person families studied make food purchases within the range. All 6-person purchases fall within \$2.00 of the lower limit or inside the range. The 7-person family purchases are slightly below the lower limit. It should be recognized that many of these studies made in 1940 and early 1941 probably did not contain fully adequate income information.

In the Midwestern Region among 2-person families a number of studies indicated that normal purchases are \$1.00 to \$4.00 below the prescribed lower limits at income levels under \$40.00 per month. Among 3-, 4-, 5-, and 6-person families practically all food purchases fell well within the range.

In the Northeastern Region the majority of the cases appear to fall within the established range, though only in family size 2 are there twenty or more cases now available for study in any particular income group. To supplement this deficiency in sample size the results of more recent program studies of non-participants were compared with the lower and upper limits established. In general, these results compared favorably with the computed normal curve and the orange stamp purchase range.

On the basis of this analysis it is concluded that the established range will effectively meet the normal purchase habits of families with the possible need for an upward adjustment in purchases among the small family sizes in the West and Midwest.

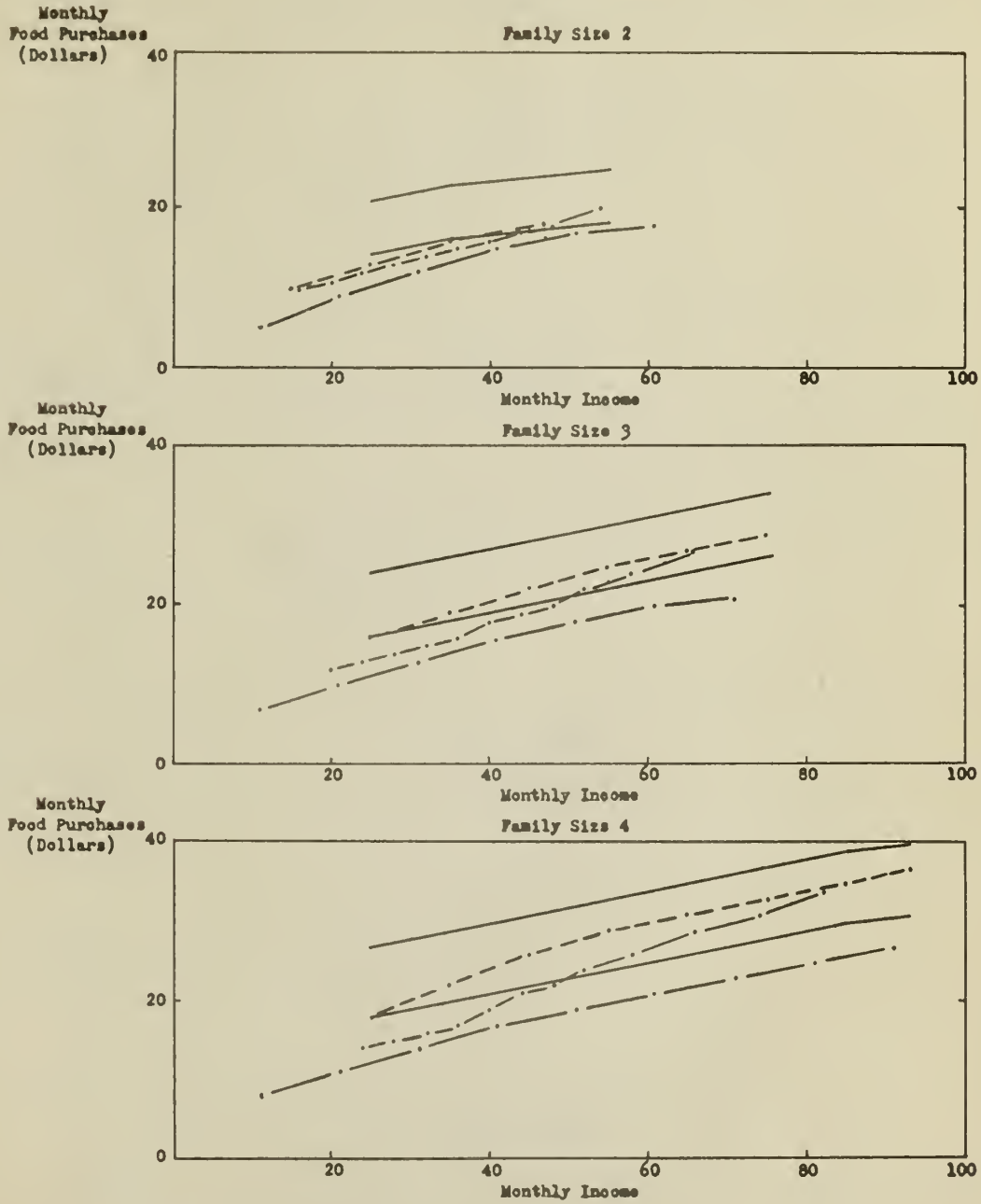
Comparison with Existing Formulas

Figure 3 presents a comparison of existing bases of issuance in the West, Midwest, and Northeast with the prescribed lower and upper orange stamp purchase range. The purchase requirement used to represent Region I is that now in effect in the states of Arizona, California, and Washington. Suggested regional formulas recently submitted to this office from Regions II and III were used for these regions./1

