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Illness in Rural Missouri

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I. SUMMARY

This bulletin reports a portion of the findings of a survey of illness and the use of medical and health facilities in five Missouri counties during the years, 1939-42. The survey covered the experience of 1544 open-country households, approximately 10 per cent of the rural-farm population in Lewis, Ray, Franklin, Dallas and New Madrid counties.

Because of marked seasonal variation in illness rates, the survey covered a full year and, hence, the results represent an understatement of the true situation since people tend to forget the shorter and less serious illnesses. It is believed, however, that most of the longer and more serious cases were recorded, including practically all those for which medical service was obtained.

On the last day of the survey year, 17 per cent of the 6017 persons included in the survey were ill. This, in spite of the fact that this day occurred in the summer when illness rates are relatively low. On this day, 11 per cent of all persons were suffering from illnesses of one year or longer, and 6 per cent from shorter ailments.

During the survey year, 44 per cent of all persons included were ill one or more days. (An illness was defined as a disability that kept the person from work, school, or other usual activities.) These persons had 2901 illnesses, or 482 illnesses per 1000 persons in the total population. For each 1000 persons 274 illnesses were treated by some medical agency. For each 1000 persons of the survey population, there were 53,777 days of illness.

During a short period, such as a year, the illness burden is unequally distributed. Only 44 per cent of all persons were ill; they were members of 78 per cent of the households. One-sixth of the survey population suffered over 90 per cent of the total days of illness. Four-fifths of the total days of illness occurred in less than one-third of the households.

Locality variations in illness were marked, also. Localities that were agriculturally poor and relatively isolated from medical and health services, on the whole, showed higher illness rates. Thus, the localities with apparently the greatest need for medical services, were the least likely to be well served.

The high average duration of illness and the high average number of days ill, resulted from the considerable burden of chronic illness. The average length of all illnesses was 111 days; many persons had been ill one year or more, however, and 16 per cent had been ill three months or longer.

Persons 60 years of age and over had illness rates six and one-half times as great as those under 15; specifically 133,849 days a year as compared with 20,187 days. This higher rate of sickness for older persons is largely accounted for by a much greater amount of

chronic illness. Whereas only one person in 20 under 15 years of age was ill three months or more during the year, nearly one-half of all individuals 70 years of age and over were ill that long.

The fact that older persons have a much greater amount of illness than younger ones is very significant in view of the progressive aging of the farm population. The growing proportion of older persons in the population means that unless illness rates, especially for the aged, decrease appreciably, the total amount of illness suffered by farm people will increase. If the illness rates of this survey and the age trend of the present are assumed, by 1960 the gross rate of illness for the farm population of Missouri will have increased by one-seventh over that of 1940.

The relatively high illness rate for older persons has implications for farm labor and management, especially in a period of labor shortage. The rate of illness for farm operators was 67,800 days yearly per 1000 operators. The average age of the farm operators in the survey was slightly over 50 years; an average similar to that for all farm operators of the State. Forty-four per cent of the farm operators were ill one or more days during the year.

The unequal burden of illness is seen in a most striking manner when illness rates for persons with the lowest and highest incomes are compared. Persons in households with the lowest incomes had the highest illness rates, although they were the least able financially to bear the illness burden. Twelve per cent of all persons lived in households with incomes under \$250. These persons were found to have an average of one-half more days of sickness than the 25 per cent of the population living in households with incomes of \$1000 and over. The rates per 1000 persons were 70,245 days of illness as compared with 45,645 days. In addition to having a relatively high amount of illness, households with the lowest incomes were characterized by their smaller size, fewer children and larger proportion of older persons.

Higher illness rates among the lower income groups were largely accounted for by a greater amount of chronic illness for persons over 40 years of age. This condition may be largely a result of the greater health hazards which persons of low income encountered in their earlier years. Exposure to infection and lack of proper treatment of defects during youth are regarded as important causes of chronic illness in later life. A large amount of chronic illness in a population suggests the need, not only for better facilities for treatment, but also for more effective preventive measures.

There are probably few ways by which greater reductions in mortality, suffering, and social and economic costs can be effected than by the prevention and treatment of chronic illness. In view of the large amount of illness which the rural people of Missouri now have, it appears that definite action to alleviate this condition is needed.

Illness in Rural Missouri

A Survey of 1544 Open-Country Households in Five Representative Counties

HAROLD F. KAUFMAN AND WARREN W. MORSE¹

II. INTRODUCTION

The Problem of Rural Health

The health of a population has not only medical significance but also considerable social and economic importance. The social and economic significance of health is especially evident during a period of manpower shortage such as occurs in wartime. Illness reduces the effective manpower of a population not only through the total or partial disability of those ill but also by preventing those who care for the sick, and those who produce drugs and appliances for them, from engaging in more productive activities. This situation is seen in the farm family when either the workers are ill or when they spend a proportion of their productive time caring for other members of the family who are in that condition.

Another economic implication of ill health is that excessive illness such as that frequently suffered by the aged is found to be associated with the need for public assistance. Thus a question arises concerning the extent to which the need for public assistance might be reduced by providing more adequate facilities for the treatment and prevention of ill health.

Furthermore, aside from its economic significance, ill health is undesirable in itself. Few individuals desire the inconvenience of sickness or the suffering which generally accompanies it. A knowledge of the social factors associated with illness may be of real value if this knowledge aids in some measure in the prevention and treatment of sickness.

A number of approaches to the study of the rural health problem are possible. Some of the more obvious of these are: (1) to ascertain the physical condition and health of the rural population; (2) to determine the nature and availability of existing health and medical agencies; (3) to discover the extent to which medical services are used, including the costs of such services; and (4) to determine the knowledge, attitudes and practices of rural people in relation to their own health situation with a view to devising an effective program of health education. This study is concerned with the first of the above named problems—that of indicating the state of health of a given population and thereby indicating its need for health and medical service. Other publications are planned which will deal with the second and third problems stated above—a description of

¹The field data had been previously collected by the Department of Rural Sociology. This bulletin was prepared under the general supervision of C. E. Lively.

the health facilities available and the use and cost of these facilities for a given population.

In order to ascertain whether or not the medical facilities of a given area are adequate, it is necessary first to have some measure of the state of health in that area. Several indices of the health of a population are in use.² Among these indices are (1) illness or morbidity rates, (2) death rates, especially the infant mortality rate, and (3) the prevalence of physical defects.³ In this study illness rates are analyzed for a population of 6017 persons in five rural Missouri counties.⁴ These rates are regarded as one measure of this population's need for health and medical service.⁵ To date relatively few studies on the extent of illness in rural areas have appeared.⁶

The central purpose of this study is to discover the extent, nature and variation of illness in selected areas in rural Missouri. An analysis is made of several social groupings in regard to variations in the extent and nature of illness.⁷ The major portion of the study is devoted to a description of the relationship of illness rates with county groupings, age and sex classes, income groupings, sizes of household, sample areas and distance to the nearest physician. In addition, the social and economic implications of the extent and variation of illness discovered are discussed. Also problems concerning the definition and enumeration of illness are considered, and a comparison is made of illness rates found in this study with those reported for other studies.

The Population Studied

The population analyzed in this study includes 6017 persons in 1544 open-country households in Lewis, Ray, Franklin, Dallas and New Madrid counties.⁸ These five counties contain approximately

²See Dienuaide, F. R., *Civilian Health in War-time*, Chap. 1, (1942).

³For description of physical defects in a Missouri population see the series of reports by Lively, C. E., and Lionberger, H. F., on "The Physical Status and Health of Farm Tenants and Farm Laborers in Southeast Missouri."

⁴Earlier publications dealing with two of these counties are: Almack, R. B., *The Rural Health Facilities of Lewis County, Missouri*, Mo. Agr. Exp. Sta. Research Bul. 365, (1943), and Meier, I., and Lively, C. E., *Family Health Practices in Dallas County, Missouri*, Mo. Agr. Exp. Sta. Research Bul. 369, (1943).

⁵See Lee, R. I., and Jones, L. W., *The Fundamentals of Good Medical Care*, (1933). These writers employ illness rates in estimating the amount of health and medical service needed.

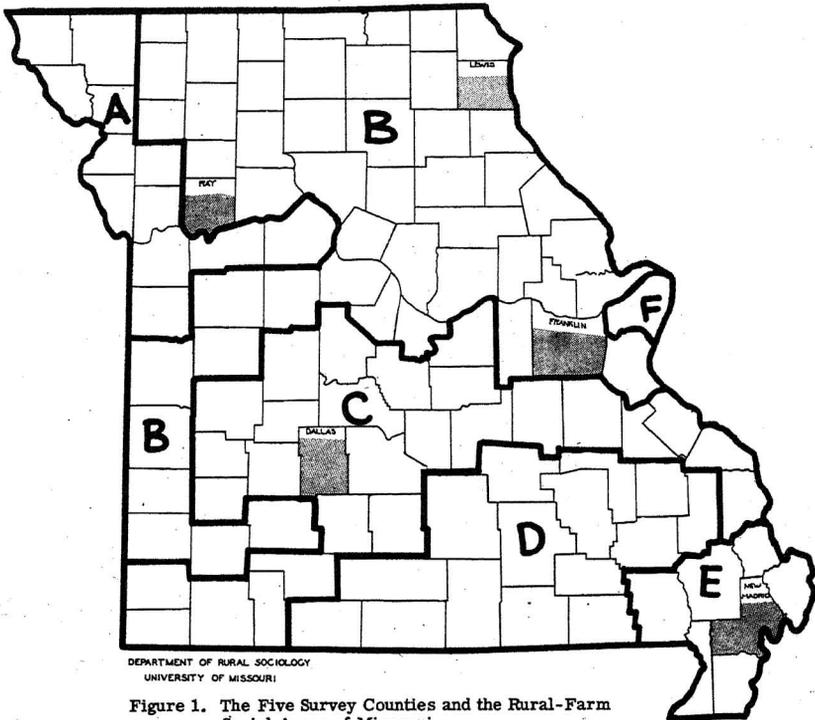
⁶The most extensive data on illness rates are to be found in the "Committee on the Cost of Medical Care" study (1928-31) and the "National Health Survey" (1935-36). These studies deal chiefly with urban populations. Studies concerned exclusively with rural populations are: Sanderson, D., *A Survey of Sickness in Rural Areas in Cortland County, New York*, Cornell Agr. Exp. Sta. Memoir 112, (1928); Wilson, I. C., and Metzler, W. H., *Sickness and Medical Care in an Osark Area in Arkansas*, Ark. Agr. Exp. Sta. Bul. 353, (1938); Wilson, I. C., *Sickness and Medical Care Among the Negro Population in a Delta Area of Arkansas*, Ark. Agr. Exp. Sta. Bul. 372, (1939); Lively, C. E., and Beck, P. G., *The Rural Health Facilities of Ross County, Ohio*, Ohio Agr. Exp. Sta. Bul. 412, (1927).

⁷See Duncan, O. D., "Rural Health as a Field of Sociological Research," *Rural Sociology*, 9:3-10 (1944).

⁸The sample population in Lewis county consists of 1121 persons in 317 households, in Ray county 1004 persons in 295 households, in Franklin county 1292 persons in 324 households, in Dallas county 1018 persons in 258 households, and in New Madrid county 1582 persons in 350 households. One or more members of each of the households were interviewed during the summer months of the years, 1939-42. Field work was conducted in Lewis county in 1939, in Ray and Franklin counties in 1940, in Dallas county in 1941 and in New Madrid county in 1942. In addition to information of extent and nature of illness, schedule data were also secured on certain social characteristics and on volume of use and cost of medical and health services.

6 per cent of the rural-farm population of the State. Approximately 10 per cent of the farm population of each of the counties is included in this study.⁹

The location of the five counties from which the sample populations for this study were selected are shown on the map of the State in Figure 1. The six major rural-farm social areas which



have been delineated for Missouri are also shown on this map. The factors used in defining these areas consisted of a farm plane of living index, and 18 other measures of economic and social variation which were highly correlated with it.¹⁰

It is seen from the map in Figure 1 that the five counties included in this study are located in three of the six social areas. Lewis, Ray, and Franklin counties¹¹ are located in area B which is the

⁹The sample population, as is shown below, is regarded as representative for the five counties studied. It is not regarded as a thoroughly representative state sample as war activities made it advisable to discontinue field work before the state sample was completed.

¹⁰For a detailed description of these areas and of procedures by which they were defined, see Lively, C. E., and Gregory, C. L., *Rural Social Areas in Missouri*, Mo. Agr. Exp. Sta. Research Bul. 303, (1939). Area A is the most productive agricultural area in the State and area D comprising the Ozark highland is the least productive.

¹¹These counties were chosen from three of the subdivisions of area B. Ray county is placed in area B in the mapping of rural-farm areas but in rural areas delineation, which includes both the rural-farm and rural-nonfarm population, it is placed in area A.

largest and the most representative of the State. Livestock and general farming predominate in this area and it has for the most part a level to rolling topography. Levels of living in area B are generally above the state average. Dallas county is located in area C, the Ozark border region. This area has a decidedly lower plane of living index than area B. In Dallas county the productivity of the soil is much lower and a much greater proportion of the land is sub-marginal for crops than is true of the other four counties. New Madrid county is located in area E, in the Southeast Missouri lowlands. The agricultural organization of this area is characterized by the crops of cotton and corn and a high proportion of tenancy, especially sharecroppers. Although the productivity of the soil is relatively high in the southeast lowlands the plane of living index is the lowest of the six social areas in the State.

Sample areas within the counties were selected on the basis of level of living of the population, soil fertility, type of agriculture, and distance and access to medical facilities. From three to five sample areas were chosen in each county and, insofar as possible, every household in each area was visited.¹²

Illness Data

In this study illness was defined as disability which, from the standpoint of the person interviewed, kept an individual from his usual activities for one or more days.¹³ Hence, the illnesses recorded included both organic and functional disorders, and represented varying degrees of disability—from those which merely interfered with work or other usual activity to those which confined a person to bed. Possibly, the most important implication of this definition of illness is that it gives an indication of the loss of time and efficiency resulting from sickness. Whether the time lost was of economic significance depends, of course, on the age and employment of the individual concerned. Of scarcely less importance is the fact that such a definition gives the individual's own evaluation and interpretation (and that of his family) of his physical condition; and after all, it is this interpretation which determines whether a practitioner or other medical or health agency will be called into use.

For the persons surveyed 2901 illnesses were recorded. These illnesses include those beginning prior to the survey year as well as within the year. The length and diagnosis of each illness occurring during the 12-month survey period were secured by an inter-

¹²The sample population of each of the five counties is found to be representative of the total farm population in terms of age, years of schooling, levels of living and farming data. A description of the sample populations and comparison of census and sample for each county are presented in Appendix D.

