

# SOCIO-ECONOMIC STATUS AND ILLNESS

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## INTRODUCTION

**A**N inverse relationship between economic status and the occurrence of ill-health is commonly accepted as a proven fact. The gross differences in prosperity between advanced and under-developed countries are certainly associated with large differences in mortality. Less marked but still appreciable mortality variations have been observed between social classes within countries. That these observations reflect social influences upon the occurrence of ill-health and not merely upon the outcome of disease has been suggested by the results of morbidity investigations made in North America earlier in this century (1, 10). There have, however, been few reappraisals of this question in recent years among economically advanced populations. Among such groups it is quite possible that the smaller variations in socio-economic position which now exist have no appreciable effect upon the occurrence of illness.

Graham (3) has described a study of the relation between socio-economic status, illness, and the use of medical services, based upon personal interviews with members of a sample of the general population in Butler County, Pennsylvania, in 1954. He found that there were no significant differences among five occupationally determined classes in their frequency of acute and chronic illness or in their use of medical services.

The present paper is a report of an inquiry which, like that of Graham, was prompted by the wish to re-examine the relationships between social class and ill-health which were observed in earlier morbidity studies.

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## METHOD OF STUDY

The investigation was based upon the records of physicians' services to families enrolled in a comprehensive plan for pre-paid medical care in Essex County, Ontario<sup>3</sup> and thus uses a different method from Graham's for the ascertainment of illness. The group with which this report deals came from a 5 per cent systematic sample of the family medical records of W.M.S. and consisted of the 115 families in this sample who enrolled in the plan in 1946.

Since the family medical ledger was put into use by W.M.S. in 1948, records of medically attended illness were available from January 1948 to June 1953, when the sampling was carried out. Because of cancellations, contract transfers and new entrants as births, not all persons had records for the entire period. Thus a compromise was sought between obtaining a maximum number for study and using as long a study period as possible. This was best achieved by counting illness episodes over a two-year period for all individuals with records for at least this length of time.

The fact that all families had enrolled in 1946, two years before their records were used, was regarded as a considerable advantage, because it meant that socio-economic comparisons could be made between families who had already had access to comparable medical care for a full two-year period.

The classification of socio-economic status was made in terms of the rent level of the family's area of residence, a method which has been used by a number of other workers (4, 5, 6). The following procedure was used: the Windsor City census tracts in which the families lived during (or for the main part of) the period were arranged in order of their median monthly rental (1951) and then combined into three groups such that each contained roughly one-third of the families. Ten families were excluded because they lived in that part of Essex County outside the City of Windsor. The small size of the sample pre-

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cluded the use of more than three groups. The distribution of families was as follows:

<i>Rental Group</i>	<i>Number of Families</i>	<i>Range of Census Tract Median Rentals</i>
Upper	36	\$43 - 57
Middle	33	\$39 - 43
Lower	36	Under \$39

The rental values appear abnormally low but this is explained by the fact that rent controls adopted during the War were not lifted until after the 1951 Census. We have however sufficient information to be certain that these rentals still provide an adequate index of the relative economic levels of the census tracts.

Among the 105 families there were 308 individuals under age 60 with records for at least two years. Persons aged 60 years and over were excluded from the study, for as a result of age restrictions on W.M.S. enrollment, they are few in number and probably very unrepresentative of the general population.

The age distributions of the three rental groups were roughly comparable apart from a relative excess at ages 1 to 19 and a relative deficit at ages 40 to 59 in the lower rental group. Because of the small total number of individuals in the study it was preferable to balance the three groups according to age rather than to make age-specific comparisons throughout. Random elimination<sup>4</sup> of 17 persons at ages 1 to 19 and 13 persons at ages 20 to 39 from the lower rental group achieved reasonable equality in the age distribution of the three groups, as shown in Table 1. Except where otherwise specified, this group of 278 individuals forms the basis for all analyses to be described.