/1 Region II Basis of Issuance contained in report entitled "Analysis of Food Purchase Studies - Recommended Basis of Issuance Guide" September 1941, page 3. Region III Basis of Issuance contained in letter of January 20, 1942.

Figure 3

Comparison of Lower and Upper Limits for Orange Stamp Purchase Requirements with Existing Formulas in each Region



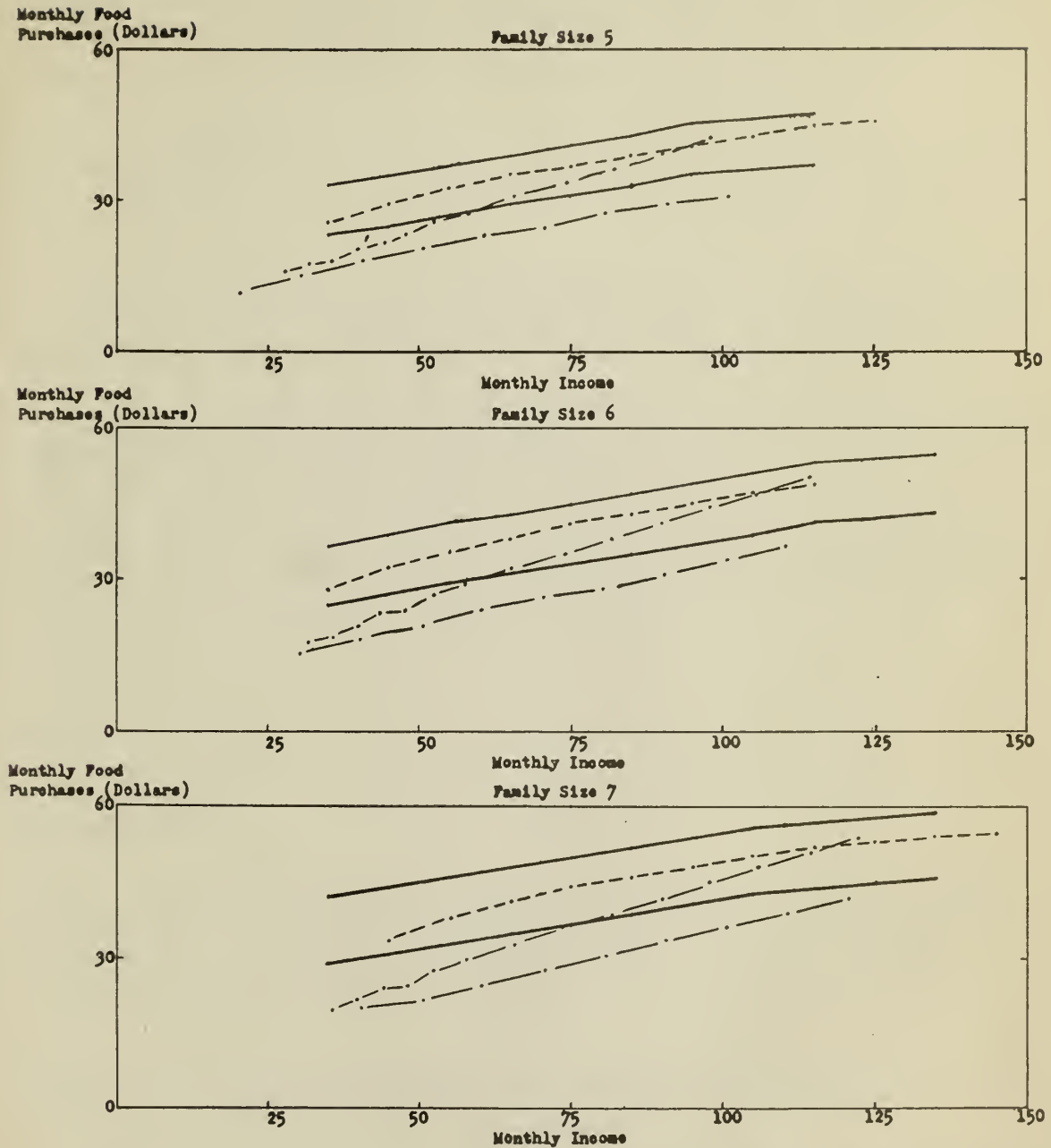
Legend:

