

## Morbidity Variations in Jaffna Society - A Pre-COVID Scenario Against – Regional Disparity and Socio-Economic Status

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### **Abstract**

*This study focuses on regional variations and socio-economic differentials of morbidity that prevailed in Jaffna society during a period prior to Covid-19 pandemic. A sample of 6388 persons of 1123 derived families of siblings of the sample of Jaffna Socio-Economic Health Study was followed. The incidence and prevalence of acute and chronic illnesses reported during 2018 were subjected to statistical analysis. In addition, various treatments, including medical and surgical admissions, by clinical and hospital episodes were recorded and analyzed to see the intensity of health issues. Correspondence analysis was applied to see relationships between “groups of diseases” and “types of treatments” to explore regional variations and socioeconomic differentials in Jaffna society. Clear pictures of groups of diseases were found for current and future research for comparative analysis in post-Covid situation that will be included with the major episodes of respiratory diseases, popularly known as Corona. The gravity and intensity of acute and chronic diseases such as infections, parasitic diseases, neoplasms, diseases of endocrine-immune mechanism-nutritional-metabolism etc. reported on the patients were analyzed and reported. Impacts on the severity, by geographical variations and socio-economic differentials, of Jaffna society required health services are clearly emphasized. Specific attention is drawn to the health professionals from this study in the Jaffna society that the people who had already been affected due to Respiratory system diseases, Circulatory system diseases and Diseases of the immune mechanism were considerably high and would be vulnerable in future Covid research.*

**Keywords:** *Pre-Covid Scenario, Socio-economic status, Regional disparity, Jaffna Socio-Economic Health Study (JSEHS), International Statistical Classification of Diseases (ICSD, Correspondence Analysis*

### **I. INTRODUCTION**

Health conditions against socioeconomic statuses of Jaffna society are being reported using statistical analysis, initially by a two-stage sample survey of 1999 and recently by a Follow-Up study conducted during 2018-2019 on the families of siblings of the original study. WHO prescribed that the well-being of a human cohort is defined by health dimensions “Physical”, “Mental” and “Social” Health (Breslow, 1972). Physical disabilities of Jaffna society were followed up and outcomes were reported (Elankumaran, 2018, 2019). Mental health conditions were also followed up, and outcomes were reported (Elankumaran, 2020, 2021). The outcomes of Health by Incidence and Prevalence of Diseases with connected Hospital Episodes followed-up are reported in this paper.

Tropical diseases were given more attention during the last four decades to show the conditions of societies. In contemplating illness phenomena, invoking the concept of disease is customary. This notion and derivatives, such as the International Statistical Classification of Diseases (ICSD), consider pathological phenomena. Long prevalent traditions in thought have fostered such separation, tending to make categorical distinctions within the human world. Studies of the geographical distribution of morbidity have focused more on healthcare professionals (Jenkins, 1983). Hence, we consider our administrative DS divisions for one basis of classification. It is also our objective to see the relationship between health conditions and socio-economic status. Hence, we use the established socio-economic groups for classification and comparison (Elankumaran, 2003).

Tropical diseases are given more attention as they are directly related to socio-economic status of people. The morbidity problems arise in Jaffna mainly due to socio-cultural beliefs and behaviors. In colloquial speech, ‘acute’ tends to indicate

something intense, whereas ‘chronic’ implies severity. Thus, acute means an ending with a finite duration, which classically culminates in a crisis. On the other hand, chronic, which is derived from time, indicates long continued. The prevalence of chronic conditions may be high, but their incidence is relatively low.

ICSD is based on components of sequence being variously and severally identified. Provision for certain non-sickness related contacts has been made ever since the 6<sup>th</sup> revision of ICD, and this aspect has been tackled in the 9<sup>th</sup> and later revisions. Statistical classification encompasses the entire range of morbid conditions within a manageable category. The ICD-10 guides recording and coding morbidity, specifically the selection of a single need for presenting morbidity statistics. This leads to include two and three-digit classification of codes of diseases. Various possible solutions were envisaged, one of which is called core classification with a series of modules. This is called three-character main and four-character sub-classifications.

