The Cost of Subsistence

Author(s): George J. Stigler

Source: *Journal of Farm Economics*, May, 1945, Vol. 27, No. 2 (May, 1945), pp. 303–314

Published by: Oxford University Press on behalf of the Agricultural & Applied Economics Association

Stable URL: https://www.jstor.org/stable/1231810

THE COST OF SUBSISTENCE

GEORGE J. STIGLER
University of Minnesota

ELABORATE investigations have been made of the adequacy of diets at various income levels, and a considerable number of "low-cost," "moderate," and "expensive" diets have been recommended to consumers. Yet, so far as I know, no one has determined the minimum cost of obtaining the amounts of calories, protein, minerals, and vitamins which these studies accept as adequate or optimum. This will be done in the present paper, not only for its own interest but because it sheds much light on the meaning of conventional "low-cost" diets.

This paper is organized under five headings, devoted to
1. The quantities of the various nutrients which should be contained in an average person's diet.
2. The quantities of these nutrients which are found in certain common foods.
3. The methodology of finding the minimum cost diet.
4. The minimum cost diet in August 1939 and August 1944.
5. Comparison with conventional low-cost diets.

The curious may wish to turn first to Table 2, which gives the composition and cost of the most economical diets in August 1939 and 1944 for an active economist (weighing 70 kilograms) who lives in a large city.

Nutritive Requirements

The economist uses a production function to describe the relationship between the quantities of the productive services and the quantity of product. The product derived from an increment of productive service A is usually assumed (1) to diminish as the quantity of A increases, and (2) to depend upon the quantities of the other productive services used with A.

This approach can be applied also to the relationship between quantities of nutrients and "health" (used here generically to describe strength, vigor, avoidance of disease, etc.). The findings of nutrition studies clearly indicate:

1. After certain minimum values of the nutrients are secured, additional quantities yield decreasing (and in some cases eventually negative) returns to health.
2. The optimum quantity of any nutrient depends upon the quantities of the other nutrients available.

303

A few of the many illustrations of these findings may be given.

Diminishing returns is illustrated by the facts that the amount of calcium in the body increases much more slowly than the input of calcium, and that increases of longevity are not proportional to increases of calcium inputs.[1] The incidence of goiter was found to vary in inverse proportion to the amount of iodine in the water in Michigan localities.[2] An example of substitution is the recommendation of 30 micrograms of thiamine per 100 calories not derived from fats,[3] and one of complementarity is the loss of riboflavin which accompanies a deficiency of thiamine.[4]

The science of nutrition is much too young to have attained even an approximate measurement of the "health" function for representative individuals, or to determine the extent of individual variation. The optimum quantity of calories is known fairly accurately, but the requirements of other nutrients are known only roughly or not at all. Many minima (to which 50 percent is usually added as a safety factor) are found by determining the lowest level of input compatible with a stable rate of loss of the nutrient through excreta. It is probable that nutrient requirements have been overstated; for example, a 5 month experiment on young men with riboflavin held at less than two-thirds of the recommended level led to the conclusion that they did not suffer any clinical or physiological defects.[5] The interrelationships among the various nutrients are even more obscure, and they are virtually ignored in dietary recommendations.

The ultimate health function will doubtless be very complex. In addition to calories, the body requires about thirteen minerals (some in very minute quantities), and perhaps half as many vitamins. Protein contains two dozen amino acids, of which almost

---

[1] Sherman, H. C., H. L. Campbell, and C. S. Lanford, "Experiments on the Relation of Nutrition to the Composition of the Body and the Length of Life," *Proceedings of the National Academy of Science*, XXV (1939), 16–20.

[2] Curtis, G. M. and M. B. Fertman, "Iodine in Nutrition," *Journal of the American Medical Association*, Vol. 121 (February 6, 1943), p. 423.

[3] Sherman, H. C., *Chemistry of Food and Nutrition* (6th ed., 1941), p. 360.

[4] Sure, B., "Vitamin Interrelationships, III," *Journal of Nutrition*, XXVII (1944), 447–52.

