TRENDS IN FAT DISAPPEARANCE IN THE UNITED STATES 1909-65

by

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In recent years there has been a great deal of interest in the level of fat consumption in the United States. Producers and manufacturers of food products have witnessed substantial shifts in consumer preferences for several foods which are major contributors to total dietary fat. In addition a number of scientific papers have examined the changing American diet with special reference to fat (1–5). Most of these investigations have indicated that there has been a significant increase in fat consumption and some important shifts in the consumption of various types of fat. In these studies three types of information have been used to measure changes in fat consumption over time. These are: disappearance or balance sheet data (1–4), nationwide survey data (2, 3, 5) and small-group studies (2, 4, 5).

These three types of data differ widely in their approach to the problem of how to assess what people have eaten. The disappearance technique assumes that food produced and available at retail is the same as food consumption. This method makes no allowance for waste between retail and ingestion. In addition it makes no distinction between individuals, households, restaurants or institutions since all food is converted to retail equivalents. The nationwide surveys (for example, 1942, 1955 and 1965) approach the problem from the viewpoint that what households eat is indicative of the society as a whole. In these surveys homemakers are interviewed using a check-list and asked to recall what foods were used in the 7 days preceding the interview. The use of small-group studies in attempts to assess historical changes in dietary patterns is based on the premise that the groups chosen represent the population as a whole. Unfortunately intensive studies have never been made on small groups selected at random to represent the United States as a whole. Therefore, it is extremely difficult to relate these small-group studies to the national situation.

In the present report, emphasis is placed on the disappearance data because of their widespread use in assessing changes in food consumption patterns. Throughout the discussion which follows, the data represent nationwide averages for the population as a whole. At no point do they take into consideration any population characteristics such as age structure, urbanization, family size, sex and so forth nor do they make any allowances for uneven distribution of food or loss of food after it is sold at retail. The disappearance method labels as food everything that cannot be accounted for in some other way including miscellaneous non-food use, stock changes at retail or consumer level and the sum of all statistical and measurement errors. Minor items may be omitted because of lack of data. These limitations are more fully detailed in the most recent United States Department of Agriculture (USDA) publication of the disappearance data (19).

The objectives of the investigation were:

1 To explore briefly the development of the food disappearance data published by the USDA with special attention to changes in methodology.
2 To describe the trends in the disappearance of total fat, fatty acids and various components using the disappearance data.
3 To explore the adequacy of these measures of fat disappearance with respect to their accuracy and to their suitability as a measure of actual fat consumption.

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4 To assemble in one place pertinent information on fat disappearance to facilitate further investigation.

Development of disappearance data

Information on the disappearance of food in the United States is published regularly by the Economic Research Service of the USDA. This information is gathered for individual commodites primarily through the USDA's Statistical Reporting Service. The annual data are subject to revision in order to conform with the Census of Agriculture and the Census of Manufacturing. It is compiled by adding imports and supplies at the beginning of the year to the basic production figures and subtracting exports, stocks at the end of the year, military, and non-food uses. The resultant figure, the total amount that disappeared into food channels, is multiplied by a constant to convert it to retail weight equivalents, thus putting all foods on the same basis in the marketing process. The retail weight equivalent is divided by the July 1 population estimate for the year to give per capita domestic disappearance for the particular commodity. This statistic is usually labeled *food consumption,* but it should be termed *food disappearance* as it makes no allowances for any events happening to the food after it leaves the retail market.

The mislabeling of disappearance data highlights the fact that these statistics were developed by economists primarily for use by economists. To the economist, disappearance at retail and consumption are synonymous. The retail level is the last pricing point and the economist is interested in the price and quantity movement at this stage. Whether the product is actually eaten is of little consequence. Of course, the nutritionist views the problem from a different perspective, equating consumption with food ingestion rather than with retail sales. Therefore, the nutritionist is forced to use the disappearance data as an indicator of what he terms consumption. The most recent publication in this series (19) for the first time points out clearly the inadequacies of the disappearance data.

Food disappearance data for the United States were first published in 1920 by Pearl (6). Sporadic reports appeared between 1920 and 1940 (7–12), but most of them were limited to specific groupings of foods rather than being reports of overall food disappearance. The major exception was a report published in 1930 by Montgomery and Kardell (9) of the Foodstuffs Division of the Department of Commerce. This report was a compilation of all existing historical data on food availability. In 1941 the USDA issued its first report of per capita food disappearance (13). The report covered the period from 1909 to 1939 and was intended to be used as background material to estimate food availability and need in World War II. Since 1942 the USDA has published quarterly and annual estimates of per capita disappearance of major foodstuffs (14). In 1944 the USDA issued a brief statement of the nutritive value of the per capita food supply from 1920 to 1943 (15). This was the first effort in reporting nutritive values. In 1946 the series was extended back to 1909 (16). In 1949 disappearance data were issued in more detail, covering total poundage, per capita poundage and nutritive value (17). Major revisions of the 1949 data have been issued in 1953 (18) and 1965 (19). A chronological listing of the USDA publications dealing with the development of the disappearance data is included in the Appendix.[1]

Space does not allow a detailed examination of the many changes that have been made in the methods of compiling this information. The Appendix includes a chart showing major changes for the fats and oils group which is indicative of the data as a whole. Over the years, however, particularly since the 1940's the data have become more accurate. Although the quoted series began with 1909, it is obvious that the data for the early years, 1909 to 1924, were clearly estimates (19). In general, those figures which can be traced directly to the production of major agricultural commodities, for example, wheat and po-

[1] The preceding discussion and the table in the Appendix cite only those publications that are clearly comprehensive redevelopments of or supplements to disappearance data or that include relatively detailed explanatory material as to methodology and sources of data. Much discussion of assessing food consumption occurred in the 1930's and other data were published but if they are not cited it is because they are not disappearance data or they do not have either a discussion of methodology published with the data or detailed data with a discussion of methodology.

tatoes, portray disappearance most accurately throughout the series. In the early years major problems were encountered with commodities that were more highly processed. Data for dairy products and meat for the 1909–1924 period are particularly questioned (19–20). The data for total fats and oils are even more subject to error. There is a high degree of interchangeability between products in this group, for example, lard and shortening, and the method of reporting was not developed sufficiently to account accurately for the actual end-use of many of these products until after World War II. Also, it was not until the post-war years that the problem of accounting for edible fats and oils which moved into industrial uses was finally resolved. More attention will be given to the fats and oils group later.

In summary, it should be recognized that the development of a coordinated, inclusive program of reporting on food disappearance has occurred only in the last 25 years. The data available for the years before 1941 are derived from secondary information and involved considerably more estimation than the data since 1941. The data available before 1941 are considered to be useful in describing general changes in per capita disappearance of various types of food. It is usually assumed that the more food products are combined the more accurately these data describe the general situation. Serious questions can be raised as to their adequacy with respect to any given food product in any given year. Even more important, for the purposes of this paper, it should be recognized that the estimates of fat disappearance are most subject to question. It is only in more recent years when more interest has been expressed in fat consumption that major efforts to improve the estimates have been made, particularly for the fats and oils category. In many cases when improved methods of estimation were adopted it was not possible to adjust previous estimates. In other words this 1909–1965 time-series might more accurately be labeled a collection of a number of time-series.

Methodology

To facilitate a detailed analysis of fat disappearance, the USDA's series on grams of fat per capita per day was reconstructed. The fat content of all major and minor sources of fat were calculated to allow study of individual series of fat. These were then added together to produce the total grams of fat per capita per year. Those foods which contribute negligible amounts of fat, such as grain products, vegetables and fruits, were not included. The 1965 revision of the disappearance data (19) was the basic source of information on disappearance of individual food products for 1909 to 1963. Primary distribution data for 1964 and 1965 were taken from the November 1965 National Food Situation (21) and converted to retail weight equivalent, using the conversion factors developed by the USDA (19). Grams of fat per person per day were computed by multiplying the pounds per capita per year of a particular food by a constant factor. The constant was calculated by taking the grams of fat in a pound of food and dividing by 365. For example, the constant for pork was 0.273 or 99.8 grams fat per pound of pork divided by 365. Weighted composites were used for foods grouped together in the disappearance data.

The 1965 revision of USDA Handbook no. 8 (22) was used to obtain the grams of fat per pound with the exception of the factor for total milk and milk products. Items were selected that best conformed to those used by the USDA in their calculations of nutritive value of disappearance data. It was difficult to obtain agreement between the sum of components of milk and milk products and the USDA percentage of total fat assigned to milk and milk products due to difficulties in determining appropriate factors and repetition of fat content in various components of milk products. Therefore, the total for milk and milk products was computed by substracting the fat from butter from the total milk fat given.

Because fat from grain products, vegetables and fruits was not included in the calculations, the total grams of fat per capita per day computed by adding the components is not directly comparable to the USDA figure for total grams of fat. Over the time-period studied, the total of the calculated components averaged 8 g

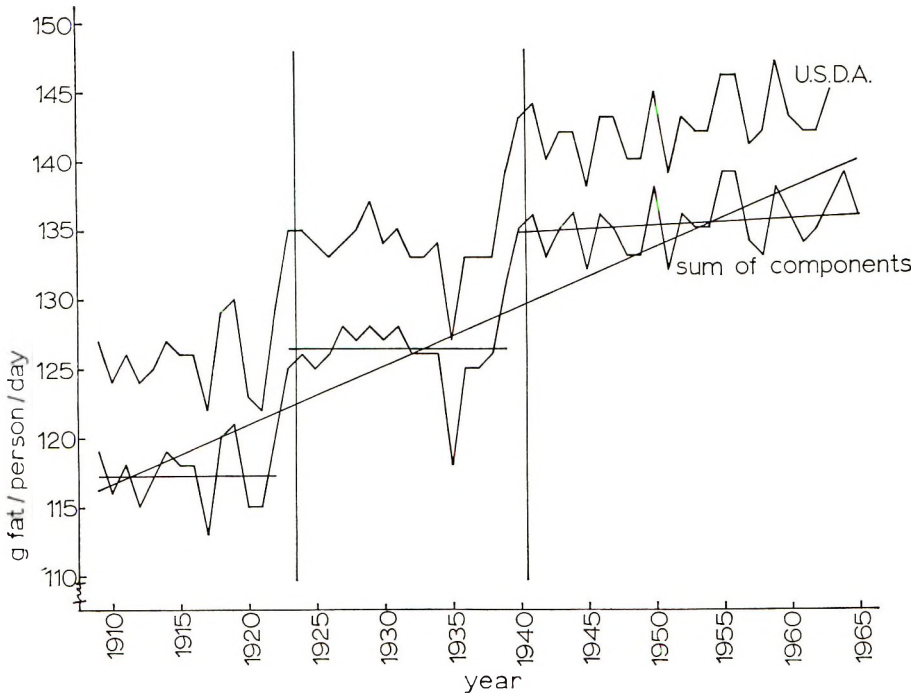

Fig. 1 Fat disappearance in the United States — grams of fat per person per day from sum of components and U. S. Department of Agriculture Statistical Bulletin 364; total fat series from 1909 to 1965.