## II. MORBIDITY STUDIES - A LITERATURE REVIEW

Analysis of social causes of mortality by hypertension diseases was investigated using demographic, social, and economic data in Massachusetts (Jenkins, et al., 1979), revealing that low education was the main cause of excess hypertensive mortality. The occurrence of diarrhea in children in the Republic of Congo was studied with socio-economic, environmental, demographic, and behavioral factors in a cross-sectional study. The findings underscored the potential impacts of educational intervention on the occurrence of diarrheal disease (Mock et al., 1993). The episodes of morbidity over a six-month period were recorded in a district of Dogon community with health, educational services, socioeconomic status, and hygienic conditions. It was found that the type of illness and duration of treatments were closely associated with all these factors (Coppo et al., 1992).

The relationship between social-economic-family events and hospital admissions was studied in a cohort in New Zealand. A consistent association between socioeconomic factors and morbidity rates was discussed (Fergusson et al., 1986).

Differences in health status between employed men and women were examined in Hawaii. Socio-demographic and occupational variables were considered. Employed women reported more problems than employed men, especially acute conditions and those requiring more health services (Kodama et al., 1991). Women reported a limiting long-standing illness more than men in a study carried out to see social class differences in illness (Rahkonen and Lahelma, 1992). Social class differences show a decline in CHD in New Zealand men (Kawachi et al., 1991). Dietary habits in households had more influence on mortality in relation to CHD (Morgan et al., 1989; Janice and Janet, 1990; Porrini et al., 1991). Socio-cultural factors have shown a higher association with ‘Ischemic Heart Disease’ (IHD) in Belgium (Lagasse et al. 1986). A study in Hong Kong with three major cardiovascular diseases (IHD, Hypertension, and Cerebrovascular) revealed that a higher risk of death by IHD is associated with a higher level of socioeconomic status (Wong and Donnan, 1992).

Malaria and diarrheal disease patterns were related to environmental and socioeconomic variables at the household level (Lenz, 1988). In the South-Asian context, it is proved in Pakistan that infectious and parasitic diseases are more prevalent in poor socioeconomic groups due to poor housing conditions, environmental sanitation, water supply, etc. (Zaidi, 1988). An integrated household survey used to study infant survival in Pakistan (Agha, 2000), revealed that access to safe water, sanitation, and socioeconomic variables influenced the infant survival. A morbidity survey in a small area within the present study area of the Jaffna peninsula by Sivarajah (1988) reveals that dysentery, diarrhea, cough and fever, passed roundworms, scabies, and measles were highly incidental and prevalent in that study area. Cancer, pulmonary tuberculosis and mental illness were selected to study the prevalence. Cross-tabulations of the selected diseases were carried out in this study. A study in New Zealand (Pearce et al., 1983) revealed that the classification of diseases against administrative divisions was useful for officers like ‘Medical Officers of Health (MOOH)’ to take remedial measures for prevention and control of epidemics.

## II. METHODOLOGICAL ISSUES

We used individuals as cases for collecting morbidity data. Our methodology is framed to record all morbidity details of family members from January to December 2018, that is, one year-period immediately before the Covid-19 pandemic scenario. We classify the morbidity to explore the nature of consequences after a decade of war concluded in 2008. Hence, the influences of war affect, and its atmosphere are minimized or absent.

### A. Data Used in the Present Study

The ISCD was the basis for collecting data, mainly tropical diseases of Jaffna society. We consider the history of diseases in the study sample retrospectively. The role and limitations of retrospective investigations of the diseases were well documented (Mantel and Haenszel, 1959). Statistical methods were employed for analyzing retrospective study data of diseases and the family backgrounds measured by a number of socioeconomic factors. In our original study JSEHS-1999, 23 important socioeconomic variables were used to establish four socioeconomic classes. Table 01 gives major categories of diseases. We selected the diseases relevant to Jaffna society from ICD and compiled them with a three-character core classification that included four-character sub-classifications. The diseases which required medical or surgical treatments were only collected.

We also recorded the number of admissions in clinics and hospitals that required treatments, separately for medical, surgical, and other types, and the total number of days spent on all treatments for all diseases. The list of variables in this study is as follows.

**Morbidity:** ICD codes of Diseases reported by Individuals

Hospital Episodes : Number of Medical admissions (NMeAd), Number of Surgical admissions (NSuAd), Number of Psychiatric admissions (NPsAd), Number of Other admissions (NOtAd), and Total number of days spent in the above admissions (Tot Day).

### B. Statistical Methods

Classification against socioeconomic groups serves the purpose of achieving measures related to primary health care. Geographical

classification is fundamental to understanding disease etiology (Lenz, 1988). We described the demographic features of the entire sample of individuals using age and sex distributions. Our statistical method is cross-tabulation of diseases against four socio-economic groups and six DS divisions. The administrative boundaries of the six divisions are more or less the same as those of the six MOH Divisions, covering the study area.