¹³The limitations of this definition are discussed in detail in Appendix A in the section entitled, "Degree of Disability."

viewer from one or more adult members of the household. Each household was visited only once.¹⁴

Many problems arise in the definition, enumeration, and diagnosis of illness. An accurate interpretation of illness rates is dependent on a careful consideration of these problems and procedures. Appendix A is devoted to a discussion of research procedures employed in this study, Appendix B to a consideration of the extent of underenumeration of illnesses, and Appendix C to a comparison of illness rates found in this survey with those reported for other studies.

III. EXTENT AND NATURE OF ILLNESS IN THE SURVEY POPULATION

In this section illness rates for the total population¹ are described, while in the following sections variations in sickness among the age, income and locality groups are considered. Illnesses suffered by the survey population are described in terms of their extent, duration and diagnosis. A large amount of chronic illness existed among the persons studied. One person in every six was ill three months or longer during the survey year.

Extent of Illness

Forty-four per cent of the persons in the five counties were ill for one or more days during the survey year; 28 per cent were ill less than three months and 16 per cent three months or longer.² That is, approximately two persons out of every three who were ill had illness lasting less than three months. Exactly one-fourth of all persons, or 57 per cent of those ill, had one or more illnesses which they considered sufficiently severe to be treated by a practitioner.³

Illness rates may not only be expressed as the proportion of persons ill but also in terms of the days of illness per person or per 1000 persons. The survey population suffered 53,777 days of illness per

¹⁴This visit occurred from one to 12 weeks after the last day of the survey period; over one-half of the households were visited within four weeks after the close of the survey year. Two persons did all the interviewing in Lewis, Franklin and Ray counties. Another individual conducted the interviews in Dallas county while five other persons collected the data in New Madrid county.

The survey period in Lewis county was August 1, 1938 to July 31, 1939; in Franklin and Ray counties July 1, 1939 to June 30, 1940; in Dallas county June 1, 1940 to May 31, 1941; in New Madrid county June 1, 1941 to May 31, 1942.

¹The total sample population is designated by the terms: survey population, total population, five-county population or population of all counties. The term Dallas or New Madrid or etc., county population, unless otherwise designated refers to the sample population of the given county.

²Illnesses lasting three months or longer are designated as "chronic" while those of a shorter duration are termed "short" or "acute". This classification is followed in the National Health Survey and is used here so that the data in this study would be comparable.

³The term "practitioner" as used here applies to doctors of medicine, osteopathic physicians and chiropractors. The great majority of illnesses recorded in this study were treated by doctors of medicine.

1000 persons or 53.8 days of illness per person.⁴ These latter two rates and the proportion of persons ill three months or longer are related and thus in the discussion to follow are frequently used interchangeably. These rates are related because approximately nine-tenths of the total days of illness are to be accounted for by illnesses lasting three months or longer.

A third type of illness rate used in this analysis is the number of illnesses per 1000 persons. During the survey year the 6017 persons had 2901 recorded illnesses, or 482 illnesses per 1000 persons.

Illness on the Last Day of the Survey Year.—Perhaps the illness rates least subject to under-enumeration are those dealing with illnesses occurring on the last day of the survey year. In the five counties 35 per cent of all illnesses were active and one person in every six was ill at the end of the year. Of the persons ill at this time, slightly over one-third had illnesses which had their onset within the survey year while the other two-thirds had illnesses which had begun prior to the survey year and thus had lasted during the entire 12 months of the study. Illnesses active at the end of the survey year were largely non-respiratory.

Illness Rates by Households.—As the household or family is the unit on which the cost of sickness is borne it is well to examine illness rates on this basis. Seventy-eight per cent of the 1544 households in the five counties had one or more persons ill during the survey year. There were 1.9 illnesses and 208 days of illness per household. This amount of illness per household is of no small consequence when its implications in terms of loss of remunerative labor and care of the sick are considered. Further analysis of illness on a household basis is presented below in the discussion of the relationship of income and of the relationship of household size to sickness.

Chronic Illness

A rate of 54 days of illness per person existed in the five counties. This rate of total sickness accounts for 15 per cent of the year. This high rate of sickness is to be explained by the relatively large number of long illnesses, as shown in Table 1.

Relative Extent of Acute and Chronic Illness.—In Table 1 the illnesses suffered by the five-county population are classified according to length. Forty-six per cent of the 2901 illnesses are found to have lasted less than two weeks while 23 per cent had a duration of a year or longer. Nearly one-third of the illnesses continued for three months or longer.

⁴Days of illness whether expressed per person or per 1000 persons should be interpreted in the same manner. The former is used more frequently because it is more easily stated. Because of the nature of the illness distribution, "mean days of illness" or "days of illness per person" is not a "typical" or "average" value. The most "typical" person, that is, a member of the largest statistical group, was not ill. The mean is not an "average" value because the illness distributions are U-shaped rather than bell-shaped. This fact as well as the justification for using the mean as a composite value are presented in detail in the section entitled "Association of Illness with Significant Social Factors" in Appendix A.

Although illnesses lasting three months or longer are only 32 per cent of all illnesses, these chronic illnesses accounted for 91 per cent of the total days of illness. Consequently, an analysis of rates based on days of illness deals chiefly with chronic illness. The mean days of sickness for chronic illnesses was 48.9 as compared with only 4.9 days for acute illnesses. Because of the high proportion of year-long illnesses the mean length of illness was 110.6 days.

TABLE 1. ILLNESSES IN THE SURVEY POPULATION CLASSIFIED BY LENGTH

Length of Illness	Number of Illnesses	Per Cent of Illnesses	Per Cent of Days of Illness	Mean Days of Illness
All Illnesses	2901 ^a	100	100	53.8
Under 2 weeks	1310	46	3	1.5
2 weeks to 2.9 months	646	22	6	3.4
3 months to 11.9 months	255	9	16	8.7
1 year and over	662	23	75	40.2

a. Includes 28 illnesses of unreported length.

A relatively high proportion of illnesses had their onset long before the beginning of the survey year. More than one-sixth of all illnesses are reported to have lasted over two years.

When the duration of illness is described in terms of persons it is found that 17 per cent of all persons were ill less than two weeks; 11 per cent, two weeks to 2.9 months; 5 per cent, three to 11.9 months; and 11 per cent, one year or longer. Fifty-six per cent of the survey population were not ill during the year.

Significance of Chronic Illness.—With the reduction of acute diseases and the aging of the population, chronic illness becomes a most important problem in the field of public health. There are few areas in which greater savings in life, suffering, and social and economic costs can be made than in the prevention and treatment of chronic illness.⁵ If these statements be valid, the amount of chronic illness discovered in this survey is of no small consequence. As has just been described, there was an average of 48.9 days of chronic illness in the five counties. One person in every six was wholly or partially disabled three months or longer, and one in every nine a year or longer.

⁵See *The Magnitude of the Chronic Disease Problem in the United States*, Preliminary Report of the National Health Survey Bul. 6 (1938).

If the rates found in the five counties⁶ were applied to the one and one-eighth million farm people of the State⁷, it would mean that nearly 175,000 persons would be wholly or partially disabled three months or longer during a typical year and that 125,000 individuals would have some disability the entire year. Over 56 million days of illness of a chronic nature would be suffered by the farm people of the State during such a year. In this survey 17 per cent of the males in the productive years, 15 to 64, were ill three months or more. This rate applied to the State would mean that over 62,000 rural-farm males in the most productive years of life would be wholly or partially disabled three months or longer during a year. The implications of such a large amount of chronic illness during a period of farm labor shortage are obvious.

A good portion of chronic illness in the later years of life is regarded as the result of exposure to infection and lack of proper treatment of defects at an earlier age. Thus it would seem that chronic illness demands not only facilities for treatment but also definite preventive measures of which health education is an important aspect. But education in regard to prevention and treatment of chronic illness may be more difficult than that for certain acute diseases. One reason for this is that chronic disease frequently has a slow, even imperceptible onset and less noticeable symptoms than have certain of the acute illnesses. As is described below, a decidedly higher proportion of accidents and poisonings reported in this survey were treated by practitioners than were certain illnesses of a chronic but less spectacular nature.

Diagnosis of Illness

The frequency and length of illnesses of various diagnoses are shown in Table 2. The respiratory illnesses are seen to have been the most numerous type; the 1196 respiratory ailments represented 41 per cent of all illnesses. Other types of illness in the order of their frequency were infectious and parasitic diseases, digestive ailments, injuries and poisonings, circulatory ailments, nervous diseases and genito-urinary disorders.⁸ The remaining illnesses not shown separately in Table 1 form one-sixth of all illnesses; these illnesses were either poorly defined, unclassifiable or with frequencies too small to show separately.

⁶While the data collected are held to be reliable for each county, the five counties taken together are not regarded as a thoroughly reliable sample of the State of Missouri. It appears to be weighted slightly in favor of the better socio-economic areas. Still, a little speculation may not be amiss as to the amount of illness existing in the State.

⁷The 1940 census figures are used here although it is known that the rural-farm population is somewhat less at the present time. As over 90 per cent of the population in this survey are rural-farm, implications are made for the rural-farm rather than for the total rural population.

⁸The classification of illness used in this study was taken from *A Diagnosis Code for Use in Tabulating Morbidity Statistics*, Bureau of the Census, reprint from Public Health Reports, Vol. 55, No. 35, (1940). As the diagnoses of illness in this survey are those reported by laymen and do not have medical verification, only a limited analysis is made of them.

The treatment of illness by a practitioner gives some indication that the illness was regarded as relatively severe by the patient or his relatives, and that the diagnosis of illness recorded in the survey is more likely to conform to the medical diagnosis.⁹ The type with the highest proportion of cases treated was injuries and poisonings, while the types with the lowest proportion treated were the respiratory disorders, and the infectious and parasitic ailments. Over 90 per cent of the injuries and poisonings were treated as contrasted with slightly over one-third of the respiratory ailments.

TABLE 2. ILLNESSES SUFFERED BY THE SURVEY POPULATION CLASSIFIED BY DIAGNOSIS

Diagnosis of Illness	Number of Illnesses	Per Cent of Illnesses	Number of Illnesses Per 1000 Persons	Mean Length of Illness (Days)
All Illnesses ^a	2901	100	482	110.6
Respiratory	1196	41	199	39.8
Non-respiratory ^a	1705	59	283	164.1
Infectious and Parasitic	262	9	44	41.8
Digestive	252	9	42	183.8
Injuries and Poisonings	175	6	29	63.8
Circulatory	152	5	25	277.7
Nervous ^b	148	5	25	165.0
Genito-Urinary ^c	139	5	23	236.6

a. This includes 438 ill-defined and unclassifiable illnesses and 139 illnesses falling into types with numbers too small to show separately.

b. The full title of this classification as it appears in the Morbidity Code is "Diseases of the Nervous System and Sense Organs".

c. This classification includes also deliveries, complications of pregnancy, etc.

There is some evidence that injuries and poisonings were considered more severe by the persons afflicted than certain illnesses of a more chronic nature in that a higher proportion of the former were treated. The proportion of injuries and poisonings treated was nearly one-fourth greater than that of circulatory disorders, digestive ailments and genito-urinary diseases. The mean duration, however, of the latter illnesses was over three times as long as that of injuries and poisonings.

⁹See Appendix A

The findings of this study conform to the well established facts concerning the relative length of illnesses of various diagnoses. The respiratory, and the infectious and parasitic illnesses had the shortest duration, the majority lasting less than a month; whereas circulatory, genito-urinary and digestive illnesses had the longest duration. The great majority of these illnesses continued for more than six months. Illnesses with a poorly defined diagnosis also had a relatively long duration. The fact that these illnesses were poorly defined and had a relatively low proportion treated is some indication that they were not regarded as serious by the persons suffering from them.

One-sixth of the illnesses in the five counties had two or more diagnoses. On the whole, it would be expected that illnesses of multiple diagnoses would be more serious than those of only one diagnosis.

IV. AGE AND SEX ASSOCIATED WITH ILLNESS

It has been generally observed that the amount of chronic illness increases with age and that young children and older persons have the greatest number of illnesses. The findings of this study are in accord with these observations. On the other hand, contrary to findings in other studies, no important difference is found in this survey between the sexes in the amount of illness.

Illness Related to Age

The extent and duration of illness in the five counties for persons of various ages are shown in Table 3. The rates show that for all types of illness persons 60 years of age and over had the greatest amount of sickness. Persons 15 to 24 years had the lowest per cent ill and the smallest number of illnesses per 1000 population. In this age class 37 per cent of all persons were ill one day or more during the survey year and there were 413 illnesses per 1000 persons as compared with 65 per cent ill and 678 illnesses for individuals 70 years of age and over who had the highest rates. It is to be noted that there is no substantial increase in these two rates, per cent of persons ill and number of illnesses per 1000 persons, until the age class 60-69 years is reached.

Treated Illness.—Rates of treated illness for the various ages are also shown in Table 3. In contrast to the rates for all illnesses, the rates of treated illness show more variation among the age classes. Children under 5 years and persons over 40 had the higher rates of treated illness. Persons 5 to 14 years of age with 198 treated illnesses per 1000 individuals had the lowest rate. From this age class the rate of treated illness increased gradually with age. Persons 70 years of age and over had 465 treated illnesses per 1000 popula-

tion, or a rate two and one-third times as great as that for persons 5 to 14 years of age.

Pronounced differences among the age classes in the rate of treated illness is in contrast to only slight and insignificant variations in this rate among the income groupings. A higher rate of treated

TABLE 3. EXTENT AND DURATION OF ILLNESS BY AGE FOR PERSONS IN THE FIVE COUNTIES

Age	Per Cent Ill	Illness Rates Per 1000 Population			Duration of Illness	
		Total Number of Illnesses	Number of Treated Illnesses	Total Days Ill	Days Per Illness	Per Cent of Persons Ill Three Months or Longer
All Ages	44	482	274	53,777	111	16
0-4	40	489	310	20,302	43	6
5-14	45	506	198	20,122	41	4
15-24	37	413	234	31,499	78	10
25-39	43	468	276	54,499	120	16
40-59	44	464	309	77,144	167	23
60-69	52	536	337	114,765	218	34
70 & over	65	678	465	161,253	241	47

illness for certain age classes indicates a greater effective demand for the service of practitioners by persons of these ages. Consequently, groups with an unusually large proportion of their population in these ages would have a greater demand for medical services than other populations with a smaller proportion of such persons. This implication is considered below in discussing the trend toward an older population.