(6–10 g) less than the USDA figure (see fig. 1). Since the analysis is concerned primarily with trends and changes in the make-up of the total fat figure the difference was not judged to be significant enough to warrant a detailed examination of the minor sources.

The material relating to specific oils and the fatty acid content of foods was taken from USDA Statistical Bulletin no. 376 (23). The fatty acid content of oils not covered by the USDA publication was derived from Bailey (24). The fatty acid content of margarine and shortening was determined from the basic oils used in manufacturing them in a given year. The saturated fatty acid and oleic acid content of these compounds was added to that given for all other foods. The polyunsaturated fatty acid component was tabulated separately and reported both as part of the total polyunsaturated fats and as polyunsaturated fats subject to hydrogenation. The polyunsaturated fatty acids from foods other than margarine and shortening was assumed not to have been hydrogenated and is reported as polyunsaturated fat not subjected to hydrogenation.

Fat disappearance

Total fat. The year-by-year plotting of total fat as shown in figure 1 indicates two important characteristics about total fat disappearance: first, the wide variability from year to year and second, the existence of what can be described as three plateaus, from 1909 to 1921, 1923 to 1939 and 1940 to 1965. A regression computed from 1909 to 1965 corrected for auto-correlation shows a significant change over time of about 0.4 g fat per person per day per year. However, as shown in figure 1, the regression line does not appear to fit the data as well as might three regressions: one drawn between 1909 and 1922, the second between 1924 and 1939 and the third from 1940 to 1965. In this and succeeding figures vertical lines have been drawn to designate breaks between the plateaus. The first two of these regressions are not

statistically significant, but the third regression is significant at the 95% level. This regression indicates an increase in the average daily disappearance of about 2.5 g during the last 26 years. The regression equations are included in the Appendix. Very recently the USDA has revised the preliminary 1965 data that were used throughout the present analysis. If the revised figure, which is lower than the preliminary 1965 estimate, is used to calculate the 1940–1965 regression, it is no longer significant at the 95% level.

Fat-containing foods or food groups. To facilitate discussion of trends in fat disappearance by components, foods were grouped in two ways: by food use and by major contributors of fat. When grouped in terms of food use (fig. 2), the fats and oils group shows wide variability but little evidence of a major trend since 1924. A downward trend in fat from meat, fish and poultry was reversed in 1940. The trend for fat from dairy products tends to counteract the trend in meats, a gradual rising to 1940, sharply up to a peak in 1945 and down since that time.

Figure 3 shows trends in grams of fat per person per day in foods which have contributed at least 5% of the fat in any given year. These foods account for over 85% of the fat recorded for any time-period by the USDA. Lean and fat pork have been placed in a single category because the USDA estimates production of bacon and salt pork as a constant percentage of total pork production. (Also it is assumed that bacon and salt pork are produced in a 3-to-1 ratio.) Several of the trends in fat disappearance by food products are noteworthy. To a certain extent since 1940, fat from beef has offset the decrease in availability of fat from pork. The upward trend in dairy products before World War II, and the downward trend since 1946 shown in figure 2 are basically due to dairy products other than fluid whole milk. The effect of fluid whole milk has been to emphasize the upswing associated with the war and augment the downward trend since then. Since 1940 the sharp decrease in fat from butter and lard has been offset by the increase in shortening, margarine and other fats and oils. The trend line for the fats and oils group also shows a downward trend in animal sources (butter, lard) and an upward trend in hydrogenated fats (shortening,

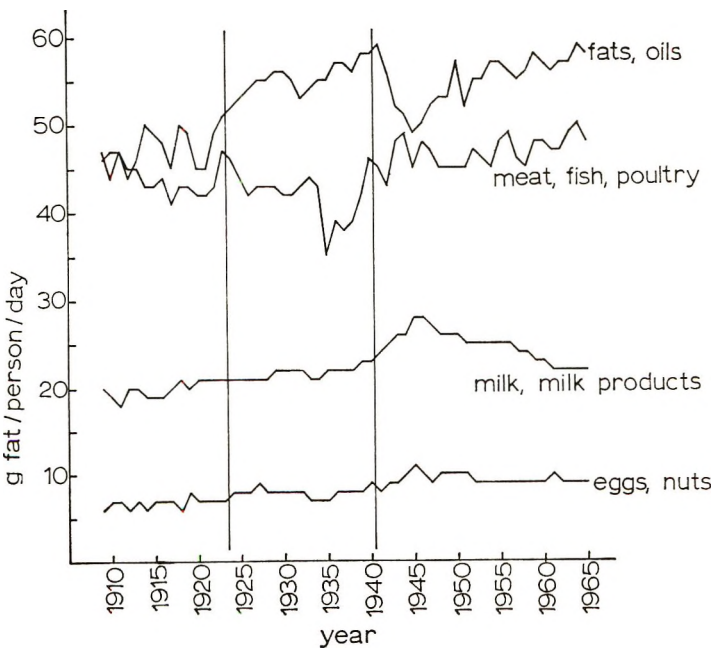

Fig. 2 Fat disappearance — contribution by major components, 1909 to 1965.

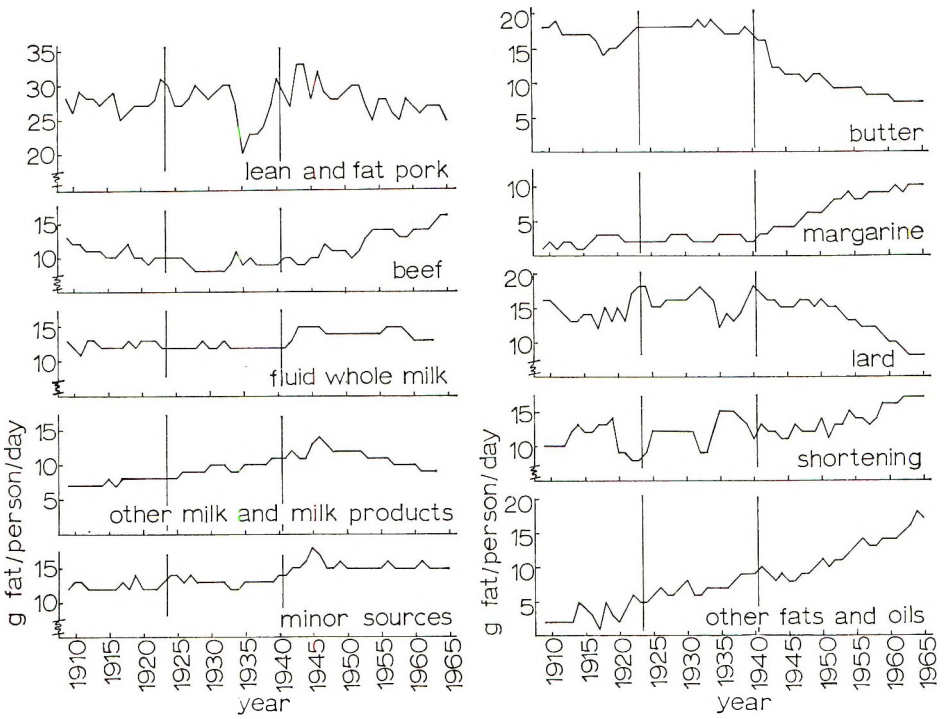

Fig. 3 Fat disappearance — grams of fat per person per day from foods contributing more than 5% of total grams of fat from 1909 to 1965. Other fats and oils are principally cottonseed, soybean and other plant sources. Minor sources include eggs, nuts, fish, shellfish, poultry, veal, lamb and mutton, edible offal and game.

margarine) and other fats and oils (predominantly vegetable oils). These trends are particularly apparent since 1940.

The fats and oils group. Because of the importance of the fats and oils group in the make-up of total dietary fat, it is worthwhile to examine changes in the make-up of this group in more detail. The percentage contribution of three components of this group based on source of fat are shown in figure 4. The animal fat sources have declined steadily from before 1924, when they made up about 65% of the group, to the present, 1965, when they contributed 25%. The hydrogenated sources, shortening and margarine, varied widely before 1940 and have increased their share of the group steadily since that time and have become the most important component, contributing 46% of the total in 1965. The "other fats and oils" component has become more important throughout the series, increasing from about 7% of the group before 1924 to 29% in 1965.

With these rather marked changes in the make-up of the fats and oils group, it is highly likely there have been some important shifts in the way fats are used. In figure 5 the fats and oils group is examined to indicate the share attributable to three components based on usage; cooking fats (lard and shortening), table spreads (butter and margarine), and cooking and salad oils (other edible fats and oils). Although the share contributed by table spreads has been relatively constant since 1940, the cooking and salad oils have increased their share at the expense of the cooking fats. This indicates that cooking oils have been increasingly substituted for cooking fats since 1940.

Discussion of analysis of fat disappearance

Year-to-year variability. In examining the data on total fat disappearance, the relatively sharp year-to-year variations in disappearance are apparent. The change

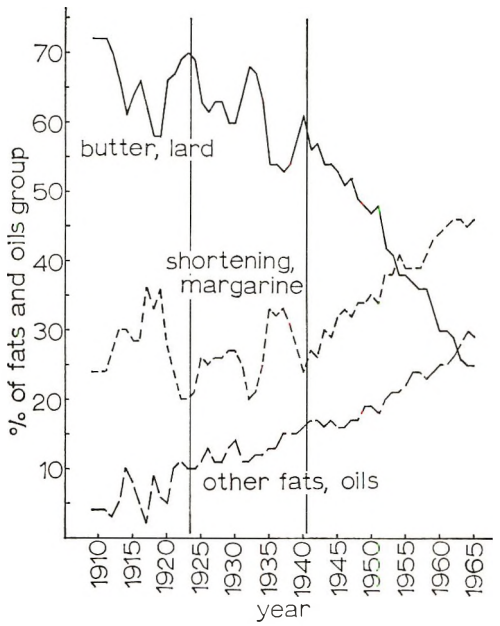

Fig. 4 Fat disappearance — percentage of fats and oils group contributed by animal, vegetable, or other fats and oils (principally cottonseed, soybean and other plant sources) by sources of these fats from 1909 to 1965.