[5] The tests were made on conscientious objectors; see A. Keys, A. F. Henschel, O. Mickelsen, J. M. Brozek, and J. H. Crawford, "Physiological and Biochemical Functions in Normal Young Men on a Diet restricted in Riboflavin," *Journal of Nutrition*, XXVII (1944), 165–78. Similar results were found for thiamine when the daily output was .9 mg.; see A. Keys, A. F. Henschel, O. Mickelsen, and J. M. Brozek, "The Performance of Normal Young Men on Controlled Thiamine Intakes," *Journal of Nutrition*, XXVI (1943), 399–415.

half are necessary to human beings.[6] The precise determination of our needs for these—and no doubt other yet undiscovered—nutrients lies far in the future.

Nevertheless standards of dietary adequacy have been established, perhaps prematurely and certainly very tentatively. The "allowances" (a term used to indicate their preliminary nature) of the National Research Council embody what is presumably the 1943 consensus of the experts; they are given in Table 1. Other minerals and vitamins are believed to be supplied in adequate quantities if these nutrients are secured from natural foods. The requirements are net of losses in the preparation of food. These standards are met by the minimum cost diets derived subsequently.

TABLE 1. DAILY ALLOWANCES OF NUTRIENTS FOR A
MODERATELY ACTIVE MAN
(weighing 154 pounds)*

Nutrient	Allowance
Calories	3,000 calories
Protein	70 grams
Calcium	.8 grams
Iron	12 milligrams
Vitamin A	5,000 International Units
Thiamine (B₁)	1.8 milligrams
Riboflavin (B₂ or G)	2.7 milligrams
Niacin (Nicotinic Acid)	18 milligrams
Ascorbic Acid (C)	75 milligrams

* National Research Council, *Recommended Dietary Allowances*, Reprint and Circular Series No. 115, January, 1943.

Nutritive Values of Foods

The minimum cost of an adequate diet is obviously governed by the nutritive values and costs of the foods eligible for inclusion. The very restricted list of foods considered in this study is discussed in Section 3 and the foods are listed in Tables A and B. It may be mentioned here that only natural foods are included; vitamin pills are excluded because they do not contain all of the nutrients (known and unknown) which are necessary to good health.[7]

The nutritive values of common foods are known only roughly,

---

[6] For summaries of the present knowledge, see *Yearbook of Agriculture*, 1939, Food and Life; H. C. Sherman, *Chemistry of Food and Nutrition* (6th ed., 1941).

[7] Puppies put on a diet in which the vitamins were provided from synthetic sources lived only 100 to 150 days; see J. P. Lambooy and E. S. Nasset, "The Inadequacy of Eight Synthetic B Vitamins for the Nutrition of Puppies," *Journal of Nutrition*, XXVI (1943), 293–302.