Chronic Illness.—In the three right-hand columns of Table 3, rates describing the increase of chronic illness with age are shown. Days of illness per person were eight times as great for persons 70 years of age and over as for those under 15 years of age; the rates were 161 days as compared to 20 days. The rate based on days of illness increases in a geometric manner beginning with persons 5 to 14 years of age.

This fact is represented graphically in Figure 2 in which the relationship of days of illness and age is shown. Also in Figure 2 is a curve representing the relation of the number of illnesses with age.¹ The number of illnesses increases much less with age (even

¹The curve showing the relation of days of illness with age is of the semi-logarithmic type. Data from which this curve is drawn are presented in Table 23, Appendix E. As this curve suggests, differences among the age classes in the proportion of persons with acute and chronic illness are highly significant statistically.

The curve representing the relation of number of illnesses to age is a free hand curve and the data for it are also taken from Table 23.

showing a decline in the earlier years) than the days of illness.

Thus, the increase in the amount of illness with age is largely an increase in the length of illness rather than in the number of illnesses. Persons 70 years of age and over had illnesses which

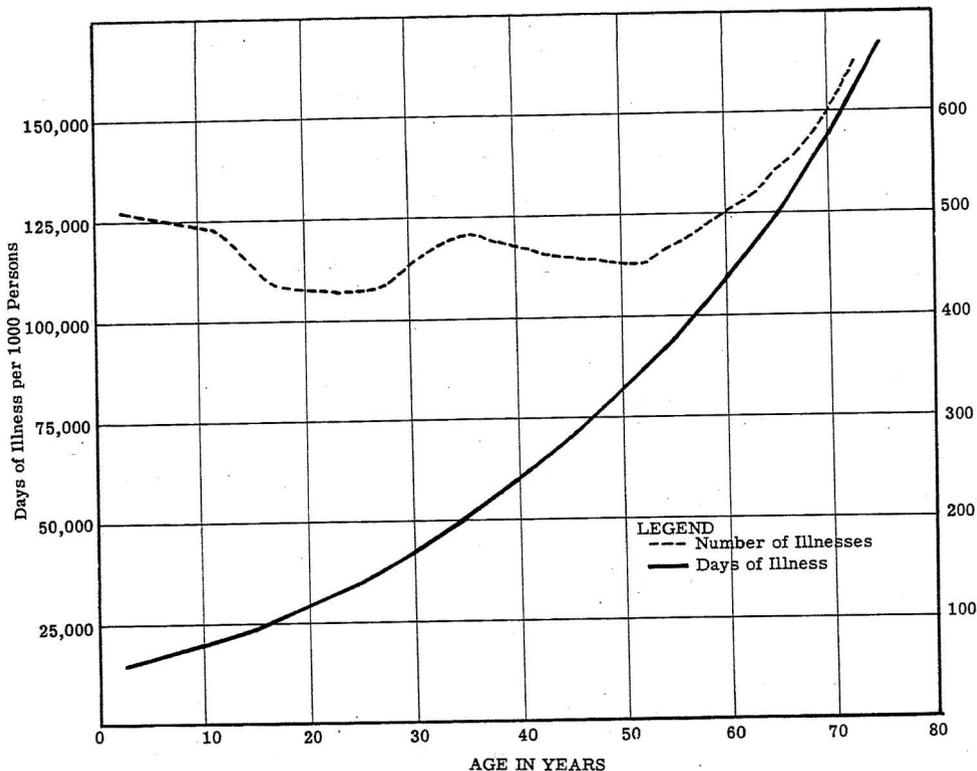


FIGURE 2. RELATION OF DAYS OF ILLNESS AND NUMBER OF ILLNESSES PER 1000 PERSONS TO AGE

averaged 241 days in length. These illnesses were nearly six times as long as the average illness of persons under 15 years of age. Likewise, 5 per cent of the individuals under 15 years of age were ill three months or more during the year as compared with 47 per cent of persons 70 years of age and over.

As these rates suggest, most of the illness of older persons was of a chronic nature while the greater proportion of the sickness of youth and children was of a relatively short duration. Of the persons ill under 15 years of age only 12 per cent had illnesses lasting three months or longer. In comparison, 70 per cent of persons 60 years of age and over who were ill had illness of a chronic nature.

Although sickness of a chronic nature increases rapidly with age, chronic illness is not only a problem of old age. Nearly three-fourths

of the persons ill three months or longer were under 60 years of age, two-fifths were under 40 and one-fifth under 25.

The findings of this survey are in general agreement with other studies² concerning the relationship of age and illness. Beginning with persons in their twenties the number of days ill is found to increase with age. The National Health Survey reports a rate over six times as great for persons 65 years of age and over as for those under 15. The ratio is similar to that found in this study. Rates based on number of illnesses show a definite increase in ages over 50.

Illness by County.—A similar type of association of days of illness and age, as is observed for the total population, is found also in each county. This is seen in Table 4 in which illness rates by age classes are presented for each county. Dallas rates were two to three times as high in all classes as the rates for the other counties. The greatest proportional differences between the Dallas rates and those for the four counties were in the years 15 to 59, while among the four counties there were the least variations in rates for these years.³

TABLE 4. DAYS OF ILLNESS PER PERSON CLASSIFIED BY AGE AND COUNTY

Age	Total	County				
		Dallas	Ray	Lewis	Frank- lin	New Madrid
Mean Days of Illness						
All ages	53.8	115.9	56.6	44.0	39.8	31.3
0-14	20.2	39.8	21.2	20.0	13.0	13.4
15-24	31.5	82.9	26.6	20.9	17.1	22.3
25-39	54.5	126.7	37.9	46.5	36.1	34.2
40-59	77.1	195.5	63.4	53.0	49.7	63.2
60 & over	133.8	237.6	136.6	94.5	113.8	82.0
Mean Days of Illness for Each Age Class Expressed as a Ratio of Age Class 0-14						
0-14	100	100	100	100	100	100
15-24	156	208	125	104	132	167
25-39	270	318	179	232	277	256
40-59	382	491	298	264	381	473
60 & over	662	597	643	471	874	614

The lower portion of this table shows the proportional increase in days of illness as age increases. An important observation here is that for the productive years 15 to 59 the ratios are higher for Dallas county than for the other counties. This means that in Dallas

²See Britten, R. H., et al., *The National Health Survey*, reprint 2143 from Public Health Reports, (1940); Collins, S. D., *Cases and Days of Illness Among Males and Females with Special Reference to Confinement to Bed*, reprint 2129 from Public Health Reports, (1940); Sanderson, *op. cit.*, Wilson and Metzler, *op. cit.*

³Illness rates which are adjusted for age are computed from rates shown in Table 4. Justification for using the age classes employed in this table and other age classifications used in this section is seen by inspecting Table 23, Appendix E.

county there was a more rapid increase in illness rate in these ages. Thus in comparison with the other counties, persons in the most productive years in Dallas county had a disproportionately high rate of illness.⁴

Implications of An Aging Population

The farm population of Missouri is aging. That is, the proportion of older persons is increasing. This has been the trend for a number of years. Three-quarters of a century ago, in 1870, only one person in every 50 in Missouri was 60 years of age and over. By 1940 the proportion of older persons in the farm population of the State had increased until one individual in every eight was in this age class. It is predicted that by 1960 one farm person in every six will be 60 years of age or over.

Implications of this growing proportion of older persons may be seen in terms of the amount of chronic illness, demand for medical service and need for public assistance. As the rate of chronic illness increases rapidly with age, the total amount of such illness will also increase with a growing proportion of older persons. This will be true unless the rate of chronic illness for older persons is appreciably reduced. If the proportion of older persons increases as predicted and the sickness rates of this study apply, by 1960 the farm population of the State will have a gross rate of days of illness one-seventh greater than that in 1940.

TABLE 5. COMPARISON OF MALE AND FEMALE ILLNESS RATES FOR THE POPULATION OF THE FIVE COUNTIES

Sex	Number of Persons	Per Cent of Persons			Number of Illnesses per 1000 Persons	Mean Days of Illness per Person
		Ill	Ill less than 3 Months	Ill 3 Months or More		
Total	6017	44	28	16	482	53.8
Male	3162	44	29	15	479	51.5
Female	2855	44	28	16	486	54.9

A growing proportion of older persons in the population means not only an increased potential demand for medical service but also a greater actual demand. It is shown above that with the exception of young children the rate of treated illness increased with age. Persons 60 years of age and over had a rate of treated illness nearly twice as high as those 5 to 24 years of age. This likelihood of growing demand for medical services is to be seen in the light of

⁴See Appendix B for a fuller explanation of the Dallas county rates.

the fact that the number of practitioners in rural areas of the State has been on the decline.⁵

An excessive amount of illness such as that found among the aged frequently increases the need for public assistance. Consequently, as the proportion of older persons with a relatively large amount of chronic illness grows, an increased need for public assistance may be expected. There is evidence that this will be the case unless the rates of chronic sickness are reduced considerably. Families apparently have less inclination now than formerly to care for their aged relatives who are dependent. Furthermore, in this study a disproportionate share of older persons were found in the lower income levels. The proportion of persons 60 years of age and over with incomes of less than \$250 was twice as great as the proportion with incomes of \$1000 and over.⁶

Illness and Sex.

Illness rates for males and females are compared in Table 5. The male and females rates are very similar with no important differences between them.⁷ Females have a slightly higher rate of chronic illness which accounts for the higher mean days of illness. If deliveries and complications of pregnancy are excluded females have a slightly lower rate based on number of illnesses than males.

All studies reviewed⁸ on the subject show greater differences between male and female rates than this study reveals. In all cases the female rates are higher than the male and in some studies the differences are pronounced. The National Health Survey⁹ reports over twice as many female workers and housewives disabled on the day of visitation as male workers. A Baltimore study¹⁰ shows that the number of illnesses suffered by females was nearly one-half greater than that for males. The data of the Committee on Cost of Medical Care¹¹ show a pronounced difference between males and females with regard to rates of non-disabling illness but a smaller difference for rates of disabling illness. All illnesses in the present study were defined as disabling to some degree.

It may be of importance to note that the studies which show the greatest differences between male and female illness rates deal with predominantly or totally urban populations. Whether this means that farm women relative to men are healthier or less conscious of

⁵Data on the decrease in number of practitioners in rural Missouri are presented in a forthcoming publication.

⁶The percentages are 18 and 9 respectively. See Table 22, Appendix D.

⁷The difference is not statistically significant.

⁸Studies reviewed are: Hailman, D. E., *The Prevalence of Disabling Illness Among Male and Female Workers and Housewives*, Public Health Bul. 260, (1941); Preas, S., and Phillips, R., *The Severity of Illness Among Males and Females*, reprint from The Milbank Memorial Fund Quarterly, Vol. XX, No. 3, (1942); Collins, *op. cit.*; Sanderson, *op. cit.*; Wilson and Metzler, *op. cit.*; and Wilson, *op. cit.*

⁹Hailman, *op. cit.*

¹⁰Preas & Phillips, *op. cit.*

¹¹Collins, *op. cit.*

organic and functional disorders than urban women, there is not sufficient evidence to say.

Diagnosis of Illness and Age and Sex

Rates of illnesses of selected diagnoses by age and sex are shown in Table 6 for the population of the five counties. The findings presented in this table are in general accord with the established facts concerning types of illness most common at various ages. Illness types of which the younger persons had the higher rates are shown in the upper portion of Table 6 and those of which the older persons had the higher rates are presented in the lower portion of the table.

Younger persons had the higher rates for infectious and parasitic diseases and for respiratory ailments. Seventy per cent of the illnesses of persons under 15 years of age were of these two diagnostic types. Rates of injuries and poisonings were very similar for all ages except the rate was moderately higher for persons 25 to 39 years of age.

TABLE 6. NUMBER OF ILLNESSES OF SELECTED DIAGNOSES PER 1000 PERSONS BY AGE AND SEX FOR THE POPULATION OF THE FIVE COUNTIES

Diagnosis of Illness	All Ages	Age Classes					Sex	
		0-14	15-24	25-39	40-59	60 & over	Male	Female
All Diagnoses ^a	482	500	413	468	464	594	479	486
Infectious and Parasitic	44	93	40	27	6	15	38	51
Respiratory Injuries and Poisonings	198	253	195	198	154	137	205	190
Digestive	42	30	40	54	50	42	39	45
Nervous	25	20	15	18	22	56	19	27
Genito-Urinary	23	7	22	28	27	50	14	32
Circulatory	25	1	6	22	50	78	25	26

a. This includes 438 ill-defined and unclassifiable illnesses and 139 illnesses falling into types with numbers too small to show separately.

Older persons had decidedly higher rates for circulatory ailments, genito-urinary diseases and nervous disorders and a moderately high rate for digestive illnesses. Almost two-fifths of the illnesses of persons 60 years of age and over were of these four diagnostic types. The great majority of illnesses of the diagnoses just named were of a chronic nature. Thus some indication is given of the nature of chronic illness which has been described above as a major health problem for older persons.

In Table 6, females are seen to have had higher rates than males for all types except injuries and poisonings, and respiratory illnesses. Yet the excess of the female rates over the male rates is not so great in the five types in which females had the higher rates, but that the total rate of illness for males and females is much the same. Injuries and poisonings and genito-urinary disorders are the types for which the greatest proportional differences between males and females occurred. As might be expected, males have the higher rate of injuries because of greater occupational hazards. Females have a higher genito-urinary rate because complications of pregnancy and disability created by childbirth are included in this classification.

V. INCOME AND ILLNESS

People with low incomes have generally been found to have more illness than persons of a higher economic status.¹ For the most part this is the case in this study in that persons with the lowest incomes² had the highest rates of illness, especially of a chronic nature. Age differences account for some variations in rates of illness among the income classes. Other possible reasons for variations in illness are suggested and some implication of these differences are considered.

Illness in the Total Population

Income classes³ in the five counties are compared with respect to selected illness rates in Table 7. The per cent of persons ill is seen to show a slight but consistent decline from 47 per cent for persons with the lowest incomes to 40 per cent for those in the highest income levels. Likewise, there was a similar difference between the lowest and highest income groups in the number of illnesses per 1000 persons. Persons at the income level \$250-499 with the highest rate, had 523 illnesses per 1000 persons. This is to be compared with 422 illnesses per 1000 persons in the income class \$1000-1499 which had the lowest rate.

There was less variation in the rate of acute illness among persons in the various income groups than in the rate of total illness just described. The percentage of persons ill three months or less ranged from 29 per cent in income class \$250-\$499 to 25 per cent in the class, \$1500 and over.