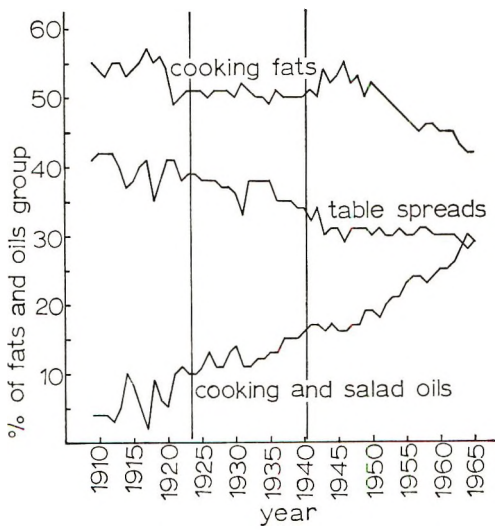

Fig. 5 Fat disappearance — percentage of fats and oils group contributed by fats grouped according to general use, 1909 to 1965. Other fats and oils are principally cottonseed, soybean and other plant sources.

can be as much as 7 g per capita per day between one year and the next, as occured between 1934 and 1935 in both pork and total grams of fat per person per day. The graphs indicate that these extremes were usually reversed within the next few years, or were components of apparent long-term trends. The exceptions to the general statement of reversibility are the two abrupt changes in the total grams of fat per person per day occurring between 1921 and 1923 and between 1938 and 1940. The year-to-year variations are usually a direct result of variations in agricultural production and are seldom, if ever, traceable to a shift in eating habits. During 1941 to 1946 some drastic changes are traceable to rationing and other direct government actions.

Because of the inherent variability of the data it is possible to make significant misinterpretations depending on the method used to smooth out the variability. For example, it may be very misleading to compare a low year such as 1948 with a high year such as 1955 (25), as is often done because of the nationwide surveys (26, 27) taken during these years. Although these surveys are an independent measure of fat disappearance, they will reflect the level of fat available to the public in the year of the survey as measured by disappearance techniques. Methods used in previous detailed discussions of the nutritive value of disappearance data to smooth out the variability have been simple 5-year averages (28), three years averaged around every tenth year (29), averages of years at selected intervals (2), and selected single years (1, 3, 4). Of the potential methods available to smooth out year-to-year variation, a 5-year moving average indicates best the true long-term nature of the year-by-year calculations but has not been used in any discussion of nutritive values.

Plateaus in fat disappearance. The presence of plateaus in total grams of fat per person per day does not coincide with expected behavior. It is not expected that a total population will permanently change its collective fat intake by 7% in 2 years when the inherent statistical variability in the data is less than 1% a year. The fact is that other than the two sharp rises in

1921–23 and 1938–40 the trend line is almost flat.

There appear to be several ways in which the plateaus might be explained. First, there could be an abrupt increase in the disappearance of a major source of fat which is not compensated for by a subsequent decrease; in other words, a rapid increase in the disappearance of some item which holds the new level without causing a decrease in some other item. This type of move from one plateau to another would reflect a true increase in fat disappearance. Second, there could have been a change in the method of compiling the data on a major source of fat. This would assume that the new statistics would more closely reflect the actual situation. If changes of this nature involved a revision of the previous information to reflect the new method, it moderates the impact. Third, it is possible for a generalized change in compilation of the statistics to bring about increased accuracy and an upward shift. Again this would assume inaccurate, unrevised data for the previous period. The latter two methods assume that the change from one plateau to another is a result of statistical methodology rather than a true increase.

Increase in a major source of fat. A re-examination of the variability in the major contributors of fat indicates that the disappearance of both butter and lard increased rapidly between 1921 and 1923, and that lean and fat pork showed a large increase between 1938 and 1940. However, for both butter in 1921 to 1923 and pork in 1938 to 1940 the abrupt increase was partly due to low values in the preceding three to four years. If the trend before and after these extremes is averaged, the average reported fat disappearance for butter from 1909 to 1916 was 18 g, whereas the average for 1923 to 1934 was also 18 g. The increase in fat contributed by lard between 1921 and 1923 was 5 g. If the average of 1909 to 1920 is compared with the average from 1924 to 1934 it indicates an increase of 2 g, that is, from 14 g to 16 g. Thus, of the approximate increase of 9 g in the 1921 to 1923 period, only 2 g can be traced to a specific source. With pork, the average reported from the 1924 to 1934 period was 29 g and that for 1940 to 1946 was 30 g.

In no other instance does a single food appear to exert an effect sufficiently great to explain the observed difference in the totals. Therefore, the abrupt increase in these two periods is attributable to relatively small increases in several sources.

A change in the method of compilation. The second explanation for the plateaus in the total grams of fat per person per day could be related to a change in the method of reporting for a single food. Careful reading of the explanatory material presented with the disappearance data reveals that shortening in 1921 to 1923 and butter between 1938 and 1940 are the only major contributors of fat in which the method of calculation was changed during the critical periods. When the magnitude of fat contributed by these sources is examined, 10 and 18 g, respectively, it is apparent that no more than 1 to 2 g could possibly be attributed to the change in compilation of these fats.

A generalized change in methodology. In view of the above observations we must consider the possibility that 1921 to 1923 and 1938 to 1940 were times in which a more generalized effect was being produced because of changes affecting broader categories than one or two major contributors of fat in the diet. If we look at food groups for an indication of where the increase occurs, there is a sharp increase in the fat contribution of fats and oils. Between 1921 and 1923 this group moved from an average of 63 g for 1909 to 1921 to 71 g for 1924 to 1934 which accounts for 8 g of the 9-g difference in the average for total fat between the two periods. Although there is an increase in the fats and oils group between 1938 and 1940, it is followed by a marked decline during World War II and stabilization afterwards at the same level as the 1924 to 1934 average, 71 g for the earlier period and 72 g for the later period. Both the meats group and the dairy products group show a slight increase in the 1938 to 1940 period. However, for meats the increase is an upward swing from low values reported in 1935, and for dairy products the increase is only 1 g in a long-term gradual increase since the early 1920's. The major increase in

fat from meats and dairy products was during World War II, not during the 1938 to 1940 period.

The explanatory material given with the disappearance data indicates that the USDA does not consider the historical data on annual production before 1924 to be very satisfactory, whereas the data since then is considered reasonably adequate for most of the major food commodities (19). Data for dairy products and meat for the period from 1909 to 1924 are particularly questioned (19, 20). The relative accuracy of the total fats and oils data is not mentioned specifically before 1924 although these data appear to be the major factor involved in producing the abrupt change between the 1909 to 1921 plateau and the 1923 to 1938 plateau. However, the individual fats and oils statistics published by the USDA for the years before 1924 include no data for any oils before 1912 and some oils are omitted in some later years (23). In the discussion of individual fats and oils, however, numerous changes are noted in the method of reporting and the other fats and oils group is considered doubtful before 1931. All these changes undoubtedly led to greater accuracy in the subsequent method of reporting. It is not clear from studying the changes whether adequate revisions were made in the data for the previous years.

Changes in grams of fat from various sources indicate that the change in total grams of fat between 1921 and 1923 is due to increases in butter, lean and fat pork, lard and other fats and oils which were not offset by the slight decrease in shortening and margarine. Maintenance of the increase can be explained as an interaction between butter, lard, shortening and other fats and oils. However, because of the acknowledged inadequacies in the data before 1924 the sudden increase in fat disappearance in the 1921 to 1923 period is not felt to represent a true increase.

The explanation for the sudden increase in grams of fat reported per person per day between 1938 and 1940 is less apparent. The population base was changed between 1940 and 1941 from total population to civilian population, but with the exception of whole milk, which is consumed in much larger quantities by children than adults (30), the change in population base should have had little effect. There is no change in fluid whole milk consumption between 1940 and 1941 when the population base changed. Even if the change in population base had an effect on per capita fluid whole milk disappearance, the amount of fat in whole milk is so small that the most this increase could add to the total would be about one gram per person per day.

When Vial (12) compiled statistics on production and consumption of dairy products in 1940 he found that it was impossible to report values for fluid milk and cream because of lack of information. He states that although more comprehensive data on other milk products are available after 1918 than before, there are discrepancies in data from different sources and in some cases the data from the same source are not comparable from year to year. In 1949 the USDA reports that 1929 to 1931 was used as a benchmark to estimate milk and cream production for nonfarm use and the statistics were estimated backward and forward from that date (17). By 1952 more comprehensive data had been compiled for 1944 and largely on the basis of these data the USDA lowered its previous estimates of fluid milk consumption starting with 1924 (18). For other milk products most of the estimates for the period before 1940 are based on the study by Vial (12).

In the 1965 disappearance data, the USDA states, as it has in every publication of disappearance data, that meat data are poorest for the early years and have improved progressively in accuracy decade by decade (19). Working (20) stated in 1954 that the meat estimates from 1921 to 1941 appear to have used similar sources of data and methods. He makes no comment on the comparability of the disappearance data for meat from 1942 to 1951 with the 1921 to 1941 figures, but considering the way the post-war data are analyzed he must consider them reasonably comparable.

Although estimates of milk and milk products and meats show some indication of inexactness before 1940, probably the most vulnerable estimates, when evaluating disappearance of fat, are those for fats and

oils. Fats and oils contribute from 40 to 50% of the total fat in a year. Also this group shows an increase during the 1938 to 1940 period, whereas meats and dairy products increase after the 1940 to 1965 plateau has been established. A study of conversion factors indicates that to produce a change of one gram of fat per person per day from a fat or oil requires an 0.8 to 1.0 pound (363 to 454 g) change in pounds fat per capita per year. To produce the same one gram of fat per person per day from an item in the meats category requires a change of from 3.5 to 4.5 pounds (1.6 to 2.0 kg) per capita per year, and from fluid milk equivalent, a change of over 20 pounds (9.1 kg) per capita per year is necessary. Fats and oils have a number of non-food uses such as paint, soap and explosives, whereas milk and livestock are produced primarily for food. Fats and oils are manufactured of raw materials from many more sources than are dairy products or meats. Fats and oils are highly interchangeable; butter has been used in making margarine, lard is often used in shortening, and the high degree of substitution of hydrogenated oils is well-known. Therefore, it appears that under- or overcompensation for these duplications is a distinct possibility. Dewees (11) in 1937 had serious reservations about the data for fats and oils. She reported no estimates of other food fats and oils listing only butter, lard, oleomargarine and compounds (shortening). However, she estimated that the reported disappearance exceeded the amount used in manufactured products by an average of 738 million pounds annually, equivalent to 7 g of fat per person per day. The disappearance data published since then show most of the 7 g as "other fats and oils." However, as Dewees pointed out, the production data from which the disappearance figures for these years were derived do not include lard, tallow and grease produced on farms or by small local butcheries and meat markets. She also stated without further elaboration that the data on butter and lard were unsatisfactory. The USDA has thoroughly reviewed this area since 1937 (17, 18, 31) but where basic data are minimal subjective evaluations become increasingly necessary. The USDA does not report production of vegetable oils prior to 1931 (23) and states that for the other fats and oils category before 1931 "considerable estimation was necessary both in basic source material and by the BAE" (19). There were also a number of changes in method of estimation of fats and oils in the 1930's, thus making the continuity of the data questionable.