Two further points concerning the study population should be mentioned: (1) For persons with records for more than two years, the first two years were taken for study. (2) Any in-

<sup>4</sup> This was done by numbering all persons in the age-rental-group and then choosing the required number to be eliminated from a table of random numbers.

AGE GROUP	RENTAL GROUP						ALL GROUPS	
	Upper		Middle		Lower			
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
1-19	39	38.2	34	38.2	34	39.1	107	38.5
20-39	29	28.4	31	34.8	27	31.0	87	31.3
40-59	34	33.3	24	27.0	26	29.9	84	30.2
ALL AGES	102	99.9	89	100.0	87	100.0	278	100.0

Table 1. Selected group of individuals with records for two years by age and rental group.

individual who changed age-groups during the period was placed in the group corresponding to his starting age.

RESULTS

Comparisons of total illness were made in terms of the mean number of illnesses per person. For comparisons of specific categories of illness, however, it was statistically simpler to use the proportion of persons with one or more episodes of the specified illness, since multiple occurrences were not common. In each case the means were also calculated but in no instance did they contradict the results given by the proportions.

1. *Total Illness (including Trauma)*. Table 2 shows the mean number of all medically attended illnesses per person over a two-year period, by rental groups. The lowest value is in the middle group, however the differences are small and were not

Table 2. Total illness—mean number illnesses per person in a two-year period. (N = 278).

RENTAL GROUP	MEAN	STANDARD DEVIATION
Upper	2.76	±2.78
Middle	2.49	±2.26
Lower	3.38	±3.31

significant when tested by analysis of variance.

It might be thought that attainment of statistical significance was prevented by a large within-group variance resulting from the

amalgamation of age-groups. This however was not the cause of the large variance because the means for the three age-groups differed relatively little.

Thus, the finding of standard deviations approximately equal to the means indicates the non-normal nature of these illness distributions, a phenomenon with considerable bearing upon the problem of individual variations in sickness experience. This problem, which is still under investigation will not be discussed further in the present report.

Table 3. Proportion of persons with traumatic illness in a two-year period. (N = 278).

RENTAL GROUP	PROPORTION
Upper	0.20
Middle	0.13
Lower	0.30
$X^2 = 7.11, \quad d.f. = 2, \quad p < 0.05 > 0.02$	

2. *Traumatic Illness.* Table 3 gives for each rental group the proportion of persons having one or more medically attended injuries in a two-year period. The highest proportion is in the lower group and the lowest in the middle group. These differences were statistically significant.

It may be noted here, that removal of traumatic illnesses from the total illness comparison had no effect upon the trends described above and shown in Table 2.

3. *Psychiatric and Psychosomatic Illness in Adults.* In a previous paper (7), a detailed description is given of an empirical code whereby illnesses, classified first by the International Statistical Classification, are placed along a psychiatric continuum ranging from the most definite psychological entities such as anxiety neurosis, through illnesses of probable and possible psychosomatic nature (e.g.: migraine, peptic ulcer, allergy, essential hypertension) to illnesses which most physicians would record as definitely organic (e.g.: neoplasms, infections, etc.).

Table 4. Proportion of persons, ages 20-59, with psychoneurotic or psychosomatic illness in a two-year period. (N = 171).

RENTAL GROUP	PROPORTION	N
Upper	0.41	63
Middle	0.40	55
Lower	0.40	53

The proportion of persons attended for one or more definite psychiatric, probable or possible psychosomatic illness is shown for individuals aged 20 to 59 in Table 4. Children were excluded

from the analysis because there are difficulties in the application of this psychiatric code to the illnesses of childhood. The proportions in the three rental groups are almost identical.

Table 5. Proportion of persons, ages 20-59, with one or more selected chronic illnesses in a two-year period. (N = 171).