¹See Collins, S. D., *Economic Status and Health*, Public Health Bul. No. 165 (1927); Falk, I. S., et al., *The Incidence of Illness and the Receipt and Costs of Medical Care Among Representative Families*, C. C. M. C. report No. 26, part II, (1933); Britten, et al., *op. cit.*; Wilson and Metzler, *op. cit.*; Wilson, *op. cit.*

²In this survey, income is regarded as an index of level of living. See Table 20 in Appendix D.

³Incomes were recorded on a household basis.

Chronic Illness.—The significant differences among the income classes are found in the rates of chronic illness.⁴ Rates of chronic illness were 70 per cent greater for persons with incomes under \$250 than for those at the income level \$1000-\$1499 who had the lowest rate. The intermediate income groups had intermediate rates.

TABLE 7. SELECTED ILLNESS RATES FOR PERSONS IN THE FIVE COUNTIES CLASSIFIED BY FAMILY INCOME

Income Class	Number of Persons	Per Cent of Persons			Days of Illness per Person	Number of Illnesses per 1000 Persons	
		Ill	Ill less than 3 Months	Ill 3 Months or Longer		All Ill-nesses	Treated Illnesses
All Incomes	6017 ^a	44	28	16	53.8	482	274
Under \$250	689	47	27	20	70.2	508	277
\$250-\$499	1833	47	29	18	60.0	523	264
\$500-\$749	1229	43	28	15	50.5	491	286
\$750-\$999	671	41	28	13	41.9	456	280
\$1000-\$1499 ^b	734	40	28	12	39.2	422	249
\$1500 and over ^c	708	40	25	15	51.5	435	304

a. Includes 153 persons with income not reported.

b. Rates for income classes \$1000-\$1249 and \$1250-\$1499 are very similar, thus the combination.

c. As rates for income classes \$1500-\$1999 and \$2000 and over are almost the same, they are also combined.

Twenty per cent of the persons with incomes under \$250 were ill three months or longer during the survey year as compared with 12 per cent of those with incomes of \$1000-\$1499; the days of illness per person in these two income groupings were 70 and 39 respectively. Persons with the highest incomes, \$1500 and over, had rates of chronic illness somewhat higher than those with incomes \$1000-\$1499; in the highest income class 15 per cent of the population had chronic illness, with an average of 51.5 days of illness per person.⁵

Treated Illness.—The rate of illness treated by a practitioner for each income class is shown in the right hand column of Table 7. Variations in the rate of treated illness among the income classes are small and unimportant. Persons with incomes under \$250 had

⁴These differences are statistically significant. The National Health Survey, which is concerned with an urban population, also finds that the differences in illness rates between the income classes are much greater for chronic than for acute illnesses. See *Illness and Medical Care in Relation to Economic Status*, Preliminary Reports, Bul. 2, (1939).

⁵Although the income class \$1500 and over had a higher rate of chronic illness than the income class \$1000-1499, which had the lowest rate, the rates of chronic illness did not continue to rise with income, but rather after a moderate rise from the middle incomes leveled off. For example, in New Madrid, Ray and Franklin counties, which had nearly five-sixths of the total population with incomes of \$1000 and over, the rate of chronic illness for the income class \$2000 and over was the same as that for the class \$1250 to \$1499. At least part of the differences in chronic illness rates between the middle and highest income groups may be explained in terms of age differences.

277 treated illnesses per 1000 persons. This is to be compared with a rate of 276 treated illnesses for persons with incomes of \$1000 and over and a rate of 304 treated illnesses for those with incomes of \$1500 and over.

In spite of the fact that there were no significant variations in the rate of treated illness, there were no doubt considerable differences among the income classes in their ability to purchase medical services. Does this imply that the economic status of farm people does not greatly influence the number of illnesses which they regard as sufficiently severe to demand medical care? It must be sufficient here to raise this question. An attempt to answer it in the light of the data gathered in this survey will be made in a future publication concerning the use of medical services by the population represented herein.

Although the rate of treated illness is much the same for the lower and higher income classes, persons with the higher incomes had a larger proportion of their illnesses treated, and they had fewer illnesses. Persons at income levels under \$500 had 51 per cent of their illnesses treated by a practitioner while those with incomes of \$1000 and over had 65 per cent treated.

County Differences in Chronic Illness

It was found above that for the total population persons with the lower incomes had a significantly greater amount of chronic illness than individuals at the higher income levels. As is seen in Table 8, this condition existed in three of the five counties—Dallas, Lewis and

TABLE 8. PER CENT OF PERSONS ILL THREE MONTHS OR LONGER BY INCOME CLASS FOR EACH OF THE FIVE COUNTIES

Income	Five Counties	County				
		Dallas	Lewis	Franklin	Ray	New Madrid
All incomes	16	33	13	11	15	10
Under \$250	20	42	19	20	21	9
\$250-\$499	17	33	14	15	13	11
\$500-\$999	14	32	14	9	13	7
\$1000 and over	13	26	9	9	17	12

Franklin. On the other hand, in New Madrid and Ray counties the lower income classes did not uniformly possess the higher rates of chronic illness.

In Dallas, Lewis and Franklin counties, persons with incomes under \$250 had the highest rates of chronic illness while those at

income levels of \$1000 and over had the lowest rates of chronic illness. In Lewis and Franklin counties, the per cent of persons ill three months or longer was more than twice as great in the lowest income class as in the highest; in Dallas county, more than one-half greater.

By contrast, in New Madrid and Ray counties no differences in rates of chronic illness occurred between persons with incomes under \$500 and those with higher incomes. In these counties the lowest rates of chronic illness were in the intermediate income groups; persons at the highest income levels had an appreciably greater amount of sickness.⁶

Illness Rates Adjusted for Age

The income classes varied concerning the proportion of persons of various ages. In the five counties, the lowest income classes, particularly the one under \$250, had the largest proportion of older persons. The middle income groups had the smallest proportion of older persons and the highest percentage of children. The highest income classes had an intermediate proportion of older persons.⁷ This same general relationship between income and age was found in each county.

Thus, in order to discover the extent to which differences in age account for variations in illness among the income classes, it is necessary to adjust sickness rates for age. Crude and adjusted rates of days of illness by income are compared for selected populations in Table 9.⁸ It is seen that there are smaller differences among the adjusted than among the crude rates for all three of the four populations compared. For the five counties, adjustment for age reduces the difference between the lowest and highest rates by approximately 20 per cent. In Lewis and Franklin counties, and in Dallas county the differences between the highest and lowest rates are reduced by one-half or more when adjustment is made for age, while in Ray and New Madrid counties the lower income groups have relatively higher rates when such adjustment is made.

In the five counties, 12 per cent of the population belonged to families with incomes of less than \$250 per year. Even after correction for age, this 12 per cent of the population had an illness

⁶Rates of chronic illness in both New Madrid and Ray counties were higher for persons with incomes of \$1000 and over than for individuals at economic levels below this figure. It is quite possible, however, that persons of higher social and economic standing had a more liberal notion of sickness and were more conscious of illness than those of lower status.

⁷Eighteen per cent of the persons with incomes under \$250 were 60 years of age or over as compared with 9 per cent of those with incomes over \$500. The intermediate income class, \$500-\$999, had 35 per cent of its population under 15 years of age and 30 per cent 40 years of age or over. This is to be compared with 27 per cent and 35 per cent respectively for the income group \$2000 and over. See Table 22, Appendix D.

⁸Illness rates are adjusted for age on the basis of the age distribution of the rural-farm population of Missouri. Five age classes are used in this computation—0-14, 15-24, 25-39, 40-59, and 60 and over. The basis of this classification as to years is to be found in the following section. The adjustment of illness rates for age might have been more exact had specific rates for five year age classes been used. It was not advisable, however, to use five year age classes because of the small frequencies in some classes.

TABLE 9. COMPARISON OF CRUDE AND ADJUSTED RATES OF DAYS OF ILLNESS PER PERSON BY INCOME FOR THE FIVE COUNTIES, LEWIS AND FRANKLIN COUNTIES, DALLAS COUNTY AND RAY AND NEW MADRID COUNTIES

Income Classes	Five Counties		Lewis and Franklin Counties		Dallas County		Ray and New Madrid Counties	
	Crude	Adjusted	Crude	Adjusted	Crude	Adjusted	Crude	Adjusted
All Incomes	53.8	56.7	41.7	40.7	115.9	123.5	39.2	45.2
Under \$250	70.2	67.1	69.9	55.2	155.0	151.1	35.2	39.8
\$250-\$499	60.0	62.0	49.1	45.5	121.3	120.9	38.9	49.2
\$500-\$999	47.7	51.5	37.8	39.0	105.4	118.3	32.2	37.5
\$1000 and over	45.6	48.1	33.0	31.7	89.2	122.4	48.2	51.4

rate based upon days of illness that was 40 per cent greater than the one-fourth of the population with incomes of \$1000 and over.

Greatest Differences in the Older Ages.—For the total population the greatest difference in days of illness occurs when persons are divided into two income classes: those under \$500 and those of \$500

TABLE 10. COMPARISON OF INCOME CLASSES UNDER \$500 AND \$500 AND OVER AS TO DAYS OF ILLNESS PER PERSON BY AGE FOR THE FIVE COUNTIES

Age	Mean Days of illness by Income Classes		Ratio of Rates, Column 1 to Column 2 (3)
	Under \$500 (1)	\$500 and Over (2)	
All ages	62.8	46.8	134
0-14	22.7	19.1	119
15-24	30.4	33.8	90
25-39	55.3	55.2	100
40-59	94.6	66.7	142
60 and over	155.7	105.6	147

and over. On this point, it may be asked whether the difference in illness rates between these two income classes is the same for all ages. Data on this question are presented in Table 10. Here illness rates for the two income classes are compared by age, and the ratio of the rates under \$500 to those \$500 and over are shown. The rate of illness for all ages in the group with incomes under \$500 is approximately one-third greater than for the group with higher incomes. But almost all of this difference in illness is accounted for by persons over 40 years of age. In other words, one reason for the

lower income classes having the higher illness rates is that the older persons in these groups have more sickness than individuals of the same age with higher incomes.

As the chronic illness of older persons accounts for a large portion of the total days of illness of a population, it is of interest to note that in the five counties 47 per cent of the persons 60 years of age and over with incomes under \$500 were ill three months or longer. This is to be compared with 31 per cent of the persons of this age with incomes of \$500 and over.

Unequal Distribution of the Illness Burden

Marked variations in the amount of illness among the counties, among age groupings and among income classes emphasize the fact that the burden of illness is unequally distributed, particularly when such a relatively short period as one year is considered. Insofar as the differences in amount of illness are accounted for by sickness of a chronic nature, however, they should not be regarded as yearly or seasonal variations but as relatively permanent conditions. Because of the large amount of chronic illness, a relatively small proportion of persons account for most of the total days of illness. One-sixth of the population had 91 per cent of the total days of illness.

Illness on a Household Basis.—In the five counties four-fifths of the total days of illness occurred in less than one-third of the households. This unequal burden of illness should be seen in relation to the financial ability of the household or family to assume such a responsibility. For this purpose, it is well to compare the illness rates for households in the lower with those in the higher income groups. Two-fifths of the total population lived in households with incomes under \$500. Although households with these incomes were smaller than the higher income households, these lower income households in the five counties had 226 mean days of illness as compared with 195 mean days of illness for households with incomes of \$500 and above.⁹

As was indicated above, households with the lower incomes not only had a decidedly higher proportion of older persons, but these individuals also had higher rates of chronic illness. Households with incomes under \$250 included 12 per cent of the total population, had 18 per cent of the persons 60 years of age and over, and 15 per cent of the total days of illness. Implications of this situation in regard to the need for public assistance have been discussed above.

The Unequal Burden of Illness—Reasons and Implications.—The poor have generally been found to have a greater amount of illness and higher death rates than persons of higher economic status.

⁹The mean number of illnesses per household was the same for incomes under \$500 as it was for the higher incomes. This rate was 1.9 illnesses per household.

Reasons for this condition are not entirely evident.¹⁰ The living conditions and health habits of persons at the lower economic levels may be more conducive to illness than is the case for those with higher incomes. Perhaps the higher rates of chronic illness for older persons with lower incomes may be explained in this manner. Exposure to infection and lack of proper treatment of defects in the early years of life are regarded as an important cause of chronic illness in later life. Thus, one might expect that the older persons at the lower income levels had been exposed to greater health hazards in their youth than individuals of a higher economic status.

Some families may be found in the low income groups largely because of the economic burden of sickness. Ill health not only limits earning capacity but the cost of excessive illness may reduce a hitherto prosperous family to relatively low economic status. In this study the lower income classes had a greater proportion of persons in the ages with the higher rates of illness, especially of treated illness. In the five counties the proportion of persons under 15 years of age and 60 years of age and over declined consistently as income rose. The income class under \$250 had a proportion of persons of these ages one-third greater than the income group \$2000 and over—48 per cent as compared with 36 per cent.¹¹

If the amount of illness may be regarded as a measure of the need for medical services, the findings of this study indicate that the need varies considerably from group to group. The greatest need for medical service is likely to be in the low income groups and, as shown on the following pages, in localities which are the most physically isolated from medical facilities. These conditions raise the question as to whether adequate medical and health services are available in spite of these economic and physical barriers. Furthermore, if adequate facilities are not available, how may they be supplied?

VI. LOCALITY VARIATIONS IN ILLNESS

Some marked locality variations in the amount of illness are to be observed. Some areas had two to three times the illness as existed in other areas. For the most part the localities which had the higher illness rates had the lower levels of living and were more isolated from medical services than the areas with the lower illness rates.

County Differences in Illness Rates

Selected illness rates for each of the five counties are presented in Table 11. The most marked differences are seen to have existed between Dallas and the other four counties. Thirty-seven per cent of

¹⁰Collins, *op. cit.*, suggests three factors which may explain the greater amount of illness among the poor. These he classifies as hereditary, environmental and selective.

¹¹See Table 22 in Appendix D.

the population in the four counties were ill as compared with 76 per cent of the Dallas county population. Forty-three per cent of all persons in Dallas county were ill less than three months. This is not quite twice the 25 per cent for the other four counties, whereas for persons ill three months or longer the Dallas rate of 33 per cent was nearly three times as high as the four-county rate of 12 per cent. In other words, the difference in the rate of short illness between Dallas and the other four counties is not as great as the variation in the rate of chronic illness.

County differences with respect to the mean days of illness per person and the number of illnesses per 1000 persons are similar to the rates just described. Dallas county had 115.9 days of illness per person and 878 illnesses per 1000 persons as compared to rates of 40.6 days and 401 illnesses in the other four counties. The rates in the five counties were 53.8 days of illness per person and 482 illnesses for each 1000 persons.