Given changes in methodology and incompleteness of data for individual sources of fat, the normal expectation would be either random error or, since the changes appear to take place in different years, a gradual change in the trend. Thus the question of what causes the 1938 to 1940 shift still remains. The answer appears to be in the history of the disappearance data and historical nutritional emphasis. The apparent need for adequate estimates of food availability has increased greatly since World War I. When Pearl (6) compiled the data from World War I they were primarily a matter of academic interest and the compilation was published by a private publisher, thus not becoming a part of official government publications. The Agricultural Adjustment Act of 1933 and the droughts of the mid-1930's, which threatened food shortages, made the need for accurate and more complete data more urgent (17). In World War II, when food rationing was at its peak, accurate knowledge of food availability became an absolute necessity (32). Thus, 1923 to 1924 represents the beginning of more adequate data as compared with information available before 1924. The compilation of data just prior to World War II represents the second major attempt to improve accuracy.

Not until the 1950's, however, did fat, as a specific component of the diet, receive major emphasis. In the late 1930's when the major re-evaluation of previous data was taking place, fat was important only as a source of calories. In an early analysis of nutritive value in 1946 (16) fat was not singled out for discussion as were the other nutrients. The reason for compilation and computation of nutrients was to check the adequacy of food available for consumption. The reasoning of the compilers might well have been that if the estimates were conservative and the nutrients available were ample, then the

investigator could be assured that food supplies were adequate. Under these conditions the errors would tend to produce estimates that were low. In the case of fats and oils, with relatively poor data to work with, this could easily have resulted in an under-reporting on the magnitude of 5 to 7 g fat per day (45 to 63 kcal per day) for the prewar period. After both periods of major re-evaluation the methods used in gathering data were strengthened, thus ensuring more complete reporting than was possible before. Because of food rationing during the war the compilation of fats and oils for that period was virtually complete for the first time (32), and given the recent impetus it has undoubtedly continued to be accurate since then.

The above interpretation argues that the plateau periods represent times of comparable compilation and the increases, the starting of more complete compilation. It could be argued, however, that the compilation in 1924 was virtually complete. If so, then there are two possible explanations of the trend since 1924: 1) it represents the true picture, or 2) the data from 1924 to the 1930's gradually became less accurate due to lack of interest and when the major recompilation occurred in connection with World War II the data were brought up to their 1924 accuracy. Both possibilities are doubtful prior to 1931 because of inadequate data for the fats and oils group. If the data are accurate since 1931, then the trend has been an increase in other fats and oils that was masked by the erratic movement in pork production from 1935 to 1938. By 1940 people may have become accustomed to using fat from sources other than pork and did not return to their earlier habits when pork fat became more available. However, it cannot be denied that a major re-evaluation of disappearance data took place in the late 1930's. The first publication of historical data on food disappearance by the USDA covered the period from 1909 to 1939 (13). Since 1942, disappearance data have been published annually thus ensuring continued interest. Therefore we are convinced that trends in fat disappearance before 1940 cannot be determined with a high degree of reliability. The most plausible plotting would show no real trend and a low period from 1935 to 1938. Compared with the 1940 to 1965 data, however, what the true level of disappearance was before 1940 is complete conjecture.

Trends in fat disappearance since 1940. Because it is of doubtful value to compare data from one plateau period with the next, the nature of the trends present or absent in a given plateau become more important. The difference between the slope of the regressions and what they would need to be if they were to be considered statistically significant for the 1909 to 1922 and 1924 to 1939 plateaus is so great that there is no problem in interpretation; there was no upward or downward trend. The problem arises with the 1940 to 1965 plateau. The slope of the regression from 1940 to 1965 for the calculations made by the authors, after correction for auto-correlation, is significant at the 95% level, indicating a 2.5-g increase in the 26-year period. As indicated earlier, since the present study was completed, 1965 preliminary data have been revised and a regression calculated with the new 1965 data is not significant. A comparison with a regression calculated from the USDA total fat data indicates that the two calculations average a 6.8-g difference between 1942 and 1947, whereas they average a 7.8-g difference between 1958 and 1962. The change in difference between the two calculations results because the USDA fat disappearance figures have not been corrected for a change in the conversion factor for beef since 1954 which was included in the beef and veal disappearance data reported in the 1965 revision (19). By not correcting for this change in the conversion factor, the USDA estimate for fat from beef in 1962 is one gram higher than the authors' estimate.

Another problem which must be considered when discussing the presence or absence of a trend in the data since 1940 is the possible effect of any changes in methodology. There has been one change of possible significance, a change in compilation of fats and oils in 1959. In 1959 the Bureau of the Census which collects the basic production data for fats and oils, changed its reporting techniques. The change includes a shift from intermediate

processing to end-product reporting and a change in definition of some of the end-products reported. The result of this change will be a more accurate and complete reporting of fats and oils. There is a possibility of a new average around which the totals for fats and oils oscillate starting with 1960, approximately one gram higher than the average from 1949 to 1959.

The groupings used in figure 6 were selected to show the trends since 1940 for fats from dairy products, hydrogenated fats, other fats and oils, and for meat fat, which was divided into the beef and pork components because of the divergence of trends. The computation of these figures was not carried back before 1940 since, if the change in levels of plateaus is due primarily to the fats and oils category, then any percentage presentation before 1940 would exaggerate the contribution of meats and dairy products at the expense of fats and oils. Figure 6 indicates clearly that there has been a substitution of fat from vegetable, hydrogenated and beef sources for fat from milk and pork in the last 25 years.

The substitution of vegetable and hydrogenated fats for animal fats since 1940 is clearly shown in figure 7. Fat from animal sources has decreased from 73% of the total in 1940 to 57% in 1965. Vegetable and hydrogenated sources increased their share from 17% in 1940 to 32% in 1965. The contribution of the minor sources has increased 1% from 10 to 11% in the 26-year period.

Disappearance of fatty acids

Because of the concern in recent years about the type of fatty acids present in the diet, it was felt that more detail on trends in the disappearance of fatty acids might be useful as a starting point in analyzing this problem. The basic fats and oils statistics published by the USDA (23) were used to determine the fatty acid content of the major fat-containing foods that were analyzed earlier in this paper. The analysis in this section is centered on the 1940 to 1965 period. It was felt that the

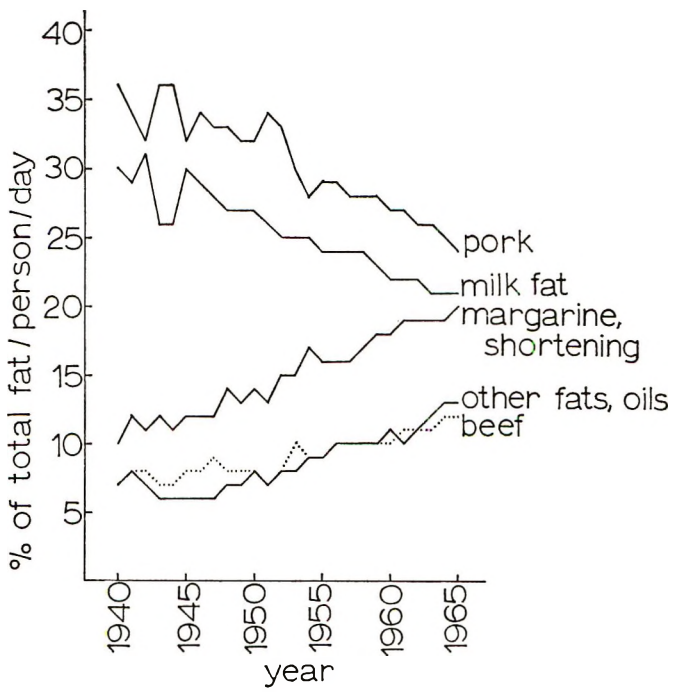

Fig. 6 Fat disappearance changes in share of total fat by major sources of fat from 1940 to 1965. Other fats and oils are principally cottonseed, soybean and other plant sources.

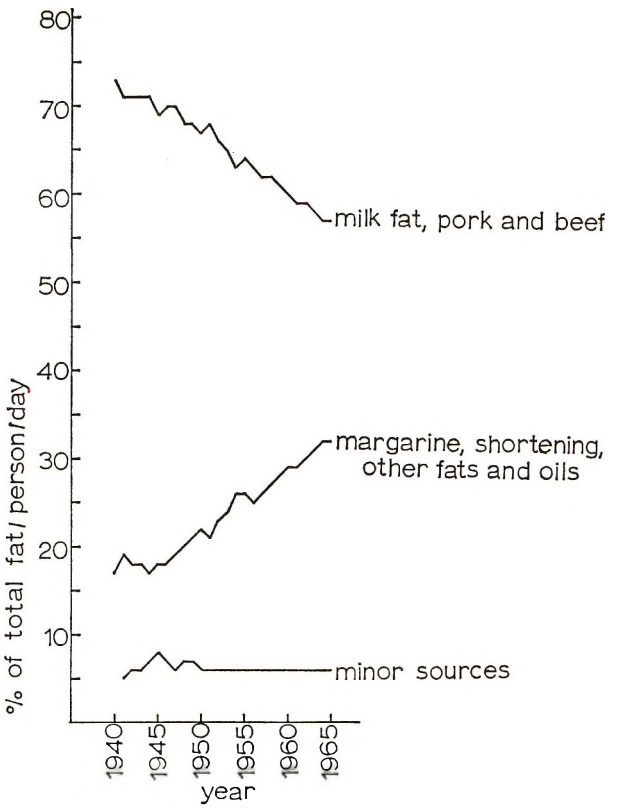

Fig. 7 Fat disappearance. Changes in share of total fat by source of fat from 1940 to 1965. Minor sources are eggs, nuts, fish, shellfish, poultry, veal, lamb and mutton, edible offal and game.

basic data were not accurate enough to justify extending the series back to earlier years. This analysis does not include the fatty acids contained in the minor food categories that were not analyzed in the previous section and no correction has been made for loss of fats or oils in producing shortening and margarine. Thus these figures probably slightly overstate the amount of polyunsaturated fatty acids in a given year. However, the trends would not be affected materially by including the above corrections.