TABLE A. NUTRITIVE VALUES OF COMMON FOODS PER DOLLAR OF EXPENDITURE, AUGUST 15, 1939

Commodity	Unit	Price Aug. 15, 1939 (cents)	Edible Weight per $1.00 (grams)	Calories (1,000)	Protein (grams)	Calcium (grams)	Iron (mg.)	Vitamin A (1,000 I.U.)	Thiamine (mg.)	Riboflavin (mg.)	Niacin (mg.)	Ascorbic Acid (mg.)
**1. Wheat Flour (Enriched)	10 lb.	36.0	12,600	44.7	1,411	2.0	365		55.4	33.3	441	
2. Macaroni	1 lb.	14.1	3,217	11.6	418	.7	54		3.2	1.9	68	
3. Wheat Cereal (Enriched)	28 oz.	24.2	3,280	11.8	377	14.4	175		14.4	8.8	114	
4. Corn Flakes	8 oz.	7.1	3,194	11.4	252	.1	56		13.5	2.3	68	
5. Corn Meal	1 lb.	4.6	9,861	36.0	897	1.7	99	30.9	17.4	7.9	106	
6. Hominy Grits	24 oz.	8.5	8,005	28.6	680	.6	80		10.6	1.6	110	
7. Rice	1 lb.	7.5	6,048	21.2	460	.6	41		2.0	4.8	60	
8. Rolled Oats	1 lb.	7.1	6,389	25.3	907	5.1	341		37.1	8.9	64	
9. White Bread (Enriched)	1 lb.	7.9	5,742	15.0	488	2.5	115		13.8	8.5	126	
10. Whole Wheat Bread	1 lb.	9.1	4,985	12.2	484	2.7	125		13.9	6.4	160	
11. Rye Bread	1 lb.	9.2	4,930	12.4	439	1.1	82		9.9	3.0	66	
12. Pound Cake	1 lb.	24.8	1,829	8.0	130	.4	31	18.9	2.8	3.0	17	
13. Soda Crackers	1 lb.	15.1	3,004	12.5	288	.5	50					
14. Milk	1 qt.	11.0	8,867	6.1	310	10.5	18	16.8	4.0	16.0	7	177
**15. Evaporated Milk (can)	14½ oz.	6.7	6,035	8.4	422	15.1	9	26.0	3.0	23.5	11	60
16. Butter	1 lb.	30.8	1,473	10.8	9		3	44.2		.2	2	
*17. Oleomargarine	1 lb.	16.1	2,817	20.6	17	.6	6	55.8				
18. Eggs	1 doz.	32.6	1,857	7.4	238	1.0	52	18.6	.8	6.5	1	
**19. Cheese (Cheddar)	1 lb.	24.2	1,874	9.5	448	16.4	19	28.1	.8	10.3	4	
20. Cream	½ pt.	14.1	1,689	15.7	49	1.7	3	16.9	.6	2.5		
21. Peanut Butter	1 lb.	17.9	2,534	8.6	661	1.0	48		9.6	8.1	471	
22. Mayonnaise	½ pt.	16.7	1,198	20.1	18	.2	8	2.7	.4	.5		
23. Crisco	1 lb.	20.3	2,234	41.7								
24. Lard	1 lb.	9.8	4,628	2.2								
25. Sirloin Steak	1 lb.	39.6	1,145*	9.2	166	.1	34	.2	2.1	2.9	5	
26. Round Steak	1 lb.	36.4	1,246*	8.4	214	.1	32	.2	2.5	2.4	69	
27. Rib Roast	1 lb.	29.2	1,553*	8.4	213	.1	33			2.0	87	
28. Chuck Roast	1 lb.	22.6	2,007*	8.5	309	.2	46	.4	1.0	4.0	120	
29. Plate	1 lb.	14.6	3,107*	8.5	404	.2	62		.9			
**30. Liver (Beef)	1 lb.	26.8	1,692*	3.2	333	.2	139	169.2	6.4	50.8	316	525
31. Leg of Lamb	1 lb.	27.6	1,643*	3.1	245	.1	20	.2	2.3	9.2	86	
32. Lamb Chops (Rib)	1 lb.	36.6	1,239*	3.3	140	.1	15	.4	1.7	2.7	54	
33. Pork Chops	1 lb.	30.7	1,477*	3.5	196	.2	80		17.4	2.7	60	
34. Pork Loin Roast	1 lb.	24.2	1,874*	4.4	249	.3	37		18.2	3.6	79	
35. Bacon	1 lb.	25.6	1,772*	10.4	152	.2	23		1.8	1.8	71	
36. Ham—smoked	1 lb.	27.4	1,655*	6.7	212	.2	31		9.9	3.3	50	
37. Salt Pork	1 lb.	16.0	2,835*	18.8	164	.1	26		1.4	1.8		
38. Roasting Chicken	1 lb.	30.3	1,497*	1.8	184	.1	30	.1	.9	2.4	68	
39. Veal Cutlets	1 lb.	42.3	1,072*	1.7	156	.1	24		1.4	2.4	57	
40. Salmon, Pink (can)	16 oz.	13.0	3,489	5.8	705	6.8	45	3.5	1.0	4.9	209	
41. Apples	1 lb.	4.4	9,072	5.8	27	.5	36	7.3	3.6	2.7	5	544
42. Bananas	1 lb.	6.1	4,982	4.9	60	.4	30	17.4	2.5	3.5	28	498
43. Lemons	1 doz.	26.0	2,380	1.0	21	.5	14				4	952
44. Oranges	1 doz.	30.9	4,439	2.2	40	1.1	18	11.1	3.6	1.3	10	1,998
*45. Green Beans	1 lb.	7.1	5,750	2.4	138	3.7	80	69.0	4.3	5.8	37	862
**46. Cabbage	1 lb.	3.7	8,949	2.6	125	4.0	36	7.2	9.0	4.5	26	5,369
47. Carrots	1 bunch	4.7	6,080	2.7	73	2.8	43	188.5	6.1	4.3	89	608
48. Celery	1 stalk	7.3	3,915	.9	51	3.0	23	.9	1.4	1.4	9	313
49. Lettuce	1 head	8.2	2,247	.4	27	1.1	22	112.4	1.8	3.4	11	449
*50. Onions	1 lb.	3.6	11,844	5.8	166	3.8	59	16.6	4.7	5.9	21	1,184