TABLE 11. PERSONS IN THE SURVEY POPULATION CLASSIFIED BY COUNTY AND BY DURATION OF ILLNESS

County	Number of Persons	Per Cent of Persons			Days of Illness per Person	Number of Illnesses per 1000 Persons
		Ill	Ill Less Than 3 Months	Ill 3 Months or Longer		
Five counties	6017	44	28	16	53.8	482
Dallas	1018	76	43	33	115.9	878
Ray	1004	42	27	15	52.6	462
Lewis	1121	45	32	13	44.0	497
Franklin	1292	36	25	11	39.8	387
New Madrid	1582	29	19	10	31.3	308

Although Dallas county is the most deviant, there are noticeable differences in illness rates among the other four counties. Of these, Ray and Lewis had the highest rates and New Madrid the lowest.¹ Ray county had the highest rate of chronic illness and Lewis the highest rate of short or acute illness. The proportion of persons ill three months or longer was one-half greater in Ray county than in New Madrid county. Some explanations for county variations in illness are given below.

¹New Madrid county had a much larger proportion of illnesses of unknown length than any of the other counties. The mean days of illness per person for New Madrid county might have been as much as one or two days greater were the length of all illnesses known. This type of under-reporting for the other counties was negligible. See Appendix A for further elaboration of this point.

Differences and Similarities in Rates.—The higher gross rates of illness in Dallas county may be explained by (1) a higher rate of chronic illnesses, (2) longer duration of chronic illnesses and (3) a higher rate of acute illnesses of a respiratory nature. Dallas county had not only twice the rate of chronic illness that existed in the other counties but the average length of chronic illnesses was one-fourth greater.

Dallas county had over twice as many illnesses per 1000 persons as the other four counties. Both the respiratory and non-respiratory rates were higher in Dallas county than in the other counties—the respiratory rate being proportionally the greater. See Table 16 in

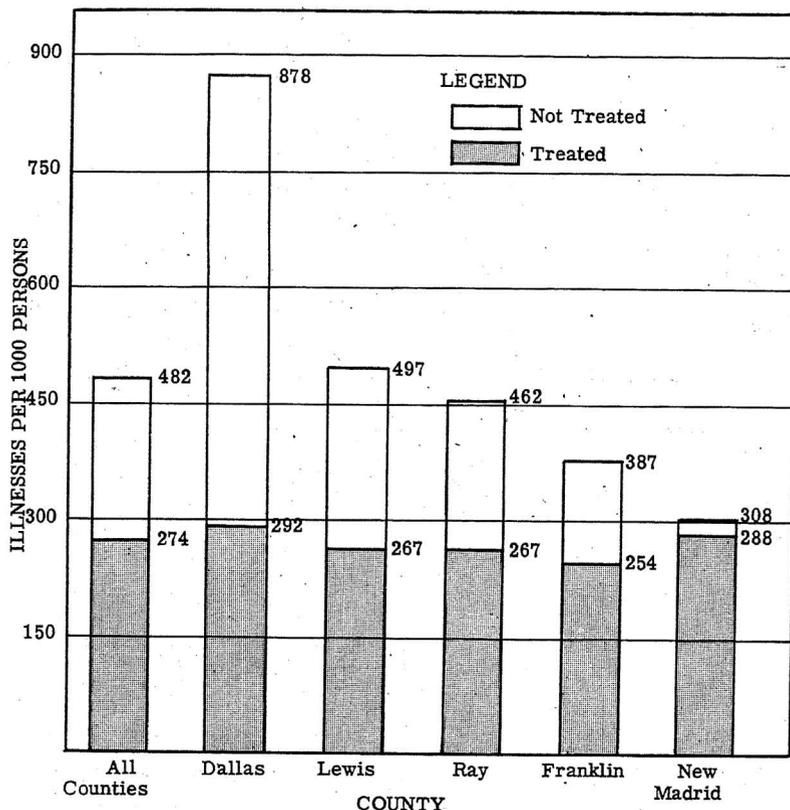


FIGURE 3. TOTAL NUMBER OF ILLNESSES AND NUMBER OF TREATED ILLNESSES PER 1000 PERSONS, BY COUNTY

Appendix B. Injuries and poisonings was the only major illness type which did not have a higher rate for Dallas than for the other counties.

Chronic illnesses formed only a slightly larger portion of all illnesses in Dallas county than in the other counties. In the five

counties nearly one-third of all illnesses continued for three months or longer. This rate ranged from 27 per cent in Lewis county to 37 per cent in Dallas county. See Table 17 in Appendix B. In Lewis county the chronic illnesses contributed 89 per cent of the total days of illness while in Dallas county the chronic illnesses accounted for 94 per cent of the total days.

On the last day of the survey year 33 per cent of the population was ill in Dallas county as compared with 14 per cent in the other four counties. This difference in proportion of persons ill is to be accounted for entirely by those illnesses beginning prior to the survey year. Six per cent of the population in Dallas county and exactly the same proportion in the other four counties were ill on the last day of the survey year suffering from illnesses beginning within that year. This indicates a similarity in rates of short illnesses of a non-respiratory nature. See Table 18 in Appendix B.

The five counties also had similar rates with regard to illnesses treated by a practitioner. This is seen in Figure 3 in which the total illnesses are compared with the treated illnesses for each county. The rate of illnesses treated by a practitioner ranged from 254 per 1000 persons in Franklin county to 292 in Dallas county.

Age Differences Account for Some Variation in Illness.—Differences in age composition account for some variation in illness among

TABLE 12. PERSONS CLASSIFIED BY COUNTY AND BY CRUDE AND ADJUSTED RATES OF NUMBER AND DAYS OF ILLNESS DURING YEAR OF SURVEY

County	Number of Persons	Number of Illnesses	Number of Illnesses per 1000 Persons		Days of Illness per 1000 Persons	
			Crude Rate	Adjusted Rate	Crude Rate	Adjusted Rate
Total	6017	2901	482	483	53,777	56,663
Dallas	1018	894	878	875	115,914	123,452
Ray	1004	464	462	461	52,645	49,509
Lewis	1121	556	497	499	43,998	41,918
Franklin	1292	500	387	385	39,849	39,057
New Madrid	1582	487	308	327	31,295	38,687

the counties. This is true because, as is described above, illness varied with age. Consequently, other things equal, older populations have more illness than younger ones. Illness rates adjusted for age² are to be interpreted on the basis of the assumption that if each population had the same age composition the rates would be as stated. A comparison of crude and adjusted illness rates for each of the

²The procedure used in adjusting illness rates for age has been described in the preceding section.

five counties is presented in Table 12. The differences between crude and adjusted rates are much greater with respect to days of illness than with regard to the number of illnesses. For the four counties the adjusted rates of days of illness are more alike than the crude rates. The adjusted rates of Franklin and New Madrid counties are almost the same. On the other hand, the difference in the adjusted rates between Dallas and the other four counties is even greater than the difference in the crude rates.

TABLE 13. COMPARISON OF SELECTED ILLNESS RATES FOR SAMPLE AREAS OF FRANKLIN, RAY AND LEWIS COUNTIES

Sample Areas	Number of Persons	Per Cent of Persons			Mean Days of Illness
		Ill	Ill Less Than 3 Months	Ill 3 Months or Longer	
Franklin County					
A	280	50	35	15	52.3
B, C, D	1018	25	17	8	36.4
Ray County					
A	448	47	28	19	66.9
B, C	556	38	27	11	40.8
Lewis County					
A	280	51	33	18	58.8
B	312	57	44	13	39.7
C, D	529	34	23	11	38.7

In the four counties the specific rates for days of illness for the productive years 16 to 64 are even more similar than the adjusted rates shown in Table 12. In New Madrid county the mean days of illness in the 16-64 age class was 43.2, in Franklin county 43.5, in Lewis county 44.1 and in Ray county 48.7.

Sample Area Variations in Illness

Considerable variation in illness rates have been found among the counties. Consequently, the question arises as to whether similar differences existed among the sample areas within the counties.³ In Franklin, Ray and Lewis counties one or more sample areas differed in a pronounced manner from the remainder of the county in regard to the extent of illness.⁴ In Table 13, the deviant sample

³The sample areas within each county were selected on the basis of level of living, soil fertility, type of farming, and distance to practitioner and trade center. The areas approximate large neighborhoods in size, ranging from 60 to 136 households each.

⁴These differences were statistically significant. If the highly deviant areas are omitted, no statistically important differences were found among the remaining areas. Only relatively small differences existed among the sample areas in New Madrid county and among those in Dallas county.

areas in each of these counties are compared with the remainder of the county on the basis of selected illness rates.

The deviant sample areas had rates from one and one-half to two times as high as the remainder of the respective counties. Area B in Lewis county⁵ was the only locality of the four in which the higher illness rates were of an acute nature entirely. This area had an influenza epidemic during the survey year. Area A in Ray county differed from the remainder of the county only in the rate of chronic illness, while illness differences for area A in Franklin county and area A in Lewis county were in terms of both acute and chronic sickness. These last two areas had higher rates of illness for all the major diagnostic types. In contrast to differences in rates of acute illness which may fluctuate from year to year, differences in the rates of chronic illness among given areas are likely to remain much the same.

Of the 19 sample areas in the five counties, seven had decidedly higher rates of illness than the others. These seven localities include the four described above and the three sample areas in Dallas county. The illness rates in Dallas county do not appear so deviant in view of the rates found in the four areas in Franklin, Ray and Lewis counties described above. From 38 to 46 per cent of the population in the sample areas in Dallas county were ill less than three months and from 31 to 34 per cent were ill three months or longer.

On the whole, several interrelated conditions characterized the seven sample areas which had the highest rates of illness. These areas were relatively isolated from trade centers, levels of living were lower, and farming conditions and the fertility of the soil were poorer than in most of the localities which had the lower rates of illness. These characteristics are discussed more in detail below.

Illness and Distance to Practitioner

That the areas of high illness rates were relatively isolated is revealed by the fact that three-fourths of the population of these localities lived eight or more miles from a trade center in which a practitioner was located. This is to be compared with only one-fourth of the persons in the other areas living that distance. The farther a family lived from a trade center of size, the less likely it was to live on an all-weather road or to possess an automobile or telephone.

This positive relationship between distance to practitioner and the amount of illness is shown in Table 14. As miles lived from prac-

⁵This Lewis county area had nearly twice the per cent of persons ill less than three months, a higher per cent of persons ill three months or longer and yet it had much the same mean days of illness as areas C and D. This condition resulted from areas C and D having a considerably higher proportion of year-long illness, although they had a much lower proportion of shorter illnesses than area B.

tioner increased, illness rates increased also.⁶ Illness rates were from one and two-fifths to twice as great for persons living over 13 miles from a practitioner as for those residing closer than 3 miles.⁷

TABLE 14. ILLNESS RATES FOR PERSONS CLASSIFIED BY DISTANCE TO PRACTITIONER FOR THE POPULATION OF THE FIVE COUNTIES

Distance in Miles	Number of persons	Per Cent of Persons			Mean Days of Illness
		Ill	Ill less Than 3 Months	Ill 3 Months or Longer	
All distances	6017 ^a	44	28	16	53.8
Less than 3	291	35	25	10	33.3
3 - 4.9	836	35	22	13	41.1
5 - 7.9	2051	40	25	15	48.2
8 - 9.9	1126	47	29	18	62.1
10 - 12.9	1068	50	32	18	64.8
13 and over	637	54	35	19	60.6

a. Includes 8 persons with distance to practitioner not reported.

This association of distance to practitioner and the amount of illness is merely an elaboration of the findings concerning the variations in illness among the sample areas. In the population of the five counties distance to practitioner is related to the amount of illness because rates of sickness were the highest in sample areas farthest from practitioners. In all counties except New Madrid, the pattern of settlement is such that the poorer farming areas are generally farther from the trade center than the more prosperous ones. If the seven sample areas with the highest rates of sickness are omitted from consideration, no relationship is found in the remaining 12 areas between the amount of illness and the distance to practitioner. These findings imply that the need for medical service in the open country is likely to be greatest in localities which are most physically isolated from practitioners, the chief medical agency used by farmers.

Differences in Level of Living and Other Factors

Marked differences in the amount of sickness among the locality groups raises the question as to what conditions, especially of a

⁶Differences in rates of illness between the distance classes are statistically significant. The distance classes have very similar age distributions but vary as to income.

⁷In Table 14 distance class 13 miles and over has a lower mean days of illness than distance classes 8-12.9 miles because of a smaller proportion of year-long illnesses.

social and economic nature, may account for such variations. Differences in age composition, as was shown before, may account for some variations in rates of illness. Other conditions which have been suggested as being related to the amount of illness are level of living, food habits and nutritional factors, and a whole complex of other health practices such as those relating to preventive medicine and sanitation. With reference to nutritional factors, the fertility of a soil seems to be a factor in determining the nutritional qualities of the food crops grown on it.⁸ Of the five counties, Dallas has on the whole the least fertile soil.

Rates of illness in the survey population were found to be highest in the lowest income groups. Thus, as income is one index of level of living, one might expect that those localities with the higher levels of living would have the lower illness rates. With respect to the level of living⁹ Lewis, Ray and Franklin counties ranked moderately high for the State with Dallas county much lower, while New Madrid county had the lowest level of living score of the five counties. As has been described, the seven sample areas with the highest illness rates had relatively low incomes and were somewhat isolated from medical facilities.

Although this was true, not all low income and relatively isolated sample areas had excessive illness rates. One such sample area in Franklin county had illness rates as low as those prevailing in the more prosperous areas in the county. Likewise, in one of the two most isolated areas in Lewis county no unusually high illness rates were found. Even so, all areas which were more prosperous and more accessible to medical services had relatively low illness rates. Consequently, in this study a definite relationship exists between the extent of illness, and a complex of factors which includes income, degree of isolation and poor living conditions.

It is not claimed that low income and relatively long distances from medical services directly produce higher rates of illness. Rather people who live under these conditions are less likely to have proper medical care and to possess dietary habits and other practices which cause them to fall victims to disease more often than is true of persons who live in more prosperous areas which are more accessible to medical facilities.

⁸See Albrecht, W. A., *Providing "Grow" Foods or Only "Go" Foods, According to the Soil and Its Treatment* (mimeographed paper); also other articles by the same writer on soil treatment and nutrition.

⁹See Lively and Gregory, *op. cit.*, and Hagood, M. J., *Rural Level of Living*, Indexes for Counties of the U. S., 1940, U. S. Dept. of Agriculture (1943).