As would be anticipated from the trends since 1940 in meats, milk and fats and oils, the fatty acid content of the diet shows a decline in saturated fatty acids and oleic acid and a marked increase in total polyunsaturated fatty acids (fig. 8). The polyunsaturated fatty acids group has been separated into 2 subgroups: those fatty acids from food products generally subjected to hydrogenation (margarine and shortening) and in the second group fatty acids from all other foods analyzed. The increase in total polyunsaturated fatty acids from 1940 to 1954 is due predominantly to an increase in the hydrogenated subgroup. Since 1954 the increase is about equally divided between the two subgroups with the non-hydrogenated subgroup being slightly more important. The percentage change in fatty acids shows a similar picture (fig. 9). This method indicates more clearly the change in the polyunsaturated fatty acid trend. In 1940, 5% of the total fatty acids was from hydrogenated sources, whereas in 1965, 10% of the total was contributed by this subgroup. In 1940 the non-hydrogenated polyunsaturated fatty acids contributed 9% of the total and in 1965, 12%. Oleic and saturated fatty acids shared the loss, oleic down 2% since 1940 and saturated fatty acids down 5% since

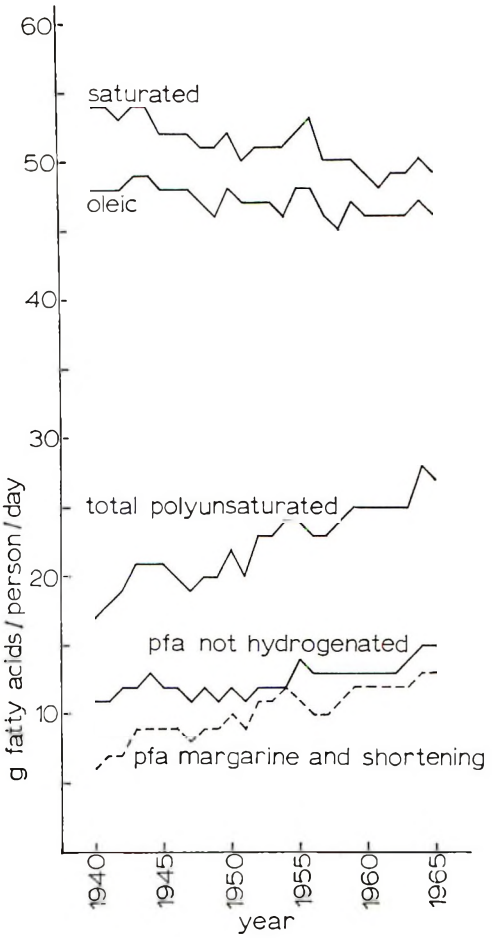

Fig. 8 Fatty acid disappearance. Grams per person per day of fatty acids in foods calculated, excluding veal, poultry, fish, shellfish, lamb and mutton, edible offal and game from 1940 to 1965. PFA indicates polyunsaturated fatty acids. PFA not hydrogenated are all PFA other than margarine and shortening.

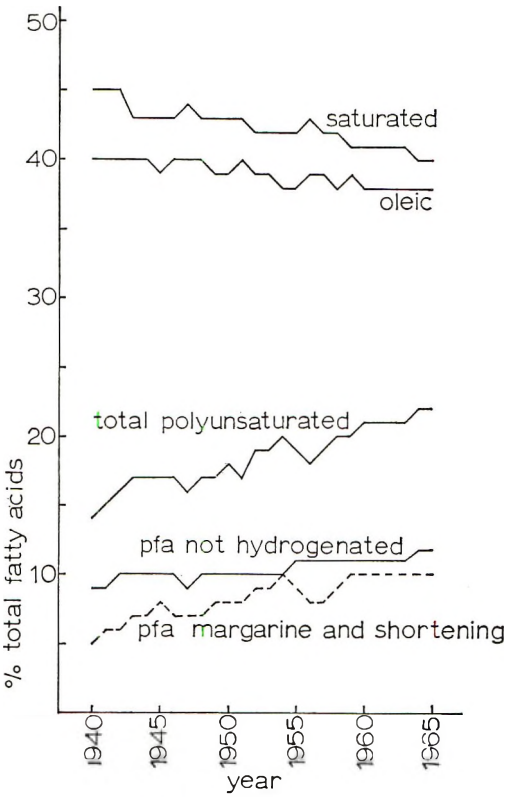

Fig. 9 Fatty acid disappearance. Percentage of fatty acids in foods calculated, excluding veal, poultry, fish, shellfish, lamb and mutton, edible offal and game from 1940 to 1965. PFA indicates polyunsaturated fatty acids. PFA not hydrogenated are all PFA other than margarine and shortening.

1940. (The discrepancy of 1% is due to rounding.)

Although we have divided the polyunsaturated fatty acid group, it is difficult to assess the true effect of hydrogenation on these fatty acids. One of two methods normally is used to produce a food fat with a more desirable consistency (33). One involves partial hydrogenation of the total fat content of the product and the other complete hydrogenation of a small percentage of the fat content. The polyunsaturated fatty acids are hydrogenated more readily than oleic acid so that a product that has been hardened by subjecting all the fat to the hydrogenation process would have a lower polyunsaturated fatty acid content than a product produced by complete hydrogenation of a portion of the fatty acids. The published data analyzed here do not permit a differentiation by type of process. With the increased concern with respect to type of fatty acids, the latter technique is probably being used with greater frequency. Therefore, the increased disappearance of hydrogenated fatty acids as described above may have been offset by a change in the method of processing these fats.

Trends in production and disappearance of fats and oils

Earlier in this paper some major shifts in the disappearance of animal and vege-

table fats since 1940 were detailed. The reasons for the increased disappearance of fats from vegetable sources at the expense of animal fats are many and complex. It is not possible in this paper to explore in detail the causes of these important shifts.

The most important determinant of the level of disappearance of most major food products is the level of production of that commodity in a given year. In the short run, disappearance is highly correlated with production. Changes in stocks often level out somewhat wide variations in production. In the longer run, changes in demand for a commodity generated at the retail level will have an impact on production and hence affect disappearance.

Per capita production of food fats and oils. The per capita production of a given fat or oil is the amount produced in the United States for the given year. This production may be channeled into many different uses: food, non-foods and into export channels. Generally the domestic food market is the most sought after outlet and if there is supply in excess of this demand the product moves into other domestic uses and the export market. The per capita production of food fats in the United States has increased substantially from 67.0 g per person per day in 1940 to 92.9 g per person per day in 1964 (fig. 10). This increase is due almost entirely to the change in production of soybean oil which increased from 5.3 g per person per day in 1940 to 48.5 g in 1964. This dramatic and important change in production of soybean oil is more clearly indicated when shares of total production are compared (fig. 11). Soybean oil contributed 8% in 1940, but over 50% in 1964. Although cottonseed oil production has remained relatively constant at 13 g per capita on a percentage basis it has decreased steadily. Lard and butter have decreased in importance both on a per capita and percentage basis. All other fats and oils have shown a slight increase in per capita production since 1940. However, on a percentage basis they have remained relatively constant at about 7–8% of the total food fat production. There is no question but that the tremendous increase in the availability of soybean oil, at a relatively low price, had a major impact on the trends outlined earlier.

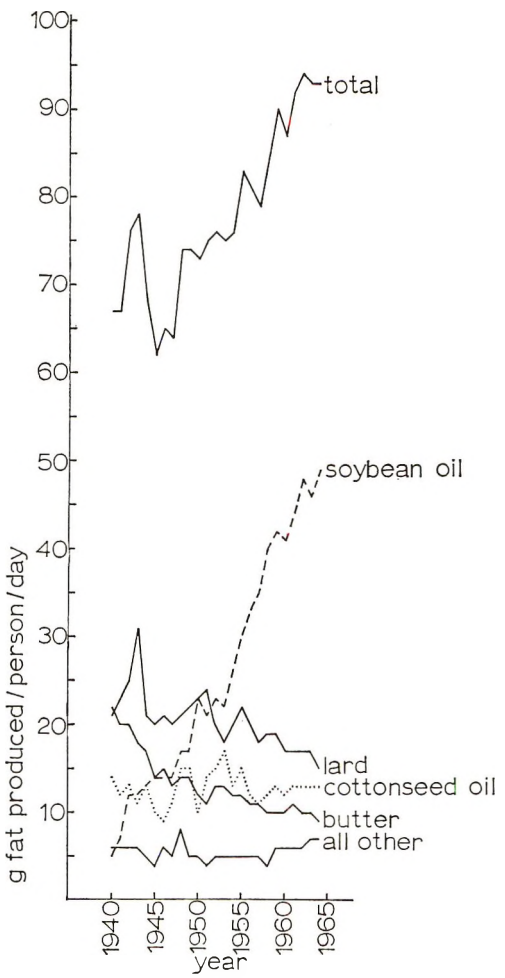

Fig. 10 Production of food fats in the United States from 1940 to 1964.

Disappearance of vegetable oils. In the earlier discussion the trends in the disappearance of butter and lard were covered. Because most vegetable oils enter the market in an altered form as a food product they were not examined separately. Since some of the vegetable oils which are produced are exported and some move into non-food uses, the per capita disappearance of vegetable oils differs from per capita production. Total per capita disappearance of vegetable fats (fig. 12) increased from 20.8 g per day in 1940 to 40.1 g in 1965. The change in the disappearance of soybean oil was solely responsible for the increase as the disappearance

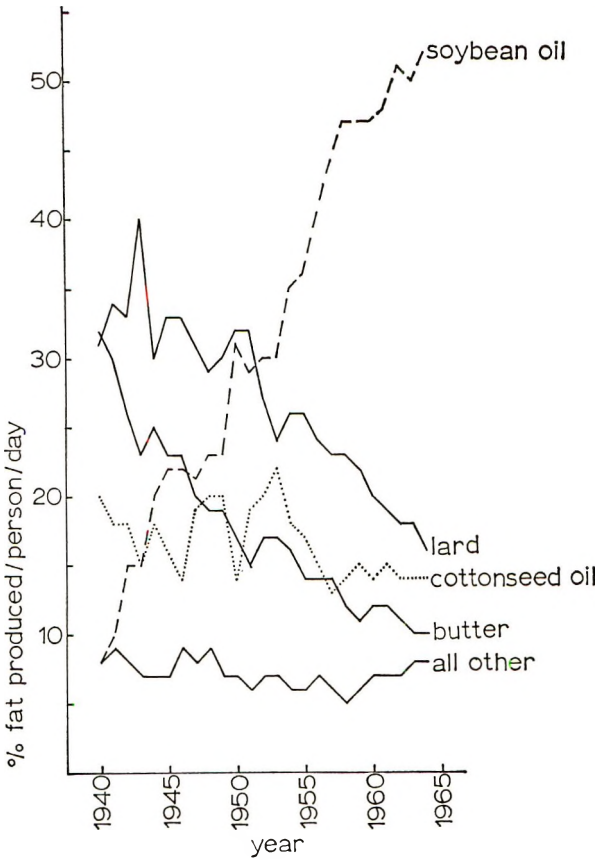

Fig. 11 Changes in percentage of per capita production of butter, lard, cottonseed, soybean and other fats from 1940 to 1964.

of cottonseed oil decreased and all other oils remained constant. On a percentage basis cottonseed oil and soybean oil have exchanged positions of importance since 1940. Cottonseed oil has decreased from 58% to 25% of the total vegetable oil disappearance while soybean oil increased from 19% to 61%. All other vegetable oils decreased their percentage contribution during the war years and have remained relatively constant at approximately 15% since then.