Commodity	Unit	Price	Calories (1,000)	Protein (grams)	Calcium (grams)	Iron (mg.)	Vitamin A (1,000 I.U.)	Thiamine (mg.)	Riboflavin (mg.)	Niacin (mg.)	Ascorbic Acid (mg.)
*51. Potatoes	15 lb.	34.0	16,810	14.3	336	1.8	6.7	29.4	7.1	198	2,522
**52. Spinach	1 lb.	8.1	4,592	1.1	106	—	218.4	5.7	13.8	33	2,755
**53. Sweet Potatoes	1 lb.	5.1	7,649	9.6	138	2.7	290.7	8.4	5.4	83	1,912
54. Peaches (can)	No. 2½	16.8	4,894	3.7	20	.4	21.5	.5	1.0	31	196
55. Pears (can)	No. 2½	20.4	4,030	3.0	8	.3	.8	.8	.8	5	81
56. Pineapple (can)	No. 2½	21.5	3,993	2.4	16	.4	2.0	2.8	.8	7	399
57. Asparagus (can)	No. 2	27.7	1,945	.4	33	.9	16.3	1.4	2.1	17	272
58. Green Beans (can)	No. 2	10.0	5,386	1.0	54	.4	53.9	1.6	4.3	32	431
59. Pork and Beans (can)	16 oz.	7.1	6,389	7.5	364	4.0	9.5	8.3	7.7	56	—
60. Corn (can)	No. 2	10.4	5,452	5.2	136	—	12.0	1.6	2.7	42	218
61. Peas (can)	No. 2	13.8	4,109	2.3	136	.2	34.9	4.0	2.5	37	370
62. Tomatoes (can)	No. 2	8.6	3,917	1.3	63	.7	53.2	3.5	2.4	36	1,253
*63. Tomato Soup (can)	10½ oz.	7.6	2,889	1.6	71	.6	57.9	3.5	4.3	67	862
*64. Peaches, Dried	1 lb.	15.7	3,889	8.5	87	1.7	86.8	1.2	4.3	55	57
*65. Prunes, Dried	1 lb.	9.0	4,284	12.8	99	2.5	85.7	3.9	4.3	65	257
66. Raisins, Dried	15 oz.	9.4	4,524	13.5	104	2.5	4.5	6.3	1.4	24	136
67. Peas, Dried	1 lb.	7.9	5,742	20.0	1,367	4.2	2.9	28.7	18.4	162	—
**68. Lima Beans, Dried	1 lb.	8.9	5,097	17.4	1,055	3.7	5.1	26.9	38.2	93	—
**69. Navy Beans, Dried	1 lb.	5.9	5,688	26.9	1,691	11.4	—	38.4	24.6	217	—
70. Coffee	1 lb.	22.4	2,025	—	—	—	—	—	—	50	—
71. Tea	¼ lb.	17.4	652	—	—	—	—	—	—	42	—
72. Cocoa	8 oz.	8.6	2,687	8.7	237	3.0	—	—	2.0	40	—
73. Chocolate	8 oz.	16.2	1,400	8.0	77	1.3	72	.9	3.4	14	—
74. Sugar	10 lb.	51.7	8,773	34.9	—	—	—	—	—	—	—
75. Corn Sirup	24 oz.	13.6	4,966	14.7	—	—	74	—	—	5	—
76. Molasses	18 oz.	13.6	9,752	9.0	11	10.3	244	1.9	7.5	146	—
77. Strawberry Preserves	1 lb.	20.5	2,213	6.4	11	.4	7	.2	.4	8	—

* Quantities including inedible portions.