VII. OTHER FACTORS ASSOCIATED WITH ILLNESS

In addition to the variations in illness described previously, significant differences were found among the various sizes of households. Also, in this section, illness rates for farm operators are described and the amount of illness for whites and Negroes is compared. Farm operators because of their age had a relatively high rate of illness. No significant difference existed between the illness rates for whites and Negroes.

Illness and Size of Household

Persons in the smaller households had on the average much more sickness than individuals in the larger households. As is seen in Table 15, persons in households of one or two individuals had 105.2 mean days of illness as compared with 33.4 days in households of six or more.¹ The major reason for this pronounced difference is that the larger households generally had more children and the members on the average were younger than in the smaller households. As illness increases with age the larger households, which have a larger proportion of younger members, would have the lower rates of sickness. When adjustment is made for age, illness rates for persons in the smaller and in the large households appear much more similar. It is seen from Table 15 that the adjusted rate of

TABLE 15. DAYS OF ILLNESS PER PERSON BY SIZE OF HOUSEHOLD AND INCOME FOR THE FIVE COUNTIES

Number of Persons in Household	Number of Persons	Crude Rate for All Incomes	Adjusted Rates for Income Classes		
			All Incomes	Under \$500	\$500 and over
All Households	6017	53.8	56.7	63.4	50.3
1 and 2	807	105.2	62.8	70.0	53.5
3 to 5	3155	53.9	56.1	64.3	50.7
6 and over	2055	33.4	51.4	55.1	48.8

illness for households with one or two individuals is only one-fifth greater than that for households with six or more persons. This is in contrast to the crude rate in which the rate for the smaller households was three times as great as that for the larger ones.

In addition to the adjustment for age, it is also necessary to consider income in relating illness to size of household.² Adjusted

¹Illness differences between various sizes of households are statistically significant.

²This is true because income is related to illness and to household size. The smallest households were the most likely to have the lowest incomes, the medium size households the highest incomes, and the largest households the moderate incomes.

rates of illness for income groups under \$500, and \$500 and over are presented in the two right hand columns of Table 15. The important finding here is that much greater differences are discovered in illness rates between various household sizes in the lower income group than in the higher. With age held constant, little relationship exists between size of household and days of illness among households having incomes of \$500 or over.

As is indicated in the above table, the highest rates of illness were found in the small, low-income households. These households had few small children but had a considerable population 20 years of age and over. As the great majority of all households consisted of only one family unit, there was a definite class of low-income families with few children and high illness rates. Some of these families consisted of aged couples whose children were grown and had left home, but a number were composed of couples in their reproductive years who had relatively few or no children. Thus, there may be at the lowest income level, a class with much more ill health and a definitely lower reproductive rate than the remainder of the population.³ Such a condition would suggest a group with low general vitality.

Illness of Farm Operators

In the five counties farm operators 16 to 64 years of age had higher illness rates than the remainder of the population of these ages. This is probably the result of the higher mean age of farm operators, which was 51 years. Forty-four per cent of the farm operators were ill as compared with 41 per cent of the remainder of the population; operators had approximately 68 mean days of illness and the remaining population, 60 days. This amount of illness for farm operators equals nearly one-fifth of the year. As most of this illness was of a chronic nature it was not highly concentrated in the winter months but distributed throughout the summer as well.

The rate of illness for the farm operators of the four counties was somewhat below the rate in the five counties because of the high amount of illness in Dallas county. Yet, in New Madrid, Franklin, Ray and Lewis counties, which are typical agricultural counties of the State, the mean days of illness for farm operators was 54 days, or over one-seventh of the year. This illness rate was approximately one-fifth greater than that for the remainder of the population in these counties. This amount of illness on the part of farm operators in periods of labor shortage would appear to be a definite handicap

³Further analysis of the data is needed to test this hypothesis, but some evidence from New Madrid county is pertinent. It was found that 22 per cent of the married women in households with incomes under \$250 had never had any children as compared with 12 per cent of the married women with incomes above this figure. The mean number of children for the married women who had had children was 3.8 for women with incomes under \$250 and 4.3 for women with higher incomes. These differences existed in spite of the fact that the married women in households with incomes under \$250 were somewhat older and consequently had lived a longer proportion of the reproductive period than the women with higher incomes.

to agricultural production. This is probably true even though some illnesses were only partially disabling.

Illness Among Negroes

All of the Negro population included in the survey was located in New Madrid county. One-sixth of the persons surveyed in this county, or 266 individuals, were Negro. In age the Negro and white populations were very similar. No significant differences are observed in illness rates between the Negroes and whites. A slightly larger proportion of Negroes than whites were ill during the survey year, 30 per cent as compared with 28 per cent, and the Negroes also had a slightly higher chronic illness rate. The mean days of illness for Negroes was 34.5 as compared to 30.6 for whites.

Rates of illness for Negroes were not significantly different from those of the whites even though the great majority of Negroes lived in households with incomes under \$500. As was shown above, in New Madrid county illness rates for persons with incomes under \$500 and for persons in higher income groups were the same. Possible reasons for the relatively low rates of illness in the lower income classes in this county have been discussed in the section on illness and income.

Illness Associated With a Complex of Factors

In this study, certain conditions or factors with definite social and economic implications have been found to be related to variations in the extent and nature of illness. No one factor, however, appears in isolation or can be designated as the sole cause of differences in sickness. An adequate and comprehensive explanation of variations in illness involve a complex of conditions—social, economic and physical. The major conditions or factors in such a complex that have been suggested in this analysis are age, income and locality. Locality, of course, in itself represents a complex. Especially relevant, but not treated to any extent in this bulletin, are the practices and beliefs of farm people concerning the prevention and treatment of disease.⁴

Two major implications of the findings of this study stand out. One, the need exists for additional research into the causes and significance of the large amount of chronic illness described herein.⁵ Two, the findings suggest that more consideration should be given to plans and programs for providing more adequate medical facilities and health education in rural areas. The magnitude of this latter problem must be seen in the light of the fact that persons with the highest illness rates are likely not only to be most isolated from medical facilities, but also least financially able to purchase medical services.

⁴cf. Meier, Iola and Lively, C. E., *op. cit.*

⁵Even though the rate of chronic illness recorded in this study is relatively high, evidence is presented in Appendix B of under-enumeration. See Appendix C for rates reported for other studies.

Appendix A

DEFINITION OF ILLNESS AND METHODS OF ANALYSIS

Definitions of illness vary considerably from study to study and from population to population. This makes it desirable that the procedures by which illness is defined and the limitations of the definition be made explicit. The need for an objective definition of illness is as obvious as the difficulties of obtaining such a definition. An objective definition of illness is needed so that illness rates may provide a basis for planning medical care and may be compared from population to population with some validity. A highly accurate and objective definition of the illness of a population would probably require that there be (1) a careful and frequent enumeration of the number of illnesses and their length, (2) medical consensus as to the diagnosis and severity of the disorders and (3) an objective measure as to the degree of disability.

In this study illness has been defined as disability which causes a loss of one or more days from usual activity. This definition of illness includes impairments as well as organic and functional disorders. Procedures related to definition and analysis which are considered in this section are those concerning (1) the enumeration of the number and length of illnesses, (2) the diagnosis of illness, (3) the degree of disability created by illness and (4) a description of the statistical techniques by which illness rates are associated with significant social and economic variables.

Number and Length

Illness rates may be expressed in terms of proportion of persons ill, number of illnesses or days of illness. The first named rate has been frequently employed in this study. The number of illnesses and the days of illness may be expressed as means or numbers per 1000 persons. As has been seen, the rate based on the number of illnesses has an advantage over the rate based on days of illness in that long illnesses do not have a disproportionate weight. On the other hand, if time lost from work is significant the rate based on days of illness is more desirable. This rate is also less influenced by under-enumeration than the rate for the number of illnesses. For these reasons the days-of-illness rate has been more frequently employed in this study than the number rate.¹

The duration of an illness has been measured in terms of the days of a continuous period of sickness. Although 28, or less than 1 per cent of all illnesses, had no length recorded, the exact number

¹In this study, days of illness seem to be subject to much less under-enumeration than the number of illnesses. No doubt the reason for this is that under-enumeration is concerned chiefly with short illnesses. See section on "Indications of Under-enumeration" in Appendix B.

of days was recorded for slightly less than one-half of the illnesses lasting less than one year. The field record might have read, e. g., from January to May; thus an estimate on the exact number of days has been necessary. The fact that some estimate of days of illness has been necessary is not considered an important limitation on the rate based on days of illness.²

Diagnosis

The diagnosis of illness refers to the cause or nature of the sickness. All illnesses had at least one diagnosis and some had two or more. A total of 3459 diagnoses were recorded for 2901 illnesses; one-sixth of the illnesses had more than one diagnosis. Illnesses with two or more diagnoses have been designated or typed by the diagnosis of the longest duration.³

The diagnoses of illness used are those reported by the household members interviewed. There is some medical verification of these diagnoses in that 57 per cent of all illnesses were treated by a practitioner. Some insight into the extent of medical verification of diagnoses reported by laymen may be gained from the findings of the National Health Survey. In this study it is reported that about 90 per cent of the cases in which a comparison was made, the layman's diagnosis and that of the physician were in agreement.⁴

Degree of Disability

All illness is more or less disabling. However, in this study, illnesses resulting in disability for less than one day have been omitted. Individuals are often acutely ill for one or more hours, but it is generally believed that such short illnesses are readily forgotten, especially in cases where no medical service is obtained. Even for illnesses of one or more days in length, it is believed that the family members are not likely to remember them, and hence to report them, unless the extent of disability was considerable. Thus, a farmer may have been prevented by illness from doing field work for a spell, yet able to do the morning and evening chores. A child may have been kept from school; a housewife may have been unable to do the washing, cleaning and garden work, yet be able to prepare meals for the family. Such cases are included in this study as well as those of a more severe nature.

²In case of the example given above the illness is estimated as lasting four months—from January 15 through May 14. Illnesses recorded as beginning and ending in the same month but with no day of the month given are estimated as lasting 10 days. This is done because the mean length of illnesses beginning and ending in the same month for which the precise length is known is approximately 10 days.

The exact days were not recorded for 56 per cent of all illnesses lasting less than one year. These illnesses form 43 per cent of all illnesses but only 14 per cent of the total days of illness. The largest possible error in estimating the length of these illnesses would change the total days of illness only slightly.

³For example, if an individual suffered from a long circulatory ailment but during this period had a shorter respiratory disorder the illness has been designated as circulatory. For a definition of sole, primary and contributory diagnoses of illness see Perrott, G. St. J., et al., *The National Health Survey*, reprint 2098 from Public Health Reports, p. 16.

⁴*Ibid.*, pp. 9-11.

From a statistical point of view, a clearer definition of illness could have been obtained by limiting the reporting to those illnesses which confined the patient to bed for one or more days, or was treated by some practitioner, or both. It is believed, however, that such a definition is too limited for a study of illness among farm people. There is evidence that only the severest illnesses are treated, and that the class differentials are marked. Furthermore, many farm people do not believe in taking their bed for illness until actually compelled to do so. Finally, it was the aim of this study to obtain as complete a picture of illness and disability as the family could report; for it is this record with its accompanying attitudes that largely determines the potential demand for medical and health services.

Because the illnesses recorded include varying degrees of disability—from slightly to totally disabling—no exact estimate of the time lost can be made. Although this is true, the best conjecture seems to be that these losses were considerable. Data on the amount of illness treated and the volume of practitioner's services used give some basis for this judgment. Approximately 35,000 days of treated illness existed per 1000 persons, and the mean number of calls per treated illness was about five. It does not appear that most farm people would make such extensive use of a practitioner, unless the illnesses from which they suffered caused some disability.

Association of Illness with Significant Social Factors

Equally as important as findings concerning gross illness rates is an indication of the degree to which illness rates are related to significant social variables. Comparison of means, correlation tables and coefficients of association may be used in determining the amount of relationship one variable has with another. Reasons for employing certain of these statistical procedures are presented below.

Inspection reveals that the illness-frequency distributions approximate U-shaped rather than bell-shaped curves. Consequently, in comparing the illness distribution of one population with another the mean is not an accurate measure of central tendency.⁵ This implies that tests of significance and measures of correlation based on the means computed from U-shaped distributions can not be evaluated on the basis of probability tables computed on the bell-shaped curve.⁶ For this reason the chi-square method has been considered more suitable for determining statistically significant differences,⁷ and the illness distributions have been compared in terms of proportions as well as means.

⁵The standard deviations of the illness distributions are from two to three times as large as the mean. The mean is not regarded as a suitable measure of central tendency if it is less than twice as large as the standard deviation. See McCormick, T. C., *Elementary Social Statistics*, (1941), pp. 129-31.

⁶Differences between means of U-shaped frequency distributions evaluated from probability tables based on the normal curve of error do not appear as significant as they actually are.

⁷For the chi-square analysis, the population has been classified in terms of length of illness into three categories—persons not ill, persons ill less than three months and persons ill three months or longer. The probability table of the chi-square distribution used is that found in Fisher, R. A., and Yates, F., *Statistical Tables for Biological, Agricultural and Medical Research*, (1938), p. 27.

Although for U-shaped frequency distributions means are not an accurate measure of central tendency, they have been regarded in this study to be the most suitable composite value in comparing the extent of illness in one population with that of another.⁸ This has been a satisfactory procedure as the several distributions of days of illness are similar in that they approximate the U-shaped curve.

Statistically significant differences in illness rates have been found to exist between counties, age classes, income groupings, sample areas, distance-to-practitioner classes and size of household groupings. Coefficients of contingency have been computed for each of these relationships. In no case are the coefficients large and their value lies in their relative size showing that one social variable is more or less related to the amount of illness than another. The uncorrected coefficients of contingency⁹ computed from the chi-square tables for the five county population are 0.31 for age and days of illness,¹⁰ 0.19 for size of household and days of illness, 0.13 for distance to practitioner and days of illness, and 0.08 for income and days of illness.¹¹

Although the coefficients of association of illness and given social variables are small and for this reason are lacking in predictive value, they are suggestive of factors responsible for variation in the amount of illness. Furthermore, the unequal distribution of the sickness burden among various groupings is much greater and more significant in its social and economic consequences than these small coefficients of association indicate.¹²

Appendix B

ENUMERATION OF ILLNESS

The best verification of the morbidity data presented in this study would be another survey of illness rates in the same five counties. In the absence of further field work, however, it is desirable to check the internal consistency of the data already acquired. Two types of evidence concerned with the accuracy of enumeration of illness are considered: (1) data are presented that some under-enumeration has occurred even though the illness rates found are relatively high, and (2) evidence is summarized concerning the validity of the high rates for Dallas county.

⁸It should be emphasized that the mean has been used not as an "average" or measure of central tendency, but as a composite value.