In 1964 the per capita production of soybean oil totaled 48.5 g and of this total 24.2 g was accounted for by domestic disappearance. The other half of the production went into non-food uses and the export market. It is obvious that this availability of soybean oil in excess of current domestic market demands will continue to have an influence on trends in fat disappearance in the future.

SUMMARY AND CONCLUSIONS

This paper presents a detailed analysis of the development of disappearance data with special reference to the problem of how much fat Americans use currently and have used historically. It has been shown that sharp changes in the per capita level of total fat disappearance occurred at times when the methodology of producing the data was being revised. The most probable source of error in these statistics is in the fats and oils group. The single most important development in the past 30 years in terms of fat in the diet is the marked increase in soybean oil production and the ramifications this has had on the availability of fats and oils at retail.

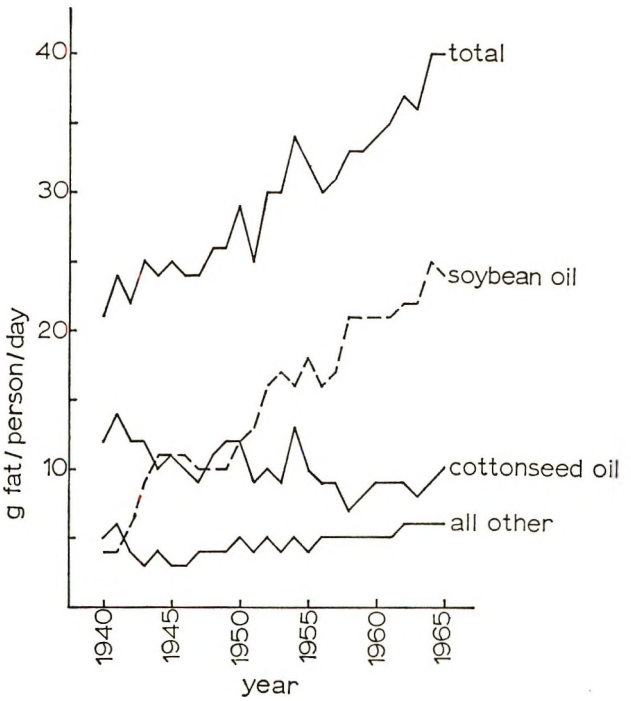

Fig. 12 Disappearance of vegetable oils used for food from 1940 to 1965.

Disappearance of a fat or oil into retail channels does not necessarily mean that the commodity was actually ingested but is only indicative of presumed ingestion. These data cannot be compared directly with data for adults as they include estimates for the total civilian population. They cannot be compared directly with household surveys as they include the food used in institutions and restaurants.

There is no real upward trend in fat disappearance between 1940 and 1965. Interpretation of data on fat disappearance before 1940 is extremely difficult due to wide variations in pork production in the 1930's and inadequate data for prior years. Therefore to presume that Americans have greatly increased their level of fat consumption since 1909 is highly questionable. We cannot say with any certainty what has actually happened to the level of fat consumption.

It is clear that some major shifts have occurred in the types of fat that make up total disappearance. The increased availability of soybean oil and changing tastes and preferences of the American consumer have led to an increased disappearance of vegetable based fats and oils at the expense of animal fats.

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APPENDIX

Tables

TABLE 1

Summary of publication of basic government data on food disappearance

Reference and publication date	Subject of publication	Period examined
(6) 1920	All foods; development of disappearance methodology	1913–1918
(7) 1922	Meats	
(7) 1925	Meats (rev. of 1922 publication); reports beef, veal, lamb and mutton, pork, goat and lard	1907–1924
(8) 1928	Fats and oils; reports neutral lard, other edible lard, edible tallow (no attempt to separate edible and non-edible components of vegetable oils)	1920–1926
(7) 1929	Meats (rev. of 1922 publication); reports beef, veal, lamb and mutton, pork and lard	1900–1928
(9) 1930	All foods; compilation of all existing statistics	1889, 1899, 1909, 1919, 1923–1927
(10) 1933	All foods; (supplement to 1930 publication)	1889, 1899, 1909, 1919, 1921–1925,[1] 1927–1931,[1] 1931, 1932
(11) 1937	Fats and oils; reports butter, oleomargarine, lard and compounds (no report of fats and oils used as such)	1912–1935
(12) 1940	Dairy products other than milk; re-evaluation of data	1849, 1859, 1869–1938
(13) 1941	All foods	1909–1939
(14) 1942+	All foods; disappearance reported annually	1938+
(15) 1944	Nutritive value of all foods	1920–1943
(16) 1947	Nutritive value of all foods	1909–1945
(17) 1949	Disappearance and nutritive value of all foods (rev. of 1941 publication, supplement 1949)	1909–1948
(18) 1953	Disappearance and nutritive value of all foods (rev. of 1949 publication, supplements 1955, 1957, 1958, 1959, 1961, 1962, 1963)	1909–1952
(19) 1965	Disappearance and nutritive value of all foods (rev. of 1953 publication, supplements 1964, 1965)	1909–1963

[1] Average for inclusive years.

TABLE 2

Changes in method of estimating disappearance of food fats and oils [1]

Year of change	Estimate changed	Previous method	Subsequent method
		Butter	
1916	Creamery production	Estimated from data in the Censuses of Manufacturers and Censuses of Agriculture by interpolation based on market receipts at New York and Chicago	Estimated from State departments of agriculture, censuses of manufacturers and original data from the Bureau of Agricultural Economics with adjustments for known incompleteness (18, 19)
1939	Creamery production	Estimated from State departments of agriculture, censuses of manufacturers and original data from the Bureau of Agricultural Economics with adjustments for known incompleteness (18, 19)	Virtually complete enumeration (18, 19)
1923	Farm production	Approximated from censuses of agriculture	Estimated on basis of reports from voluntary cooperators (18, 19)
1913	Butter used in manufacturing margarine [2]	Based on trend in fiscal year data in later years	Fiscal year averages from Bureau of Internal Revenue (1913 to 1916), Institute of Margarine Manufacturers (1917 to 1919), and reports of the Commissioner of Internal Revenue (1920 to 1921) (18)
1922	Butter used in manufacturing margarine [2]	Fiscal year averages from Bureau of Internal Revenue (1913 to 1916), Institute of Margarine Manufacturers (1917 to 1919), and reports of the Commissioner of Internal Revenue (1920 to 1921) (18)	Monthly data published in Internal Revenue Bulletin. Since 1930 practically no butter has been used in margarine (18)
1933	Butter donated by USDA for domestic consumption [2]	None	Residual from estimates of stocks and exports of butter oil held by the government (19)
		Lard [3]	
1921	Production by federally inspected plants [3]	Records of number of hogs slaughtered, available data on hog marketings and weights and average lard yield data from Census of Manufacturers	Average yield reported by a 90 to 95% sample of packers and the records of numbers of hogs slaughtered under federal inspection (17–19)

TABLE 2 (*Continued*)

Changes in method of estimating disappearance of food fats and oils [1]

Year of change	Estimate changed	Previous method	Subsequent method
1937	Production by federally inspected plants [3]	Average yield reported by a 90 to 95% sample of packers and the records of numbers of hogs slaughtered under federal inspection (17–19)	Monthly reports on lard production gathered by Federal Meat Inspection Service (17–19)
1940	Production by non-federally inspected plants [3]	Lard yield estimated at 12% live weight of hogs slaughtered at these plants	Lard yield estimated at 9 to 10% live weight of hogs slaughtered at these plants (17, 18)
1945	Production by non-federally inspected plants [3]	Lard yield estimated at 9 to 10% live weight of hogs slaughtered at these plants (17, 18)	Monthly reports on production of lard and number and live weight of hogs slaughtered (18, 19)
1941	Farm production [3]	15% of estimated live weight of hogs produced on farms	Lower percentages used due to changes in farm practices (18)
1945	Farm production [3]	Lower percentages used due to changes in farm practices (18)	Specific questions relating to lard production included in annual farm surveys (17, 18)
1913	Use of lard in margarine, shortening and soap [2]	Based on trend of subsequent data	Data from various sources with interpolation for non-reported years (18)
1930	Use of lard in margarine, shortening and soap [2]	Data from various sources with interpolation for non-reported years (18)	Regular reports in Bureau of Internal Revenue Bulletin or by the Bureau of the Census (17–19)
		Margarine	
1948	Total production	Computed from tax paid withdrawals by subtracting shipments to Alaska and Hawaii and adding use in federal institutions	Computed from data on production, stocks, foreign trade and military procurement (19)
1923	Shipments to U. S. territories and possessions [2]	No estimates of such shipments	Estimates of shipments calculated in various ways (17, 18)
1928 1935 1936 1937 1939 1941 1960	Shipments to U. S. territories and possessions [2]	Changes in method of estimating shipments occurred during these years	Population figures changed to include Alaska and Hawaii. Puerto Rico and Virgin Islands not included in basic data since 1941 (17–19)
1950	Stocks [2]	Estimated from production and withdrawal data	Available from census reports (19)

TABLE 2 (*Continued*)

Changes in method of estimating disappearance of food fats and oils [1]