Table 01: The Summary Codes of the International Classification of Diseases

No	Description of the Classes of Diseases	ICD Code
1	Infectious and Parasitic Diseases	A00 – B99
2	Neoplasms	C00 – D48
3	Diseases of Blood and Blood forming Organs and Immune Mechanism	D50 – D89
4	Endocrine, Nutritional and Metabolic Diseases	E00 – E90
5	Mental and Behavioral Disorders	F00 – F99
6	Diseases of the Nervous System	G00 – G99
7	Diseases of the Eye and Adnexa	H00 – H59
8	Diseases of the Ear and Mastoid process	H60 – H95
9	Diseases of the Circulatory System	I00 – I99
10	Diseases of the Respiratory System	J00 – J99
11	Diseases of the Digestive System	K00 – K93
12	Diseases of the Skin and Subcutaneous System	L00 – L99
13	Diseases of the Musculoskeletal System and Connective tissue	M00 – M99
14	Diseases of the Genito-Urinary System	N00 – N99

Incidence and prevalence are two kinds of rates for measuring diseases. An ‘**incidence rate**’ for a given event is the number of new occurrences in a specified period, as a ratio of the population at risk of experiencing the event during the same period. A ‘**prevalence rate**’ is the ratio of total number of individuals who have an attribute or disease at a particular time or during a particular period of time to the population at risk of having the attribute or disease. Incidence rates may allow an individual to be counted more than once as a case.

Essentially, an incidence rate is an expression of the average frequency of occurrence of an event in a population.

At the second stage of analysis, we constructed a frequency table for the occurrence of groups of diseases and carried out correspondence analysis against the socio-economic groups and DS divisions. We constructed cross-tabulated frequency distributions of various hospital admissions to show the intensity of the reported diseases. Finally, we analyzed total number of days spent by individuals in hospitals to show the severity of diseases. This will also show the usage of health services. Again, correspondence analysis was suitable against socioeconomic groups and DS divisions.

III. RESULTS AND DISCUSSION

Our data analysis is defined with 6388 individual subjects in the sample. It is now proper to show the distributions of demographic features. Age-sex distribution of the sample of individuals is used to construct a population pyramid, given in Figure 01, which shows the basic demographic structure of the study population. This figure shows that the number of youths aged 21 to 45 years is comparatively lower than in other groups. Most youths have left their families for various purposes including educational, political and economic reasons. It also clearly shows that the life expectancy of the people varies between 61 and 80 years, on average 71.

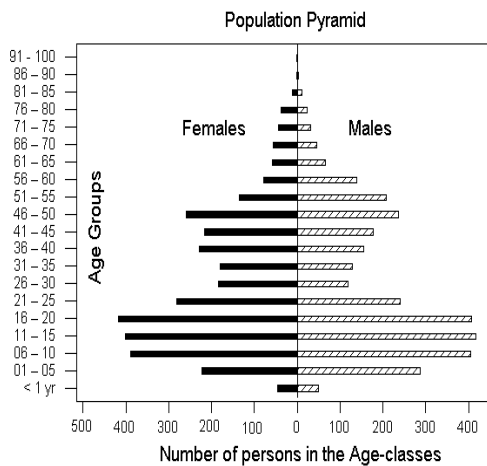


Figure 01: Age-sex Distribution of 6388 Persons in the Sample.

A. Incidence and Prevalence of Various Groups of Diseases

1) Infectious and Parasitic Diseases

Infectious diseases are sub-grouped and named as: Intestinal infectious disease (A00-A09), Tuberculosis (A15-A19), Certain zoonotic bacterial diseases (A20-A28), Other bacterial diseases (A30-A49), Infections with a predominantly sexual mode of transmission (A50-A64), Other spirochactal diseases (A65-A69), Other diseases caused by chlamydiae (A70-A74), Rickettsioses (A75-A79), Viral infections of the central nervous system (A80-A89), and Arthropod-borne viral fevers and viral haemorrhagic fevers (A90-A99). The relevant diseases for the Jaffna society are listed in Table 02, and the occurrences of such diseases are classified against DS divisions and SE groups.