⁹The corrected coefficients would be slightly larger. See McCormick, T. C., *op. cit.*, pp. 206-08.

¹⁰For comparative purposes the correlation ratio has been computed on this relationship. The correlation ratio of days of illness on age is 0.32.

¹¹The coefficients are higher for certain individual counties. The coefficient of contingency for income and days of illness in Dallas county is 0.16 and in Franklin county 0.14.

¹²This is seen in the fact that a small difference between two populations in the percentage of persons ill three months or longer might contribute relatively little to the amount of the chi-square but make a great difference in the total days of illness.

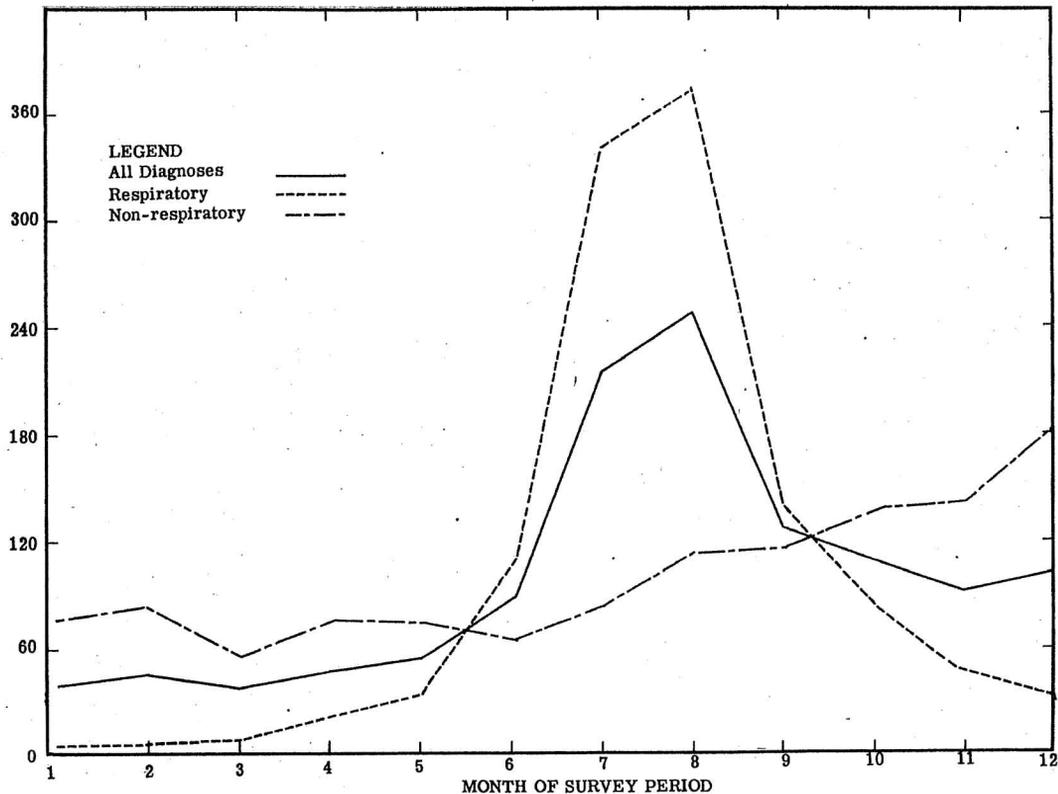


FIGURE 4. ONSET OF RESPIRATORY, NON-RESPIRATORY AND ALL DIAGNOSES OF ILLNESS BY SURVEY MONTH FOR THE FIVE COUNTIES (NUMBER FOR EACH MONTH EXPRESSED AS A RATIO BY THE MEAN - MEAN = 100)

Indications of Under-enumeration

There are several indications of under-enumeration of illness in this study. Perhaps the most important evidence is that the number of illnesses beginning in a given month declined, as the time elapsing from the last month of the survey period increased.

Time Elapsing From the Last Month of the Survey Period.—The proportion of diagnoses of illness onsetting in each month of the survey year are shown in Figure 4.¹ Two important facts are presented in this figure. One is the pronounced seasonality trend of respiratory diagnoses. This is found to be very similar for all counties. As would be expected, the peak came in the seventh and eighth months of the survey year which was in either January or February depending on the county.²

The other important fact concerning the month of onset of diagnosis is that a much smaller proportion of diagnoses are found to have begun in the first months of the survey period than in the last months. Only one-half as many non-respiratory diagnoses began in the first two months of the survey year as in the last two months. This proportion for respiratory diagnoses is much smaller. Thus under-enumeration is indicated, if it is assumed that the number of non-respiratory diagnoses of illness onsetting throughout the year should remain fairly constant, and that the number of respiratory diagnoses should be about the same during the summer months.

From the first through the fifth or sixth months of the survey year the number of diagnoses onsetting in each month was much the same. This may imply that the number of illnesses forgotten by a person increased each month until six or eight months had elapsed from date of interview; after this only the most serious illnesses were remembered and the number remembered remained much the same.

The same indication of under-enumeration described above is found for each county, each income class and each major type of diagnosis. For Dallas and Franklin counties approximately one-third as many diagnoses are found to have begun in the first two months of the survey period as in the last two months; in Lewis and Ray counties this proportion is one-half and in New Madrid county over two-thirds. The income classes are very similar in the amount of under-enumeration indicated as are the major types of diagnoses.

¹All diagnoses of illness, contributory as well as sole or primary, are included in this analysis. This is done for two reasons. First, contributory diagnoses were often the shorter ones and were more likely to be forgotten. Second, the field record was one of diagnoses and not of illnesses, and thus the length of each diagnosis was given. As most illnesses have only one diagnosis, the length of the diagnosis was, of course, the length of the illness, whereas for illnesses with multiple diagnoses the combined length of the diagnoses (because they ran concurrently) was greater than the length of the illness.

²The first month of the survey year for Dallas and New Madrid counties was June; Franklin and Ray counties July, and Lewis county August.

As might be expected, the shorter diagnoses of illness appear much more likely to have been forgotten than the longer ones. For diagnoses of a month or less in length, less than one-third as many were recorded as beginning in the first two months of the survey year as in the last two months, while for diagnoses lasting over a month three-fourths as many diagnoses began in the first two months of the survey year as in the tenth and eleventh months.³ This would imply that persons who had a larger proportion of short illnesses, such as younger individuals, would have had greater under-enumeration in number of illnesses and, perhaps, also in days. Thus, it seems likely that persons under five years of age, and especially those under one, have had a decidedly higher under-enumeration of illness than older persons.⁴

The under-enumeration of number of illnesses (continuous periods of sickness) has likely been less than that of diagnoses because some diagnoses (contributory) not enumerated have probably occurred at the time of longer illnesses which have been recorded. Furthermore, the under-enumeration of days of illness has no doubt been lower than that of the number of illnesses. This is true because a large proportion of the unrecorded illnesses were probably the shorter ones which contribute a relatively small amount to the total days.

No attempt has been made to adjust illness rates for under-enumeration because all analytical classes examined show some under-enumeration and the population in many classes is too small with which to make statistically valid comparisons. Also, there are other indications of under-enumeration described below in this section which can not be adequately estimated.

Time Elapsing from Date of Interview.—The above analysis reveals that the number of diagnoses declined as the time elapsing from the last month of the survey year increased. But the last month of the interview period may also have been subject to under-enumeration because of the time elapsing between it and the interview date. There was from one to twelve weeks between the last day of the survey period and the date of interview. One-half of the population were interviewed before four weeks had elapsed from the last day of the survey year while only one-tenth were visited after eight weeks had elapsed.

It is found that for all counties except Franklin⁵ the mean number of diagnoses onsetting in the last month of the survey year declined as the time elapsing between the last day of the survey period and the interview date increased. In Dallas county in which the interview period extended over 10 weeks, the diagnosis rate for the popu-

³No diagnoses onsetting in the twelfth month of the survey year would have had a recorded length of over a month.

⁴In addition, disability is more difficult to define for young children than for adults.

⁵It is likely that Franklin county deviates from the rest because the interviewing was done last in the area which had an illness rate much higher than the remainder of the county.

lation interviewed in the first four weeks was more than twice as high as the rate for the population visited in the remaining six weeks. It should be pointed out, however, that the sample area in Dallas county with the lowest income was visited first.

Other Considerations.—Other sources of under-enumeration of illness may be suggested. Members of the household who are interviewed may recall their own illnesses better and, thus have a higher illness rate because of this fact than members who are not interviewed.⁶ Also, the more serious illnesses in terms of length, use of medical service and intensity of disorder are more likely to be remembered and recorded than less serious sicknesses. Although this be true, illnesses preceding deaths seem to be frequently overlooked by the surviving members of the family.

Another factor which may affect the number of illnesses recorded is the quality of interviewing. The better the rapport that is reached between interviewer and informant the more accurate the sickness data secured is likely to be. This and other types of under-enumeration just described are not peculiar to this survey but have been found for other studies that have employed similar methods.⁷

The chief value of this analysis of the under-enumeration of illness is that it has given some support to three important assumptions made in this study. One assumption is that most of the longer illnesses and those for which medical care was obtained have been recorded. Another assumption is that the degree of under-enumeration of days of illness, especially of the longer illnesses, does not vary greatly among the major analytical classes such as the sex, age and income classes. If this assumption were not valid the tests of significance and measures of association employed above would be without meaning.

The third assumption is that the rate for days of illness has not been greatly under-enumerated and that it is more accurate than the rate based on number of illnesses. Although any estimate of the amount of under-enumeration of illness should be made with caution some estimate is probably desirable. If the factors described are considered, and if it is assumed that the rate of illness in the last month or two of the survey year approximates the true rate, it would appear that the days of illness would increase from 5 to 20 per cent were all illnesses recorded while the number of illnesses would probably increase as much as 100 per cent. This increase in number of illnesses would consist very largely of the shorter and less serious illnesses.

⁶From a partial analysis of Franklin and Dallas counties there is some indication but no clear cut evidence that this type of under-enumeration occurred in this study. In these two counties only one person, most of the time the housewife, was interviewed in three-fourths of the households.

⁷Correspondence with Dr. Selwyn D. Collins of the U. S. Public Health Service. See sections on method in the National Health Survey and the Committee on the Cost of Medical Care reports.

The Dallas County Data

Since Dallas county illness rates are significantly higher than those of the other four counties, some further explanation is required. Although the rates for this county are definitely higher than for the others, they are accepted as valid and so treated in this report for the following reasons: (1) As a body, the data, including the rates, are entirely consistent with those of the other four counties. This is true with respect to the proportions of illnesses in the various diagnostic classes (See Table 16) and the relative duration of illnesses (See Table 17). (2) The proportion of persons ill on the last day of the survey year, which presumably yielded the most accurate record of any day of the survey year, showed the same relatively high rate of illness (See Table 18). (3) The record shows that much of the difference between Dallas and the other four counties is the result of a considerably higher incidence of long, chronic illnesses which had their inception *before* the beginning of the survey year and which lasted throughout the survey year. Such illnesses can scarcely be regarded as a result of faulty enumeration. (4) The rate of treated illness for Dallas county was much the same as that for the other four counties. In view of the fact that practitioners were scarcer and the people poorer than in the three northern counties, such a record implies that considerable serious illness occurred.

There are other reasons for accepting the Dallas county record at its face value. In the first place, all surveys of illness covering a period of one year represent an understatement of the situation. Under-enumeration, particularly of the shorter and milder cases of illness, increases with the length of the time period covered.⁸ In this respect, the present survey is no exception. All counties show evidence of such under-enumeration. Hence, it may be said with confidence that the entire survey, including Dallas county, represents an understatement of the true situation.

In the second place, there are reasons for believing that the Dallas county record more nearly represents the actual situation in the county than the records of the other four counties. In other words, although the Dallas county record represents an understatement, it was subject to less under-enumeration than the other counties. Reasons for this belief are: (1) The field work was more uniform; it was all done by the same person. (2) The field worker in Dallas county was of a higher type, more mature and more experienced at interviewing, than the workers in the other counties. (3) The interviews were longer; the health situation was discussed in greater detail, which may have been conducive to a better memory of the illness record of the previous twelve months.

⁸The use of a year as the survey period is justified because of the marked seasonal variation of illness.

Finally, the relatively poor circumstances under which a considerable proportion of the Dallas county people lived, the long-standing difficulty of obtaining satisfactory medical service in that area, and the wide-spread use of home and patent remedies (See Mo. Agri. Exp. St., Res. Bul., No. 369), all suggest that the high rates of chronic

TABLE 16. NUMBER OF ILLNESSES PER 1000 PERSONS BY TYPE OF DIAGNOSIS FOR EACH OF THE FIVE COUNTIES

Diagnosis of Illness	Number of Illnesses	Number of Illnesses per 1000 Persons					
		Total	Dallas	Lewis	Ray	Franklin	New Madrid
All Illnesses ^a	2901	482	878	496	462	387	308
Respiratory	1196	199	415	252	201	152	58
Non-respiratory ^a	1705	283	463	244	261	235	250
Infectious and Parasitic	262	44	80	21	31	39	47
Digestive	252	42	57	36	44	25	49
Injuries and Poisonings	175	29	21	31	31	20	39
Circulatory	152	25	40	23	23	26	18
Nervous ^b	148	25	32	23	36	23	15
Genito-Urinary ^c	139	23	42	13	17	13	30

a. This includes 438 ill-defined and unclassifiable illnesses and 139 illnesses falling into types with numbers too small to show separately.

b. The full title of this classification as it appears in the Morbidity Code is "Diseases of the Nervous System and Sense Organs".

c. This classification includes also deliveries, complications of pregnancy, etc.

TABLE 17. DURATION OF ILLNESSES FOR EACH OF THE FIVE COUNTIES

County	Number of Illnesses	Per Cent of Illnesses Lasting				Mean Length of Illness (days)	Per Cent of Ill Days Accounted for by Illnesses Lasting 3 Months and over
		Under 2 Weeks	2 Weeks to 2.9 Months	3 Months to 11.9 Months	1 Year and Over		
Total	2901	46	22	9	23	110.6	91
Dallas	894	47	16	6	31	132.0	94
Ray	464	50	19	6	25	113.5	92
Lewis	556	58	15	11	16	88.7	89
Franklin	500	43	29	7	21	103.0	89
New Madrid	487	26	40	17	17	101.7	88

illness herein reported represent the cumulative effects of insufficient medical care during a considerable span of years preceding the date of this survey.