Year of change	Estimate changed	Previous method	Subsequent method
		Shortening	
1912	Total	Estimate with no adequate data	Production not reported regularly. Data from various sources with interpolation for non-reported years (1913, 1915) (17–19)
1922	Total	Production not reported regularly. Data from various sources with interpolation for non-reported years (1913, 1915) (17–19)	Shortening production and stocks reported by Bureau of the Census (17–19)
1922 1928 1933 1935 1941 1945 1948 1949	Shipments to U. S. territories and possessions	Changes in methodology of estimating such shipments occurred during these years	Shipments refer only to Puerto Rico and the Virgin Islands (17, 18)
1961	Donations to foreign countries	None other than reported by the Bureau of the Census	Includes estimates of foreign donations not reported separately by the Bureau of the Census (19)
		Other fats and oils	
1931	Total group	Considerable estimation necessary both in basic source material and by the Bureau of Agricultural Economics	Bureau of Census reports factory consumption of fats and oils with respect to end products (17–19)
		Total fats and oils group	
1959	All fats and oils	Census Bureau use intermediate product reporting in survey of production, stocks and consumption	Census Bureau use end-product reporting, add category of salad and cooking oils and change shortening category to "baking and frying (shortening)" (19)

[1] With the exception of butter and the other fats and oils group, methods of estimating data for years before 1940 has not changed since the 1949 publication of disappearance data (17). In the 1953 revision of disappearance data (18) the estimates on creamery production of butter were changed from 1917 through 1938. Published estimates of per capita disappearance of the other fats and oils group were changed for the years 1921 through 1930 when the U. S. Department of Agriculture revised its fats and oils statistics in 1954 (31). No reason is available to explain the change either in the publication cited or from the Fats and Oils Section of the Economic Research Service. The change was not incorporated into the series of publications of disappearance data until the 1965 revision (19). There is a discrepancy in the data for 1921 for shortening. In 1949 it was reported as 7.9 pounds/capita/ year and in 1953 as 6.9 pounds/capita/year. Later publications have followed the 1953 figure. Again no explanation for the discrepancy is available. In general the 1949 and 1953 publications give more detailed explanations of the methodology than the 1965 publication.

[2] Small percentage of total fat or oil cited for the years given.

[3] Federally inspected plants produce about 60% of total output of lard, non-federally inspected plants 10% and farm production 20% (17).

TABLE 3

Regressions for total fat as measured by sum of components for selected time periods

	1909 to 1965 [1]		1909 to 1922		1924 to 1939		1940 to 1965 [1]	
	Raw data	Corrected data [2]	Raw data	Corrected data [2]	Raw data	Corrected data [2]	Raw data	Corrected data [2]
Mean	128.1	58.5	117.2	143.5	126.1	110.8	135.3	155.1
Slope	0.4225	0.4239	0.0196	0.0598	−0.0715	−0.0652	0.0876	0.0977
Standard deviation	0.02636	0.05032	0.1559	0.1402	0.1412	0.1846	0.05246	0.04413
Significant at 95% level	yes	yes	no	no	no	no	no	yes [1]

[1] Preliminary data for 1965. When final estimates are used the regression for 1940 to 1965 when corrected for auto-correlation is not significant at the 95% level. The 1965 final estimates have no statistically significant effect on the 1909 to 1965 regression.

[2] Corrected for auto-correlation.

TABLE 4

Grams fat per person per day from various sources, 1909 to 1965

Year	Lean and fat pork	Beef	Fluid whole milk	Other milk and milk products	Butter	Lard	Shortening	Margarine	Other fats and oils	All other [1]	Total	USDA total [2]
1909	28.1	12.6	12.6	7.0	17.9	15.5	9.9	1.2	1.9	12.2	118.9	127
1910	26.1	11.9	11.6	6.8	18.4	15.5	9.9	1.6	1.9	12.5	116.2	124
1911	28.8	11.6	11.1	6.7	18.7	15.0	9.9	1.1	1.9	12.9	117.7	126
1912	28.0	10.9	13.0	7.4	16.7	13.9	10.3	1.5	1.5	11.5	114.7	124
1913	28.0	10.7	12.6	7.4	16.6	13.3	11.8	1.5	2.4	12.3	116.6	125
1914	27.2	10.5	11.8	7.3	17.1	13.2	13.3	1.4	4.7	12.0	118.5	127
1915	27.8	9.6	11.7	7.5	17.3	14.3	12.4	1.4	3.8	12.3	118.1	126
1916	28.8	10.0	11.6	7.4	17.4	14.4	11.8	1.8	2.5	12.1	117.8	126
1917	24.7	11.0	12.0	7.7	15.8	12.4	13.4	2.7	1.1	12.5	113.3	122
1918	25.5	11.6	13.3	7.8	14.2	14.6	13.0	3.3	4.6	11.9	119.8	129
1919	26.7	10.4	12.3	8.1	15.3	13.3	14.4	3.4	3.0	13.6	120.5	130
1920	26.6	10.0	12.8	8.1	15.0	14.9	9.4	3.4	2.2	12.4	114.8	123
1921	27.1	9.4	12.7	8.3	16.4	13.4	8.7	2.0	4.3	12.2	114.5	122
1922	27.5	10.0	12.6	8.3	17.2	16.5	8.3	1.7	5.5	12.3	119.9	129
1923	31.1	10.1	12.0	8.4	17.9	17.7	8.2	2.0	4.8	13.1	125.3	135
1924	29.9	10.1	12.4	8.3	17.9	17.6	8.7	2.0	5.3	14.1	126.3	135
1925	27.0	10.1	12.4	8.4	18.2	15.2	12.0	2.0	6.0	14.1	125.4	134
1926	26.8	10.2	12.4	8.9	18.4	15.1	11.8	2.0	7.0	13.3	125.9	133
1927	28.3	9.2	12.4	8.7	18.4	15.8	12.0	2.3	6.1	14.4	127.6	134
1928	29.7	8.3	12.4	9.0	17.7	16.4	11.5	2.6	6.2	13.2	127.0	135
1929	29.2	8.4	12.5	9.3	17.7	15.8	12.3	2.9	7.0	13.1	128.2	137
1930	28.1	8.3	12.4	9.7	17.7	15.8	12.2	2.6	7.7	12.8	127.3	134
1931	28.7	8.2	12.3	10.1	18.4	16.9	11.7	1.9	6.3	13.4	127.9	135
1932	29.6	7.9	12.5	9.5	18.6	17.9	9.3	1.6	6.0	12.9	125.8	133
1933	29.6	8.7	12.4	8.9	18.3	17.4	9.3	1.9	6.6	12.4	125.5	133
1934	27.0	10.8	11.8	9.2	18.7	16.1	11.8	2.1	6.7	12.2	126.4	134
1935	20.2	9.0	12.0	9.5	17.7	11.9	15.0	3.0	7.3	12.7	118.3	127
1936	23.0	10.3	12.1	9.7	16.9	14.0	15.3	3.1	7.4	13.2	125.0	133
1937	23.3	9.4	12.2	10.0	16.9	13.0	15.3	3.1	8.2	13.4	124.8	133

TABLE 4 (*Continued*)

Grams fat per person per day from various sources, 1909 to 1965

Year	Lean and fat pork	Beef	Fluid whole milk	Other milk and milk products	Butter	Lard	Shortening	Margarine	Other fats and oils	All other [1]	Total	USDA total [2]
1938	24.3	9.2	12.1	10.2	16.7	13.8	14.3	3.0	8.6	13.3	125.5	133
1939	27.1	9.3	12.2	10.7	17.5	15.8	13.3	2.3	8.9	13.4	130.5	139
1940	30.8	9.3	12.2	11.0	17.1	17.9	11.2	2.4	9.2	14.1	135.2	143
1941	28.7	10.3	12.3	11.2	16.2	17.1	12.9	2.8	10.2	14.0	135.7	144
1942	26.6	10.4	13.3	11.9	16.0	15.9	11.7	2.8	9.4	15.0	133.0	140
1943	33.0	9.0	14.5	11.0	11.9	16.1	11.9	3.9	8.3	15.3	134.9	142
1944	33.3	9.4	15.1	10.9	12.0	15.3	11.0	3.9	8.6	16.3	135.8	142
1945	27.8	10.1	15.4	12.8	11.0	14.5	11.3	4.1	7.7	17.5	132.2	138
1946	31.7	10.4	14.8	13.6	10.6	14.6	12.7	3.9	7.9	16.0	136.2	143
1947	29.2	11.8	14.1	12.7	11.3	15.6	11.7	5.0	8.6	15.3	135.3	143
1948	28.3	10.7	13.5	12.2	10.1	15.8	12.0	6.1	8.8	15.4	132.9	140
1949	28.3	10.8	13.6	11.9	10.6	14.6	12.0	5.8	9.8	15.7	133.1	140
1950	29.0	10.7	13.5	12.2	10.8	15.6	13.7	6.1	10.7	15.2	137.5	145
1951	30.1	9.5	13.7	11.6	9.7	15.3	11.2	6.6	9.6	15.0	132.3	139
1952	30.4	10.5	13.8	11.5	8.6	14.6	12.7	7.9	10.8	15.1	135.9	143
1953	26.6	13.2	13.7	11.0	8.5	14.1	12.7	8.1	11.3	15.4	134.6	142
1954	25.1	13.5	13.7	11.0	8.9	12.7	14.6	8.5	11.8	15.3	135.1	142
1955	28.0	13.7	13.9	10.8	9.0	12.5	14.3	8.2	13.0	15.1	138.5	146
1956	28.1	14.2	14.1	10.5	8.7	12.2	13.5	8.2	13.5	15.5	138.5	146
1957	25.5	14.0	13.9	10.0	8.3	11.7	12.9	8.6	13.4	15.3	133.6	141
1958	25.2	13.2	13.7	9.8	8.3	11.9	14.0	9.1	13.0	15.1	133.3	142
1959	28.3	13.3	13.4	9.7	7.9	10.9	15.6	9.2	13.9	15.4	137.6	147
1960	27.3	13.8	13.2	9.6	7.5	9.6	15.6	9.4	14.3	15.3	135.6	143
1961	26.0	14.1	12.8	9.4	7.4	9.6	15.9	9.6	13.9	15.5	134.2	142
1962	26.6	14.2	12.8	9.4	7.3	8.9	16.6	9.4	14.5	15.1	134.8	142
1963	27.3	15.0	12.7	9.3	6.9	7.9	16.6	9.7	16.2	15.4	137.0	145
1964	27.3	16.0	21.9		6.8	7.9	16.9	9.7	17.5	15.2	139.2	
1965 [3]	25.2	15.8	21.8		6.6	7.6	16.7	9.9	17.0	15.3	135.9	

[1] Veal, lamb, edible offal, game, poultry, fish, eggs and nuts.
[2] U. S. Department of Agriculture, Economic Research Service 1965. U. S. Food Consumption. Sources of data and trends, 1909–63, Statistical Bull. No. 364. Government Printing Office, Washington, D. C.
[3] Preliminary data.