- Region I
- Region II
- . - . - Region III
- Range for Orange Stamp Purchase Requirements

Source of data: Economic Analysis Section
Agricultural Marketing Administration
May 1, 1942

Figure 3 (Cont'd)

Comparison of Lower and Upper Limits for Orange Stamp Purchase Requirements with Existing Formulas in Each Region



Legend:

- Region I
- Region II
- . - . Region III
- Range for Orange Stamp Purchase Requirements

Source of data: Economic Analysis Section
Agricultural Marketing Administration
May 1, 1942

For the Western Region an increase of purchase rates at every income interval will be required to meet the lower limit of the prescribed range. The range of this increase by family size is given below. Large increases are evident for the lower income classes decreasing generally as income increases.

| Family Size | 2 | 3 | 4 | 5 | 6 | 7 |
|---|----------|-------|-------|-------|-------|-------|
| Range of Increase in Minimums (Dollars) | 1 - 3.50 | 3 - 5 | 5 - 8 | 5 - 7 | 4 - 8 | 4 - 8 |

It may be noted that this increase is partly necessary because the Western Region minimums are generally a full standard deviation below the average, as compared with the quarter deviation used here.

For the Midwestern Region some increase in purchase rates in the lower income classes will be required. These occur in the \$20.00-\$30.00 and \$30.00-\$40.00 income class in family size 2; in the \$20.00-\$30.00, \$30.00-\$40.00; and \$40.00-\$50.00 income classes in family size 3; in all income intervals in family size 4; in the \$30.00-\$40.00 and \$40.00-\$50.00 income class in family size 5; in the \$30.00-\$40.00, \$40.00-\$50.00, \$50.00-\$60.00 income classes in family size 6; and in the \$40.00-\$50.00 and \$50.00-\$60.00 income classes in family size 7. The range of this increase by family size is presented below:

| Family Size | 2 | 3 | 4 | 5 | 6 | 7 |
|---|----------|----------|--------|--------|-----|-----|
| Range of Increase in Minimums (Dollars) | 1 - 1.50 | .50-2.50 | 2-2.50 | 3-5.50 | 1-6 | 2-5 |

For the Northeastern Region, the \$20.00-\$30.00 income class of family size 2 is the only interval which falls below the established lower limit for orange stamp purchase rates. In this instance, an increase of \$1.00 in the purchase rate is necessary to bring the requirement to the lower limit.

In no case do the issuance rates in the Western, Midwestern, and Northeastern Regions exceed the upper limit established.

METHOD OF OBTAINING FOOD PURCHASE CURVESAverage Purchase Curves

All pre-program food purchase data for the three regions were combined for each family size on \$10.00 income intervals. The mean food purchases were then computed for each family size and income interval. Each mean was assumed to be at the midpoint of its income interval. These data are shown in Table 1, page 4, of the text.

The method of obtaining the curve was based on the formula $y = a + b\sqrt{x} + cx$, where x refers to income and y to food purchases, a formula successfully used by the National Resources Committee for smoothing data¹. The curve was then fitted to the scatter of the averages at each income interval for each family size by the method of least squares. Averages based on less than seven observations were eliminated from the scatter prior to the curve fitting. Selection of uniform income intervals for each family size made it possible to obtain a formula for the coefficients a , b , and c , in terms of $\sum y$, $\sum \sqrt{x}$, $\sum y^2$ and $\sum xy$ which then could be applied to the data for each family size separately so that the bulk of the computational work was done only once.

The coefficients a , b , c , were evaluated from the equations in the following table. These equations are valid only for the number of consecutive income classes of \$10.00 intervals with the range indicated in this table.

Conditions and Equations for the Evaluation of a , b , c

| Family Size | No. of Income Intervals | Income Interval Range | Coefficients | Sum of y | Sum of \sqrt{x} | Sum of y^2 | Sum of (xy) |
|---------------|-------------------------|-----------------------|--------------|-------------|-------------------|--------------|---------------|
| 2, 3, 4, 5 | 9 | 10-19.99 | $a =$ | + 22.859202 | - 6.8723887 | + .48331182 | |
| | | to | $b =$ | - 6.8723887 | + 2.1232638 | - .15215408 | |
| | | 90-99.99 | $c =$ | + .48331182 | - .15215408 | + .01107099 | |
| 6 | 8 | 20-29.99 | $a =$ | + 79.927548 | - 22.091793 | + 1.4649989 | |
| | | to | $b =$ | - 22.091793 | + 6.1820863 | - .41395757 | |
| | | 90-99.99 | $c =$ | + 1.4649989 | - .41395757 | + .027957034 | |
| 7 | 7 | 30-39.99 | $a =$ | +261.476299 | - 67.684904 | + 4.2696714 | |
| | | to | $b =$ | - 67.684904 | + 17.632078 | - 1.1183069 | |
| | | 90-99.99 | $c =$ | + 4.2696714 | - 1.1183069 | + .071285272 | |

¹ See "Consumer Expenditures in the United States" National Resources Committee - page 133.