TABLE B. NUTRITIVE VALUES OF COMMON FOODS PER DOLLAR OF EXPENDITURE, AUGUST 15, 1944

Commodity	Price Aug. 15, 1944 (cents)	Calories (1,000)	Protein (grams)	Calcium (grams)	Iron (mg.)	Vitamin A (1,000 I.U.)	Thiamine (mg.)	Riboflavin (mg.)	Niacin (mg.)	Ascorbic Acid (mg.)
1. Wheat Flour	64.6	24.9	786	1.1	203	—	30.9	18.6	246	—
3. Wheat Cereal	23.2	12.3	398	15.0	183	—	15.0	9.2	119	—
5. Corn Meal	6.3	26.3	655	1.2	72	—	12.7	5.8	77	—
8. Rolled Oats	9.9	18.1	651	3.7	245	—	26.6	6.4	46	—
15. Evaporated Milk	10.0	5.6	283	10.1	6	22.6	2.0	15.7	7	40
46. Cabbage	4.9	2.0	94	3.0	27	17.4	6.8	3.4	20	4,054
51. Potatoes	80.1	6.1	143	.8	50	5.4	12.5	3.0	84	1,071
52. Spinach	11.6	.8	74	—	96	2.8	4.0	9.6	23	1,924
53. Sweet Potatoes	12.3	4.0	57	1.1	22	641.3	3.5	2.2	34	793
69. Navy Beans	10.8	14.7	924	6.2	433	120.5	21.0	13.4	119	—
74. Sugar	67.0	26.9	—	—	—	—	—	—	—	—
78. Pancake Flour[1]	12.2	16.0	479	18.1	46	—	3.7	1.9	41	—
79. Beets[2]	7.3	9.2	85	1.1	70	132.3	2.9	6.3	29	895
80. Liver (Pork)[3]	21.9	2.7	408	.2	518	145.0	10.4	51.8	472	590

[1] Unit: 20 oz.; edible weight: 4,647 g.   [2] Unit: 1 bunch; edible weight: 4,971 g.   [3] Unit: 1 lb.; edible weight: 2,071 g.

and indeed they *can* be known only roughly. A large margin of uncertainty arises on several scores:

1. Many nutritive values have not been established quantitatively, or have been determined by obsolete and inaccurate techniques, or the determinations have large standard errors. Beef flank is known to contain the B complex, but the quantities are unknown. Vitamin A is measured by the rate of growth of rats, with standard errors averaging 10 or 15 percent of the mean values.
2. Most foods are not even approximately homogeneous, and wide ranges of nutritive values are found. For example, the milligrams of ascorbic acid in 100 grams of apples varies as follows with variety:[8]

Jonathan	4.4
McIntosh	2.0
Northern Spy	11.0
Ontario	20.8
Winesap	5.8
Winter Banana	6.6

   Again, the ascorbic acid in milk varies with the season.
3. The maturity of the product, the length and conditions of storage, temperature, and similar factors are important. The ascorbic acid decreases with the maturing of corn, but the vitamin A content increases. Vitamin A, thiamine, and ascorbic acid are often lost during storage.
4. Even when the nutritive values of the food are known, they are much affected by the way the food is prepared. Well-done rib roasts of beef have 69 percent of the thiamine, 77 percent of the riboflavin, and 79 percent of the niacin present in the raw cuts. Cabbage has a high ascorbic acid content, but if it is boiled for several hours and the liquid discarded, virtually none of the vitamin survives. On the other hand the vitamin A in turnip greens is increased by cooking.
5. The proportion of food wasted is an additional unknown in the evaluation of ordinary diets.[9]
6. The nutrients in foods cannot be wholly extracted. Spinach contains much calcium but it is not nutritionally available because of the presence of oxalic acid.