RENTAL GROUP	PROPORTION
Upper	0.22
Middle	0.29
Lower	0.36
$X^2 = 2.62, \quad d.f. = 2, \quad p < 0.30 > 0.20$	

nervous disease, cerebral vascular disease, degenerative cardiovascular disease, venous disorders, peptic ulcer, hernia, arthritis, and bone deformity. Table 5 shows for each rental group the proportion of persons aged 20 to 59 attended for one or more chronic illnesses over the two-year period.

Here for the first time one observes a gradient from upper to lower rental groups. However, this trend did not reach statistical significance.

5. *Otitis Media in Children.* Otitis media was selected for special study because this condition usually is a complication of upper respiratory infection or communicable disease and therefore its occurrence might be particularly sensitive to socio-economic influences upon a child's general health and upon the care he receives during minor illness.

Table 6. Proportion of children, ages 1-19, with one or more episodes of otitis media. (N = 141).

RENTAL GROUP	PROPORTION	N
Upper	0.11	45
Middle	0.18	40
Lower	0.32	56
$X^2 = 7.02, \quad d.f. = 2, \quad p < 0.05$		

of years for which their records were available.

Table 6 gives the proportion of children attended for one or more episodes of otitis media in a two-year period.

4. *Chronic Illness in Adults.* The following chronic illnesses were grouped together for study: malignant tumors, thyroid and other endocrine disorders, obesity, organic

For the analysis of one specific illness a larger number of children was required; this was accomplished by including all children aged 1 to 19 regardless of the number

The increase in this proportion from upper to lower rental groups is statistically significant at the 5 per cent level.

However, since otitis media is generally commoner among very young children than among the school-age and adolescent groups it is necessary to compare the three rental groups as to age distribution within the broad 1 to 19 year age group.

Table 7. Percentage age distribution of all children aged 1-19 by rental groups. (N = 141).

AGE GROUP	RENTAL GROUPS		
	Upper	Middle	Lower
1-4	23.2	32.4	44.4
5-9	18.6	18.9	18.5
10-14	25.6	18.9	20.4
15-19	32.6	29.7	16.7
ALL AGES	100.0	99.9	100.0

Table 7 gives the finer age breakdown and reveals the fact that there is an increase in the proportion of children aged 1 to 4, as one goes from upper to lower rental groups. To determine how much of the observed difference in otitis media might be due to this factor, an age-standardized proportion of children with otitis media was calculated for each rental group (the three rental groups combined were taken as the "standard" population).

The results of this calculation are shown in Table 8. Once correction for age has been made, very little trend remains and the difference between upper and lower groups is not impressive.

6. *Preventive Services and Illness in Infants Under Two Years of Age.* This analysis was based upon data for 45 children who were under two years of age at any time during the study period.

Their distribution by rental groups was as follows:

<i>Rental Group</i>	<i>Number of Infants</i>	<i>Mean Duration of Observation Period</i>	<i>Mean Age at Midpoint of Period</i>
Upper	11	1.47 years	0.85 years
Middle	15	1.47 years	0.85 years
Lower	19	1.45 years	0.82 years

Preventive services included immunization, dietary regulation, and routine medical examination of the well baby.

The results are shown in Table 9. A clear trend for illness is

Table 8. Age standardized proportions of children with otitis media. (N = 141).

RENTAL GROUP	AGE-STANDARDIZED PROPORTION
Upper	0.18
Middle	0.17
Lower	0.26

apparent, and some difference in the use of preventive services is seen, although it does not follow a linear trend.

Analysis of variance was applied to these data. No significant differences were found for preventive services, but for medically attended illness the differences were statistically significant as shown in Table 10.

Further study of the illness data showed that this trend was present for both of the chief causes of illness in infants; gastrointestinal and respiratory infections. It was thought that the differences found among infants might be due to an increase in family size from upper to lower rental groups with an asso-

Table 9. Preventive services and illnesses, infants under two years of age. (N = 45).

	RENTAL GROUP		
	Upper	Middle	Lower
Average Number Preventive Services per Infant	10.7	7.7	8.5
Average Number Illnesses per Infant	2.8	3.4	5.8

Table 10. Analysis of variance—illnesses in infants under two years of age.