The following table presents the values of a, b, and c, for each family size.

Coefficients a, b, c, by Family Size

| Family Size | a | b | c |
|-------------|---------|--------|---------|
| 2 | 5.01 | 1.853 | -.00341 |
| 3 | 5.78 | 2.376 | -.02344 |
| 4 | 11.47 | .84167 | .11464 |
| 5 | 11.98 | 1.429 | .06348 |
| 6 | - 18.94 | 8.4478 | -.28013 |
| 7 | 1.80 | 3.161 | .07916 |

To derive the food purchase curve for a family size the values a, b, c, were substituted in the equation $y = a + b \sqrt{x} + c x$, where x is the midpoint of each class.

Adjustments for Home-grown and Donated Foods

To obtain normal purchase values adjustments were made for the effect of home-grown and donated commodities on food purchases. Overall averages for income, food purchases, and value of donations were obtained. If average food purchases reflect maximum substitution of donated and home-grown commodities, then the lower limit of normal purchases would not fall below this average if these non-purchased commodities were stopped. To obtain an upper limit of food purchases the value of the donated and home-grown commodities was added to income and food purchases. The ratio between food purchases (including the value of donations and home-grown foods) and income (including the value of donations and home-grown foods) represents this upper limit in terms of percent of income spent for food. This ratio applied to the average cash income of the families gives the upper limit in dollars to which we might expect families to increase their purchases if donated and home-grown commodities were not available. The difference between the lower and upper limit indicates the actual amount of increase in food purchases that might be expected. This value expressed as a percentage of the average value of donated commodities and home-grown foods represents the maximum percentage of substitution of donated and home-grown commodities for normal purchases. These percentages applied to the average value of donations and home-grown foods for each family size represents the amounts to be added to the average food purchases to obtain normal purchases.

The following example is given to illustrate the steps involved:

1. Average income is \$2.94, the average food purchases are \$1.48. The average value of non-purchased foods is \$.27.
2. If the supply of non-purchased foods were stopped it is assumed that at least \$1.48 would continue to be spent for food.
3. If the value of the non-purchased foods, \$.27, were given in cash instead of food, the total income would be increased to \$3.21 and food expenditures would be increased at most to \$1.75.
4. Therefore, the ratio of normal food expenditures to income will be between $\frac{\$1.48}{\$2.94}$ and $\frac{\$1.75}{\$3.21}$ or between .503 and .545 percent.
5. Assuming that the ratios are applicable to all incomes ranging between \$2.94 and \$3.21, the lower limit for normal food purchases where there are no non-purchased foods, for an income of \$2.94 would be $.503 \times \$2.94 = \1.48 and the upper limit would be $.545 \times \$2.94 = \1.60 .
6. The difference between \$1.48 and \$1.60 or \$.12 represents the maximum increase in food purchases that may be expected if the supply of non-purchased foods were stopped.
7. \$.12 expressed as a percentage of the total value of the non-purchased foods, (\$.27) is the maximum percent of substitution of non-purchased foods for normal purchases (44 percent).

This procedure was applied to the average value of non-purchased foods for each family size and the amounts to be added to the average food purchases to obtain normal purchases. Appendix Table 1 presents these data. Since the bulk of the non-purchased foods represents direct distribution which is issued on a family size basis only, a straight addition was made to average food purchases in each income group.

It should be noted that this adjustment is made for purposes of determining normal food expenditures and not as a means of determining how to adjust the food stamp formula for home-produced and consumed foods.