Enough difficulties have been indicated to suggest the almost infinite complexity of a refined and accurate assessment of nutritive value of a diet.

---

[8] On this and subsequent points, see L. E. Booher, E. R. Hartzler, and E. M. Hewston, *A Compilation of the Vitamin Values of Foods in Relation to Processing and Other Variants*, Department of Agriculture, Circular 638 (May 1942); and G. Adams and S. L. Smith, *The Vitamin Content and the Preservation of Foods*, Department of Agriculture, Miscell. Public. No. 536 (1944).

[9] Another difficulty that may be mentioned in this connection is the variation in the quantity of food received for a given price, as when oranges are purchased by the dozen and celery by the stalk.

In the subsequent work, I use C. Chatfield and G. Adams' *Proximate Composition of American Food Materials* for estimates of inedible refuse, calories, and protein.[10] The data on minerals and vitamins are from the unusually complete summary by A. D. Bowes and C. F. Church, *Food Values of Portions Commonly Used.*[11] In light of the foregoing remarks it should not be necessary to belabor the tentativeness of the figures.

The average nutritive values used are those of the foods as purchased. The losses due to waste and faulty preparation are ignored, as in most diet appraisals,[12] in part for the common reason that virtually nothing is known about the extent of these losses. But there is also the reason that these losses are largely avoidable, and a person who wished to minimize the cost of his food could reduce them to inappreciable amounts.

Methodology

The first step is to select a list of potential commodities; obviously the wider this list the lower the cost of the "adequate" diet will probably be. The list here chosen consists of the commodities for which retail prices are reported by the Bureau of Labor Statistics.[13] The list is reproduced in Table A, along with the nutritive values of one dollar's expenditures on each commodity.

The BLS list is a short one, and it excludes almost all fresh fruits, nuts, many cheap vegetables rich in nutrients, and fresh fish. It is beyond question that with a fuller list the minimum cost of meeting the National Research Council's allowances could be reduced, possibly by a substantial amount.[14]

Since the prices are averages of many (large) cities, the minimum cost diet will in principle be affected by seasonal price patterns and should be computed separately for each month. This effect will not prove to be great because seasonal foods play little

---

[10] Department of Agriculture, Circular 549, June 1940.

[11] Privately printed, Philadelphia (5th ed., 1944).

[12] *Diets of Families of Employed Wage Earners and Clerical Workers in Cities,* Department of Agriculture, Circular 507, January 1939; *Family Food Consumption and Dietary Levels,* Department of Agriculture, Miscellaneous Publication 405, 1941.

[13] The commodities are described in *Retail Prices of Food,* 1923–36, Bureau of Labor Statistics, Bulletin 635, October 1937. The price quotations are averages of 51 large cities in 1939 and 56 cities in 1944; they were taken from the *Monthly Labor Review,* October 1939 and December 1944.

[14] A physiological chemist to whom I showed the diets recommended in turn a mixture he fed to rats, which would (in 1945) cost a man about $27 a year.

part in the minimum cost diet.[15] It may be noted also that since the prices are averages, they overstate the cost for a representative city because a food with lower-than-average price can be exploited and a food with higher-than-average price curtailed.

As a first step in finding the minimum cost diet, one may exclude any commodity all of whose nutritive values (per dollar of expenditure) are less than those of some other commodity. This procedure is carried a trifle farther in practice, by excluding also a commodity which is definitely inferior to another in its important nutrients and only slightly superior in others. For example, white bread (commodity no. 9) has less than half the nutrients (per dollar) of white flour (commodity no. 1) except for calcium, for which neither commodity is an economical source. This preliminary weeding reduces the list of eligible foods from 77 to 15, and excludes all meats except liver, all sugars, beverages, and patented cereals. The survivors are starred in Table A.