TABLE 18. ILLNESS RATES FOR THE LAST DAY OF THE SURVEY YEAR FOR DALLAS COUNTY AND THE FOUR COUNTIES

County	Number of Persons	Total Number of Illnesses	Per Cent of Illnesses Active	Last Day of Survey Year		
				Illness	Per Cent of Persons With Illnesses Beginning Prior to the Survey Year	
Total	6017	2901	35	17	6	11
Four counties ^a	4999	2007	33	14	6	8
Dallas	1018	894	37	33	6	27

a. Exclusive of Dallas county.

In the light of the above discussion the conclusion appears to be (1) that the Dallas county record, although representing an understatement of the true situation, is valid and more nearly approaches complete accuracy than those of the other four counties; (2) that illness rates in Dallas county, particularly those representing chronic illness, are somewhat higher than those to be found in the other four counties.

Appendix C

COMPARISON OF ILLNESS RATES IN THIS STUDY WITH OTHER STUDIES

The question may well be asked as to how the illness rates found in this study¹ compare with those reported for other studies. Over a score of studies have been reviewed² and rates are found to range from less than 200 illnesses to over 1200 illnesses per 1000 persons during a year; most of these studies give illness rates ranging from 400 to 1000 illnesses per 1000 persons. As definition of illness and thoroughness of enumeration vary from survey to survey, certain caution must be taken in comparing one study with another. If these limitations are considered, however, some insight may be gained from a comparison of illness rates found in various surveys.

Illness rates obtained in the National Health Survey, the Baltimore Study and the Investigation of the Committee on the Cost of Medical

¹The study reported in this bulletin is referred to in this section as the Missouri Study.

²Many of these studies have been referred to above and the remainder of the studies are referred to in the publications cited.

Care³ are compared in Table 17 with rates found in the Missouri Study. In the top row of this table the number of recorded illnesses per 1000 persons is shown. This rate for the Missouri Study is 482 as compared with 1256 for the Baltimore Study, 850 for the Cost of Medical Care investigation, 171 for the urban population of the National Health Survey and 254 for the rural Missouri population

TABLE 19. COMPARISON OF ILLNESS RATES IN THE MISSOURI STUDY^a WITH RATES REPORTED FOR THREE OTHER STUDIES

	Missouri Study			Baltimore Study ^d	Committee on Cost of Medical Care ^d	National Health Survey ^b	
	Five Counties	Dallas County	Four Counties			Urban	Rural Mo ^c
Number of Illnesses							
Per 1000 persons	482.0	878.0	401.0	1256.0	850.0	171.0	254.0
Days of Illness per Person:							
All Illnesses	53.3	115.9	40.6	69.4	26.3	9.9	12.1
Illnesses lasting less than three months	4.9	7.4	4.3	---	---	2.6	---
Illnesses lasting one year or longer	40.2	98.2	28.1	30.8	---	---	---
Per Cent of Persons:							
With illnesses lasting three months or longer	15.3	32.1	11.9	---	---	17.7 ^d	4.9
Ill on a given day ^e	16.7	32.6	13.4	18.7	---	4.4	4.0

a. The Study described in this bulletin.

b. Disabling illnesses lasting one week or longer.

c. Included over 32,000 persons classified as "purely rural", living in Howell, Linn and Livingston Counties and surveyed in 1935-36.

d. Both disabling and non-disabling illnesses.

e. In this study the count is for the last day of the survey period which averaged four weeks from the interview date; in the Baltimore study the count was made on the day of the first visit and in the National Health Survey on the day of the only visit.

of this survey.⁴ The rates for the Baltimore Study and for the Cost of Medical Care investigation are for illnesses defined both as disabling and as non-disabling. Illnesses recorded in the National Health Survey were defined as disabling and had continued for a week or longer.

The number of illnesses per 1000 persons in the Missouri Study is much less than that reported for either the Baltimore Study or for the Committee on Cost of Medical Care. As has been described above, the number of illnesses appears to have been decidedly under-enumerated in the Missouri Study and would probably have been much higher had the families been visited more frequently.⁵ Visits were made monthly in the Baltimore Study and every two to four months in the Cost of Medical Care investigation.

At this point it may be of interest to note that a rate of 250 illnesses per 1000 persons found for the rural Missouri population of the National Health Survey is very similar to the rate of treated illnesses discovered in the Missouri Study. In the five counties there

³These studies have been referred to in the text of this bulletin. No attempt has been made to adjust the illness rates of these studies for age, although it is known that there would be some changes, were this done.

⁴The illness rates for population in rural Missouri of the National Health Survey have been computed from photostatic tables furnished by the U. S. Public Health Service. This population included over 32,000 persons living in Howell, Linn and Livingston counties.

⁵The amount of under-enumeration is indicated in Appendix B.

were 274 treated illnesses per 1000 persons, and in the four counties 261 such illnesses.

The definition of illness in terms of degree of disability presents a major difficulty in comparing the illness rates of one study with those of another. The distinction between disabling and non-disabling illness is likely to be vague unless an explicit definition of disability is employed.⁶ In the Missouri Study no strictly objective definition of disability was followed. Consequently, some populations, such as the one in Dallas county, may have reported all the illnesses of which they were aware, while in other populations only the more serious illnesses in terms of degree of disability were recorded. The position might be taken that all illnesses are to a greater or lesser degree disabling if they decrease an individual's efficiency.

Because of the lack of objectivity in the definition of disability, the rates of illness in the Missouri Study are compared with the total as well as the rates of disabling illness reported for other studies. In the second row of Table 17 the days of illness per person are shown. The rate in the five counties is 53.8 days, in the four counties 40.6 days, for the Baltimore Study 69.4 days, for the Cost of Medical Care investigation 26.3 and for the two populations of the National Health Survey 9.9 and 12.1 days respectively. The rate of disabling illness in the Baltimore Study was 15.1 days per person and for the committee on the cost of Medical Care 7.4 days per person.

The extreme differences in rates based on days of illness were largely a result of the great variation in the amount of illness of a chronic nature. As is shown in Table 17, rates for short illnesses were much more similar than those for the longer illnesses. In the four counties the rate for illness lasting less than three months was 4.3 days per person; this is to be compared with a rate of 2.6 days reported for the National Health Survey.

A relatively high rate of chronic illness, a finding common to surveys of sickness, is indicated for all the studies shown in Table 17.⁷ This may be seen by inspecting rates based on days for year-long illnesses and the per cent of all persons with illnesses lasting three months or longer. On both these types of rates findings in the Missouri Study, if Dallas county is excluded, do not differ greatly from the rates reported for the Baltimore study and for the urban population of the National Health Survey.

In the bottom row of Table 17 the per cent of persons ill on a given day is shown. The rate is probably less subject to under-enumeration than the others presented above. One-sixth of all persons surveyed in the Missouri Study were ill on a given day as

⁶In the Baltimore Study a disabling illness was defined as one which kept a person from his work, school, usual activity or confined him to the house.

⁷In a study in a community in the Arkansas Ozarks, one-ninth of the population were reported to be afflicted with chronic illness. See Wilson and Metzler, *op. cit.*

compared with rates of 4.4 per cent in the National Health Survey and 18.7 per cent in the Baltimore Study. If only illnesses lasting less than one year and one week or more are considered, approximately 5 per cent of the population of the Missouri Study were ill on a given day as compared with 3.2 per cent in the National Health Survey. In this instance the Dallas rate is very similar to that for the other counties.

In the summary it may be said that, with the exception of Dallas county, rates of chronic illness for the Missouri Study do not differ greatly from those reported for other studies. The rate of chronic illness in Dallas county is quite high even though allowance is made for a more liberal definition of sickness. The acute illnesses reported in the Missouri Study, as indicated by rates based on number of illnesses, appear to be decidedly under-enumerated.

As important as a comparison of gross illness rates from study to study is a comparison of the findings of the association of illness with significant social variables. In the Missouri Study the same type of relationships existed between income and illness and age and illness as have been reported for other studies. On the other hand, in the Missouri Study as contrasted with other studies, significant differences have not been found between the sexes in the amount of illness.

Appendix D

SOCIAL AND ECONOMIC CHARACTERISTICS OF THE POPULATION SURVEYED

All of the survey population lived in the open country and over 90 per cent of it was rural-farm. Although it was the purpose of the study to survey only open country populations, the rural-urban representativeness of this sample for the State as a whole is to be seen in light of the fact that if the State's three largest urban areas are excluded,¹ three-fourths of the remaining population is rural and one-half is rural-farm.

Social and economic data secured on the sample population include age, sex, years of schooling, certain level of living items, tenure status, size of farm operations and distance to medical facilities. From observing a series of correlation tables, estimated total cash receipts was found to be the best index of the several socio-economic items and has been regarded in the analysis above as an index of socio-economic status.² The association of estimated cash receipts with selected socio-economic variables is shown in Table 20.

¹These areas are St. Louis city, St. Louis county, Jackson county including Kansas City, and the city of St. Joseph, and are located on the east and west borders of the State.

²Throughout this study in describing the sample population the term income is used interchangeably with that of estimated total cash receipts. The estimated total cash receipts are those secured by the family during the twelve-month survey period. Although estimated cash receipts is the best single index of the socio-economic data secured on the schedules, its meaning in terms of association with other socio-economic items varies some from county to county.

Variations may be noted between the county sample populations in terms of their income distributions, age distributions and accessibility of medical facilities. A comparison of the sample populations of each county on these and other characteristics, as well as a

TABLE 20. ASSOCIATION OF INCOME WITH SELECTED CHARACTERISTICS FOR THE POPULATION OF THE FIVE COUNTIES

Income	Number of Households	Socio-economic Factors					Other Factors			
		Per cent of Households Reporting:					Mean Miles to Practitioner	Mean Size of Household		
		Automobile	Telephone	Water in House	Electricity in House	Per cent Full-time Operators	Median Size of Operating Unit (Acres)	Median Years of Schooling for those 25 yrs. & over		
Under \$250	222	38	12	4	11	48	49	5.9	8.4	3.1
\$250-499	431	63	36	3	12	54	89	8.4	8.5	3.8
\$500-999	453	82	44	6	19	68	126	8.7	8.6	4.2
\$1000-1999	247	93	53	15	33	73	161	9.0	7.8	4.2
\$2000 & over	101	94	47	28	55	81	251	9.3	6.6	4.0
Total	1544 ^a	73	39	8	21	63	118	8.6	8.3	3.9

a. Includes 40 Households with unreported income.

comparison of the sample populations with the census, is shown in Table 21. Lewis, Ray and Franklin counties are seen in Table 21 to have had similar income distributions. The Dallas county sample has an appreciably lower mean income than have the other four counties. The New Madrid county distribution has a much greater spread than have the other counties; i. e., there is a much greater proportion of households in this county in both the highest and lowest income classes than in any other county. In terms of distance to medical services and whether or not the household lives on an all-weather road, the Lewis and Dallas county sample populations are the most isolated, the New Madrid and Ray samples are least so, while the Franklin county sample is in an intermediate position.³

The age distributions of the Lewis, Ray and Franklin county sample populations are seen to have been similar and approximate somewhat that for the rural-farm population of the State. The Dallas county sample was decidedly younger than that of the State, while the New Madrid county sample had the youngest population of all. Age and income are associated in Table 22. The lowest income class is found to have had a relatively low proportion of children and the highest proportion of persons 60 years of age and over.

³There are marked variations on these factors between the sample spots within each county.

TABLE 21. COMPARISON OF SAMPLE DATA AND 1940 CENSUS DATA FOR THE RURAL-FARM POPULATION OF EACH OF THE SURVEY COUNTIES, AND COMPARISON OF THE COUNTY SAMPLES WITH EACH OTHER ON OTHER FACTORS

Selected Characteristics	State		Dallas		New Madrid		Franklin		Ray		Lewis	
	All Counties	Five Counties	Census	Sample	Census	Sample	Census	Sample	Census	Sample	Census	Sample
<u>Age</u>					(per cent)							
0-14	29	32	31	34	38	41	25	29	24	27	23	26
15-24	18	16	18	16	22	19	17	16	16	15	16	15
25-39	18	19	17	19	19	20	18	18	19	18	18	17
40-59	22	22	21	19	16	15	25	24	25	25	27	28
60 & over	13	11	13	12	5	5	15	13	16	15	16	14
<u>Males</u>	53	53	52	52	53	52	54	53	53	52	53	53
<u>Years of Schooling^a</u>												
1-8	75	74	77	73	81	79	85	87	73	68	63	65
9 & over	21	21	19	22	11	14	12	11	25	29	35	31

a. Persons 25 years old and over.

TABLE 21. (Continued) COMPARISON OF SAMPLE DATA AND 1940 CENSUS DATA FOR THE RURAL-FARM POPULATION OF EACH OF THE SURVEY COUNTIES, AND COMPARISON OF THE COUNTY SAMPLES WITH EACH OTHER ON OTHER FACTORS

Selected Characteristics	State		Dallas		New Madrid		Franklin		Ray		Lewis	
	All Counties	Five Counties	Census	Sample	Census	Sample	Census	Sample	Census	Sample	Census	Sample
Farms Reporting (per cent)												
Automobile	63	72	53	63	40	58	72	80	68	83	72	79
Electricity	18	21	4	10	12	18	18	25	9	17	31	31
Telephone	39	39	16	17	2	3	58	51	49	48	69	77
Mean Age of Farm Operator	50	51	50	51	42	48	51	52	51	50	50	51
Mean Size of Farm (Acres)	136	145	124	151	86	109	137	133	133	166	176	169
Mean Years of Operators' Occupancy	13	14	13	12	5	6	17	20	15	17	14	15
<u>Isolation Data</u>												
Mean Miles to Practitioner		8		10		6		8		6		11
Households on All-weather Road (per cent)		69		77		67		84		73		46
<u>Income Data</u>												
Median Income		608		487		627		679		664		570
Households Reporting: Under \$250 (per cent)		11		14		18		8		7		9
\$2000 & over (per cent)		7		4		14		3		7		2

TABLE 22. AGE DISTRIBUTIONS AND MEAN AND MEDIAN AGES BY INCOME CLASSES FOR PERSONS IN THE FIVE COUNTIES

Income	Number of Persons	Per Cent of Persons in Age Classes					Mean Age	Median Age
		0-14	15-24	25-39	40-59	60 & over		
All Incomes	6017 ^a	33	16	19	21	11	29.8	25.9
Under \$250	678	30	17	15	20	18	32.9	27.8
\$250 - \$499	1819	33	16	19	20	13	30.2	26.0
\$500 - \$999	1897	35	17	18	22	8	28.6	23.2
\$1000 - \$1999	1032	32	14	24	21	9	29.4	27.2
\$2000 & over	407	27	20	18	26	9	30.7	27.9

a. Includes 184 persons whose age or income or both was not reported.