Appendix table 1

Average Values of Donated and Home-Grown Commodities Per Person per Week and Per Family Per Month by Region and Family Size; Overall Averages, Estimated Percent of Substitution and Adjustments for Normal Purchases for All Regions Combined and for Regions I, II, and III Combined by Family Size

| Family Size | Region: Region | | | | All Regions | | | |
|--------------------------------------|----------------|---------|--------------|--------------|-------------|-----------|--------------|-----------------------------|
| | I | II | III | IV | Average | Estimated | Adjustment | Regions I, II, III Combined |
| | Donations | Percent | Substitution | Purchases /1 | Donations | Percent | Substitution | Purchases /2 |
| 1 | .34 | .34 | .34 | .34 | .34 | .34 | .34 | .34 |
| 2 | .37 | .34 | .34 | .34 | .29 | .28 | .28 | .28 |
| 3 | .42 | .27 | .32 | .32 | .29 | .27 | .27 | .27 |
| 4 | .47 | .20 | .30 | .30 | .26 | .24 | .24 | .24 |
| 5 | .40 | .19 | .30 | .30 | .25 | .23 | .23 | .23 |
| 6 | .61 | .11 | .27 | .27 | .25 | .23 | .23 | .23 |
| 7 | .36 | .12 | .27 | .27 | .25 | .21 | .21 | .21 |
| --- Dollars per Person per Week --- | | | | | | | | |
| 1 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 |
| 2 | 3.20 | 2.86 | 2.94 | 2.94 | 2.51 | 2.42 | 2.42 | 2.42 |
| 3 | 5.46 | 3.51 | 4.16 | 4.16 | 3.77 | 3.51 | 3.51 | 3.51 |
| 4 | 8.14 | 3.46 | 5.20 | 5.20 | 4.50 | 4.16 | 4.16 | 4.16 |
| 5 | 8.66 | 4.11 | 6.50 | 6.50 | 5.41 | 4.98 | 4.98 | 4.98 |
| 6 | 15.85 | 2.86 | 7.01 | 7.01 | 6.50 | 5.98 | 5.98 | 5.98 |
| 7 | 10.91 | 3.64 | 8.18 | 8.18 | 7.58 | 6.37 | 6.37 | 6.37 |
| --- Dollars per Family per Month --- | | | | | | | | |
| 1 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 |
| 2 | 3.20 | 2.86 | 2.94 | 2.94 | 2.51 | 2.42 | 2.42 | 2.42 |
| 3 | 5.46 | 3.51 | 4.16 | 4.16 | 3.77 | 3.51 | 3.51 | 3.51 |
| 4 | 8.14 | 3.46 | 5.20 | 5.20 | 4.50 | 4.16 | 4.16 | 4.16 |
| 5 | 8.66 | 4.11 | 6.50 | 6.50 | 5.41 | 4.98 | 4.98 | 4.98 |
| 6 | 15.85 | 2.86 | 7.01 | 7.01 | 6.50 | 5.98 | 5.98 | 5.98 |
| 7 | 10.91 | 3.64 | 8.18 | 8.18 | 7.58 | 6.37 | 6.37 | 6.37 |

1 Average Donations X Estimated percent substitution, All Regions.

2 Average donations X Estimated percent substitution, Regions I, II, III Combined.

Source of data: Pre-program Food Purchase Studies conducted by
 Economic Analysis Section
 Agricultural Marketing Administration
 May 1, 1942

ESTABLISHING MINIMUM AND MAXIMUM RANGE

Since standard deviations were not available by income class, it was necessary to select values for each family size that would be representative. In our recent sampling memorandum the scatter of the values of standard deviations for each Food Purchase Study by family size, category, and race were presented^{/1}. From these scatters maximum values of standard deviations were established for each family size. These maxima were selected as representative of the actual distributions and indicate upper limits of food purchase variances which would be valid in any area. The maximum variances obtained for each race, and category were then averaged for each family size. These figures on a calendar month basis were used to obtain minima at 1/4 of a standard deviation below the normal purchase curve and 3/4 of a standard deviation above the mean. The average food purchases and the value of these standard deviations were as follows:

| Family Size | Average Food Purchases | Standard Deviation | Standard Deviation as Percent of Total Food Purchases | Standard Deviation as Percent of Total Food Purchases |
|-------------|-------------------------|--------------------|---|---|
| | \$ per family per month | | percent | \$ per family per month |
| 2 | 17.68 | 6.93 | 39.2 | 1.73 |
| 3 | 21.72 | 8.57 | 39.5 | 2.14 |
| 4 | 24.38 | 9.35 | 38.4 | 2.34 |
| 5 | 26.89 | 10.39 | 38.6 | 2.60 |
| 6 | 29.87 | 11.69 | 39.1 | 2.92 |
| 7 | 32.73 | 13.34 | 40.8 | 3.34 |

In order to insure general consistency in the formula between family sizes, the values obtained at 1/4 standard deviation below and 3/4 of a standard deviation above the mean by family size were plotted. The resultant curves were then smoothed slightly. The effect of this smoothing did not materially change the actual computed values.

^{/1} Memorandum on Sampling - Figures I and II between pages 15 and 16.