TABLE 5

Fatty acid content of foods excluding veal, lamb, edible offal, game, poultry, fish and shellfish, 1931 to 1965

Year	Saturated fatty acids		Oleic		Polyunsaturated fatty acids						Total fatty acids
					Total		Margarine and shortening		All other		
	g	%	*g*	%	*g*	%	*g*	%	*g*	%	*g*
1931	51.6	46	45.4	41	14.5	13	5.1	5	9.4	8	111.5
1932	50.9	46	45.0	41	13.8	13	4.4	4	9.4	9	109.7
1933	50.9	46	44.7	41	13.9	13	4.4	4	9.5	9	109.5
1934	51.2	46	44.5	40	14.8	13	5.6	5	9.2	8	110.5
1935	48.0	47	40.5	39	14.3	14	6.4	6	8.0	8	102.8
1936	50.1	46	43.2	40	15.2	14	6.3	6	8.8	8	108.5
1937	49.6	46	42.9	39	16.5	15	7.6	7	8.9	8	109.0
1938	50.0	45	43.4	39	16.8	15	7.0	6	9.8	9	110.2
1939	52.2	46	45.6	40	16.6	15	6.4	6	10.0	9	114.4
1940	53.7	45	47.9	40	17.2	14	6.2	5	11.0	9	118.8
1941	54.3	45	48.0	40	18.1	15	7.0	6	11.1	9	120.4
1942	53.1	45	47.5	40	18.6	16	7.1	6	11.5	10	119.2
1943	53.5	43	49.1	40	20.8	17	8.7	7	12.1	10	123.4
1944	53.6	43	49.3	40	21.1	17	8.6	7	12.6	10	124.1
1945	52.1	43	47.5	39	20.9	17	9.1	8	11.9	10	120.6
1946	52.2	43	47.7	40	20.2	17	8.6	7	11.6	10	120.1
1947	52.3	44	47.7	40	19.4	16	8.0	7	11.4	9	119.4
1948	51.0	43	46.6	40	20.0	17	8.6	7	11.5	10	117.7
1949	50.8	43	46.1	39	20.4	17	9.1	8	11.3	10	117.3
1950	52.4	43	48.0	39	21.7	18	9.9	8	11.8	10	122.1
1951	50.3	43	46.5	40	20.4	17	8.9	8	11.4	10	117.1
1952	51.3	42	47.4	39	22.6	19	10.5	9	12.0	10	121.2
1953	50.7	42	46.6	39	22.8	19	10.6	9	12.1	10	120.0
1954	51.2	42	46.1	38	23.7	20	11.6	10	12.2	10	121.1
1955	52.3	42	47.6	38	23.7	19	10.7	9	13.7	11	124.3
1956	52.6	43	47.9	39	22.7	18	9.6	8	13.1	11	123.2
1957	50.4	42	45.9	39	22.5	19	9.6	8	12.9	11	118.8
1958	49.6	42	45.3	38	23.7	20	10.9	9	12.8	11	118.6
1959	49.5	41	47.0	39	24.6	20	11.6	10	13.0	11	121.1
1960	48.6	41	45.9	38	25.0	21	11.8	10	13.0	11	119.3
1961	48.4	41	46.0	38	25.2	21	11.7	10	13.3	11	119.4
1962	49.0	41	46.0	38	25.5	21	12.3	10	13.3	11	120.6
1963	48.9	41	46.1	38	25.3	21	11.6	10	13.7	11	120.3
1964	49.6	40	47.0	38	27.5	22	12.5	10	14.9	12	124.0
1965 [1]	48.7	40	45.9	38	27.4	22	12.8	10	14.6	12	122.0

[1] Preliminary data.

TABLE 6

Per capita domestic production of food fats, 1931 to 1964

Year	Butter		Lard		Cottonseed oil		Soybean oil		All other fats and oils		Total
	g	%	*g*	%	*g*	%	*g*	%	*g*	%	*g*
1931	23.0	34.0	23.7	35.0	17.6	26.0	0.4	0.6	3.0	4.4	67.7
1932	23.5	35.4	24.8	37.4	14.5	21.8	0.3	0.4	3.3	4.9	66.4
1933	22.7	37.6	21.6	35.8	12.5	20.7	0.3	0.4	3.3	5.4	60.4
1934	22.0	43.1	14.2	27.9	10.7	20.9	0.8	1.5	3.4	6.6	51.0
1935	20.9	38.7	14.9	27.5	11.7	21.6	2.3	4.3	4.3	7.9	54.0
1936	21.0	37.7	14.5	26.2	14.0	25.2	2.0	3.5	4.1	7.4	55.5
1937	21.4	34.1	15.8	25.2	18.5	29.6	2.8	4.5	4.2	6.6	62.7
1938	21.4	34.8	18.4	29.8	13.1	21.3	4.4	7.1	4.4	7.1	61.6
1939	21.0	32.9	21.3	33.4	11.9	18.6	6.0	9.4	3.7	5.8	63.9
1940	21.5	32.1	21.0	31.4	13.7	20.4	5.3	7.9	5.5	8.3	67.0
1941	20.3	30.1	22.6	33.6	12.0	17.9	6.7	10.0	5.7	8.5	67.2
1942	19.5	25.8	25.3	33.4	13.2	17.5	11.5	15.1	6.1	8.1	75.6
1943	17.7	22.8	31.4	40.4	11.3	14.6	11.8	15.2	5.5	7.0	77.8
1944	16.9	24.7	20.5	30.0	12.6	18.4	13.4	19.6	5.0	7.3	68.4
1945	14.0	22.6	20.2	32.8	9.6	15.6	13.8	22.4	4.0	6.5	61.7
1946	15.1	23.1	21.4	32.9	9.1	13.9	14.0	21.5	5.6	8.6	65.0
1947	12.9	20.4	19.9	31.3	11.8	18.6	13.6	21.4	5.3	8.4	63.5
1948	14.2	19.1	21.2	28.6	14.8	20.0	17.4	23.4	8.2	8.8	74.0
1949	14.3	19.3	22.1	29.8	15.1	20.4	17.3	23.4	5.3	7.1	74.1
1950	12.1	16.6	23.2	31.8	10.1	13.9	22.5	30.8	5.1	6.9	73.0
1951	11.3	15.0	24.0	31.9	14.2	18.9	21.4	28.5	4.3	5.7	75.2
1952	12.7	16.8	20.3	26.7	14.9	19.6	23.1	30.4	5.0	6.6	76.0
1953	13.1	17.4	17.9	23.8	16.7	22.3	22.1	29.5	5.3	7.1	75.2
1954	11.9	15.7	20.0	26.3	13.4	17.6	26.3	34.6	4.5	5.8	76.1
1955	11.9	14.4	21.8	26.3	14.5	17.4	29.7	35.8	5.1	6.2	83.0
1956	11.4	14.1	19.6	24.1	12.2	15.0	32.7	40.2	5.4	6.6	81.4
1957	11.1	14.0	17.8	22.5	10.5	13.2	34.9	44.0	5.0	6.3	79.2
1958	10.2	12.0	19.4	22.8	11.5	13.5	39.5	46.6	4.3	5.0	84.8
1959	10.2	11.3	19.4	21.5	13.0	14.5	41.9	46.5	5.5	6.1	89.9
1960	10.4	11.9	17.3	19.9	12.4	14.3	40.7	46.9	6.0	6.9	86.8
1961	10.9	11.9	16.9	18.5	13.4	14.6	44.3	48.4	6.0	6.6	91.5
1962	10.1	10.7	16.8	17.9	13.0	13.8	47.7	50.7	6.4	6.8	94.1
1963	9.7	10.4	16.5	17.8	12.9	13.9	46.0	49.8	7.4	8.0	92.5
1964	9.3	10.0	14.5	15.6	13.1	14.1	48.5	52.2	7.5	8.1	92.9

TABLE 7

Per capita disappearance of vegetable oils, 1931 to 1965

Year	Cottonseed oil		Soybean oil		All other vegetable oils		Total vegetable oils
	g	%	*g*	%	*g*	%	*g*
1931	12.0	67.4	0.3	1.1	5.6	31.5	17.9
1932	11.2	74.1	0.3	1.3	3.7	24.7	15.0
1933	11.7	70.5	0.1	0.5	4.8	29.1	16.5
1934	14.1	75.1	0.1	0.7	4.6	24.2	18.7
1935	12.8	56.5	0.7	3.3	9.1	40.2	22.6
1936	11.9	52.7	1.9	8.0	8.9	39.3	22.7
1937	15.5	63.6	1.4	5.6	7.6	30.8	24.4
1938	14.4	61.2	2.5	10.4	6.7	28.5	23.6
1939	12.5	56.4	3.7	16.6	6.0	27.0	22.2
1940	12.2	58.0	3.8	18.7	4.8	23.2	20.8
1941	13.8	57.7	4.1	17.1	6.0	25.0	23.8
1942	12.3	55.5	5.7	25.6	4.1	18.5	22.1
1943	11.7	47.6	9.4	38.1	3.5	14.1	24.6
1944	10.2	41.8	10.7	43.8	3.6	14.7	24.4
1945	10.8	43.0	10.9	43.5	3.4	13.4	25.0
1946	9.7	40.3	11.0	46.4	3.2	13.5	23.9
1947	8.9	38.0	10.3	43.6	4.3	18.4	23.6
1948	10.8	42.4	10.3	40.3	4.5	17.5	25.5
1949	12.2	46.3	10.2	38.9	3.8	14.7	26.2
1950	11.9	41.8	11.9	41.8	4.7	16.5	28.5
1951	8.6	33.6	12.7	49.5	4.2	16.6	25.4
1952	9.8	33.1	15.5	51.9	4.5	15.0	29.8
1953	9.2	30.1	16.9	55.8	4.2	13.9	30.3
1954	13.4	39.9	15.6	46.3	4.7	14.0	33.7
1955	10.3	31.8	17.6	54.8	4.3	13.5	32.2
1956	9.4	31.0	16.1	53.4	4.7	15.6	30.3
1957	9.1	29.2	16.9	54.8	5.0	16.1	30.9
1958	7.4	22.7	20.5	62.2	5.0	15.1	32.9
1959	7.8	23.5	20.7	61.9	5.0	14.8	33.5
1960	8.8	25.8	21.0	61.0	4.6	13.4	34.4
1961	9.1	25.6	20.8	58.9	5.5	15.4	35.3
1962	8.8	23.8	22.1	60.0	6.0	16.2	36.8
1963	8.3	23.3	21.7	60.9	5.6	15.7	35.6
1964	9.2	23.1	24.6	61.7	6.0	15.0	39.7
1965 [1]	9.8	24.5	24.2	60.8	6.1	15.2	40.1

[1] Preliminary data.