Thereafter the procedure is experimental because there does not appear to be any direct method of finding the minimum of a linear function subject to linear conditions. By making linear combinations of various commodities it is possible to construct a composite commodity which is superior in all respects to some survivor, and by this process the list of eligible commodities can be reduced at least to 9 (which are double starred in Table A). The nutritive values of each of these commodities is then expressed in terms of days' supply of requirements. Various combinations of commodities were used to fulfill certain nutrient requirements,[16] and the one finally chosen is presented in Section 4. There is no reason to believe that the cheapest combination was found, for only a handful of the 510 possible combinations of commodities were examined.[17] On the other hand the annual cost could not have been reduced by more than a few dollars by a better selection from these commodities.[18]

---

[15] Although it is possible that if the diets had been constructed with prices for some other month, other foods would have been chosen.

[16] An excess of calories is objectionable, but there is no reason to expect ill effects of moderately excessive intakes of the other nutrients. In the test of various combinations of foods, those nutrients (in addition to calories) which would, if fulfilled, necessarily imply fulfillment of other nutrient conditions were used in the algebraic solution.

[17] As a matter of fact, each of these combinations will have a different cost with each set of linear (nutrient) conditions, and there are many such nutrient conditions because excesses are in general unobjectionable.

[18] The nutrient with the highest cost (when secured from its most economical

The derivation of the minimum cost budget for 1944 follows the same procedure.[19] The surviving commodities surviving the first test are reproduced in Table B.[20] Because of computational limitations, fewer trial combinations were investigated but again no large reduction in cost is possible by further search.

It should be added that the content of a diet can be altered substantially without affecting its cost appreciably. In the process of finding the 1939 minimum cost budget several alternative budgets of only slightly higher costs were found among the most preferable commodities.[21] It also appears reasonable to suppose that the number of commodities could be increased materially without increasing much the cost of the diet, although the laborious calculations necessary to illustrate this were not undertaken.

The Minimum Cost Diets

The minimum cost diets for August 1939 and August 1944 are given in Table 2, and their nutritive values are compared with the National Research Council's allowances in Table 3. Consideration

TABLE 2. MINIMUM COST ANNUAL DIETS, AUGUST 1939 AND 1944

Commodity	August 1939		August 1944	
	Quantity	Cost	Quantity	Cost
Wheat Flour	370 lb.	$13.33	535 lb.	$34.53
Evaporated Milk	57 cans	3.84	—	—
Cabbage	111 lb.	4.11	107 lb.	5.23
Spinach	23 lb.	1.85	13 lb.	1.56
Dried Navy Beans	285 lb.	16.80	—	—
Pancake Flour	—	—	134 lb.	13.08
Pork Liver	—	—	25 lb.	5.48
Total Cost		$39.93		$59.88

source) is calories; it would require $24.50 to supply for a year the calories from flour (commodity no. 1). But then only 61 days' calcium would be provided, and the most efficient source (cheese, no. 19) could meet the deficiency only at a cost of $14.90, and the contribution to calories would be relatively small. The requirements for vitamin A and ascorbic acid would still be unfilled. Use of other commodities for calories yields a similar conclusion.

[19] The corresponding table of nutritive values can of course be secured simply by multiplying the entries in Table A by the ratio of 1939 to 1944 prices.

[20] It will be observed that three new commodities are added to the list. The BLS abandoned price quotations on 19 commodities in Table A (including one starred commodity, dried lima beans), and 12 new commodities were examined in making Table B.

[21] The minimum cost diet for 1939, which differs greatly from that for 1944, would have cost only 13 percent more than the latter in 1944.

of the lists in Table 2 will suggest reasons in addition to those given in the preceding sections for not recommending the diets.

The cost of the minimum cost diet rose exactly 50 percent from 1939 to 1944; the cost of food in the BLS index of retail prices of food rose 47 percent in the same period. The fact that the minimum cost diet, with its variable composition, increased slightly more than the (relatively) fixed-composition index of the BLS, is indicative of the fact (which the detailed data confirm) that the more efficient food sources rose relatively more in price.