SOURCE OF VARIATION	SUM OF SQUARES	d.f.	MEAN SQUARE	F-RATIO	P
Between Classes	78.4	2	39.2	4.1	<0.05
Due to Linear Regression	72.0	1	72.0	7.6	<0.01
Deviation from Linear Regression	6.4	1	6.4		
Within Classes	400.4	42	9.5		
TOTAL	478.8	44			



RENTAL GROUP	STARTING AGE			
	1-2	3-4	5-9	10-19
Upper	3.43	3.00	4.89	2.39
Middle	3.80	1.50	1.57	2.27
Lower	6.36	2.25	3.57	2.11

Table 11. Mean number illnesses per person in a two-year period, children 1-19 years. (N = 107).

ciated increase in exposure of the infant to infection. This, however, was not the case, for the mean sibship sizes (including the infant) were 2.4, 2.2, and 2.1 for infants in the upper, middle and lower groups respectively.

A reasonable question which now arises is whether or not the same phenomenon existed throughout childhood, that is in the age-group 1 to 19, whose total illness by rental groups has not been shown separately. Table 11 presents the data for four age-groups within the childhood period. The means at ages 1 to 2 follow the trend already observed among the whole infant group, but beyond this age no socio-economic gradient is apparent. In fact, the tendency for the middle group to have the lowest value, which was observed for all age-groups combined, is also apparent in childhood.

## DISCUSSION

Before considering any of the specific findings of this study, it should be emphasized that the socio-economic comparisons which are made relate to a population which does not include people at the very bottom of the economic scale. This is inherent in the method of study, based as it is upon records for persons insured through employed groups.

In many respects, the results of this study lead to conclusions similar to those of Graham (3), in spite of the fact that different techniques were used for ascertainment of illness and for socio-economic classification. In both studies, no appreciable trends were found for illness in toto. An essentially similar result comes from the recent Canadian Sickness Survey (2) where illness, as measured by average number of days of dis-

ability per year, did not rise with decreasing income until the lowest group (annual income of less than \$1,500) was reached. The present data on chronic illness showed a consistent trend of increase with decreasing social status more marked than that observed by Graham although the differences, like his, were not statistically significant.

The interpretation of the peculiar finding in the present study that accidents were more frequent in the upper and lower groups must be left open for further investigation specific for type of accident and place of occurrence, etc. This result differs from that of Steed (9) who found a fairly consistent rise in the frequency of accidents as housing standard fell, among residents of two census tracts in the city of Augusta, Georgia.

The absence of any socio-economic trend in the occurrence of psychiatric and psychosomatic illness is of some interest. Since no comparison of specific diagnoses has been made, undetected qualitative differences may exist, but in quantitative terms no social gradient was apparent.

Of considerable interest is the finding of significant differences between rental groups in the amount of total illness among infants under two years of age. The latter observation is in agreement with the results of an intensive investigation of 1,000 families made by Spence and colleagues (8) in Newcastle, England.

Such agreement is worthy of comment. The Newcastle study covered a much wider range of socio-economic classes than the present one and since it was based upon illnesses from May 1947 to April 1948, before the appointed day for the National Health Service Act, it did not pertain to a completely insured population. Thus it is noteworthy that the present population, whose socio-economic range is relatively narrow and whose members had access to equal medical care for two years before as well as during the study period, showed the same phenomenon as that observed in the British investigation.

#### SUMMARY

Data from records of medically attended illness among 105

urban families enrolled in a comprehensive medical care plan have been used to compare the morbidity of three socio-economic groups distinguished by the median rental of the census tracts in which they lived. All persons were followed for two full years.

The three groups did not differ in total illness or in psychiatric and psychosomatic illness.

Accidents showed significant differences and were least common in the middle group and most common in the lowest group.

Chronic illness showed a trend of increase with decreasing status, although not statistically significant.

A significant gradient was observed for total illness among infants under two years of age.

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