TABLE 3. ADEQUACY OF MINIMUM COST DIETS, AUGUST 1939 AND 1944

Nutrient	Percent of Year's Allowance*	
	August 1939	August 1944
Calories	100	100
Protein	194	141
Calcium	100	100
Iron	425	245
Vitamin A	100	100
Thiamine	220	185
Riboflavin	100	100
Niacin	148	179
Ascorbic Acid	100	100

* The allowances are given in Table 1.

In this connection it is interesting to notice that the quantity of wheat flour is increased substantially between the two dates, although its price rose more than other eligible cereals. This is an artificial example of the Giffen paradox, that

a rise in the price of bread makes so large a drain on the resources of the poorer labouring families and raises so much the marginal utility of money to them, that they are forced to curtail their consumption of meat and the more expensive farinaceous foods; . . . .[22]

The purpose of the determination of the minimum cost diet will be explained in the next section, but in the light of comments of friends a few remarks (which are really a digression) may be added here. It is usually objected that relative prices would change if the commodities in Table 2 became the sole objects of demand. No one recommends these diets for anyone, let alone everyone; it would be the height of absurdity to practice extreme economy at the dinner table in order to have an excess of housing or recreation or

[22] Marshall, A., *Principles of Economics* (8th ed.), p. 132.

leisure. Waiving this point, all dietary studies accept the prices paid by consumers since these are the conditions of purchase which face the individual buyer. Moreover, any sensible system of prices will lead to similar results. If a society were so misguided as to adopt a minimum diet, it cannot be doubted that the prices of the commodities would fall once agriculture, transportation, food processing, and distributive industries were readjusted to this reduced task.

Comparison with Other Diets

It would no doubt be possible to cull from the literature a very large number of absurd estimates of the minimum cost of subsistence. Instead, I shall list a few restrained estimates by competent dieticians:

1. In 1936 Carpenter and Stiebeling described a minimum cost diet which "gives the cheapest combination of foods that it is desirable to use for an indefinite period," which cost (in 1935) about $125 a person.[23] (It would have cost about $100 in 1939.) A restricted diet for emergency use was also given; it cost $83 in 1935.

2. In 1939 Stiebeling and Clark estimated the cost of an "economical fair diet," as they unenthusiastically described it, at $78 to $104 per person in villages and cities. If the recommended classes of commodities are chosen from the BLS list, the 1939 cost would be about $94 and the 1944 cost about $138. This was explicitly stated not to be a minimum diet, but it was implied that much less was not tolerable.[24]

3. M. S. Rose presented an unqualifiedly minimum diet which would have cost about $115 in 1939.[25]

These low-cost diets of the professional dieticians thus cost about two or three times as much as a minimum cost diet.

Why do these conventional diets cost so much? The answer is evident from their composition. The dieticians take account of the palatability of foods, variety of diet, prestige of various foods, and other cultural facets of consumption. Primarily on such grounds

---

[23] *Diets to Fit the Family Income*, Department of Agriculture, Farmer's Bulletin No. 1757 (1936), p. 10.

[24] *Yearbook of Agriculture*, 1939, p. 333: The diet is for families "in straightened circumstances"; it covers "average minimum requirements but does not afford as wide a margin of safety as desirable. . . . "

[25] *Foundations of Nutrition* (1935), p. 472.

can one explain their emphasis on meats and the inclusion of sugar.[26]

There are two fundamental objections to so merging the physio-logical and the cultural components of diet. The first is that the particular judgments of the dieticians as to minimum palatability, variety, and prestige are at present highly personal and non-scientific, and should not be presented in the guise of being parts of a scientifically-determined budget. The second reason is that these cultural judgments, while they appear modest enough to government employees and even to college professors, can never be valid in such a general form. No one can now say with any certainty what the cultural requirements of a particular person may be, and on its face it will always be impossible to determine a unique cultural minimum diet for 140 million Americans of transcendental variety of background, social position, and cultural values. If the dieticians persist in presenting minimum diets, they should at least report separately the physical and cultural components of these diets.

---

[26] Tax-supported bureaucrats and professors may also have another reason for certain of their practices.