Table 02: Frequency Distributions of the Incidence of Infectious Diseases by DS Divisions and Socio-economic Groups

Disease ICD Code	DS Divisions						SE Groups					Total
	JAF	NAL	VAS	VAS	VAS	VAS	R	UM	LM	P	UK	
A00	0	0	1	4	0	1	0	4	1	1	0	6
A01	3	4	3	1	3	3	2	5	5	6	3	19
A04 /08	1	1	2	2	1	1	0	2	2	4	0	8
A05 /06	8	1	4	3	4	8	0	1	1	7	0	39
A09	2	5	2	3	4	3	3	4	4	1	6	20
A15 -18	2	5	5	2	3	5	1	8	5	8	0	22
A30	0	1	0	0	0	0	0	0	1	0	0	1
A33 /34	0	1	1	0	0	1	0	0	1	2	0	3
A37	1	0	0	1	2	1	0	2	1	2	0	5
A41	3	2	0	3	0	0	2	1	4	1	0	8
A46	1	0	1	3	1	3	0	0	3	6	0	9
A48	1	0	0	0	0	0	0	0	0	1	0	1
A51 /64	1	1	0	0	0	0	0	1	0	1	0	2
A80	1	0	3	0	2	1	0	3	3	1	0	7
A82	0	1	1	0	0	2	0	0	3	1	0	4
A83 /86	0	2	1	0	0	0	0	0	1	1	1	3
A90	0	1	0	1	0	0	0	0	2	0	0	2
Total	7	1	8	7	8	8	2	1	1	2	1	5
	6	2	0	2	6	3	6	3	4	0	0	2
		4						3	3	9		1

(R – Rich, UM – Upper Middle, LM – Lower Middle, P – Poor, UK – Unknown)

Incidence of infectious diseases in the respective DS divisions are 82.6, 100.5, 88.7, 72.9, 80.5 and 64.9 per 1000 persons. This reveals that infectious diseases are more prevalent in the Nallur DS division. The next highest rate is the Valikamam south-west division. The incidence of infectious diseases in the respective socioeconomic groups is 49.2, 77.1, 64.9, and 113.1 per 1000 persons. This reveals that infectious diseases are more prevalent in the poor SE group, which is much higher than middle SE groups and very much higher than the rich group. The overall incidence rate of the region seems to be 81.5 per 1000 persons.

If we consider specific diseases, ‘**typhoid**’ (A01) and ‘**diarrhea**’ (A09) are more prevalent in Jaffna society. The incidence rates of these diseases are 30.5 and 32.2 per 1000 persons. It is interesting to note that the incidence of Typhoid fever is higher in the rich SE group (37.8) than in the poor SE group (34.1). However, the incidence rate of Diarrhea is higher in the poor SE group (59.5) compared to the rich SE group which is only 5.7 per 1000 persons. The incidence of ‘**bacterial food-borne intoxications/amoebiasis**’ (A05/A06) and ‘**tuberculosis**’ (A15-A18) also seem to be prevalent. The incidence rates of these diseases are 6.1 and 3.4 per 1000 persons. While the former is more prevalent in middle SE groups, tuberculosis is more prevalent in poor and upper middle SE groups. The regional variations on these diseases are not significant. It is also relevant to mention here that some other infectious diseases such as ‘**intestinal infections**’ (A04/08), ‘**septicaemia**’ (A41), ‘**erysipelis**’ (A46), and ‘**Acute poliomyelitis**’ (A80), which are slightly prevalent. The prevalence rates are 1.2, 1.2, 1.4 and 1.1 per 1000 persons.

Parasitic diseases are sub-grouped and named as: Viral infections (B00-B09), Viral hepatitis (B15-B19), Human immunodeficiency virus (HIV) disease (B20-B24), Other viral diseases (B25-B34), Mycoses (B35-B49), Protozoal diseases (B50-B64), Helminthiasis (B65-B83), Pediculosis, acariasis & other infestations (B85-B89), Sequelae of infectious & parasitic diseases (B90-B94), Bacterial, viral, & other infectious agents (B95-B97), and Other infectious diseases (B99). The reported diseases in Jaffna society are listed against DS divisions and SE groups in Table 03.

Incidence rates of parasitic diseases in the respective DS divisions are 219.5, 225.3, 350.3, 358.6, 270.6 and 277.2 per 1000 persons. These results reveal that the parasitic diseases are more prevalent in the western parts, covering Valikamam's south-west and west divisions. Rural zones Valikamam south and east also seem to have higher incidence rates. However, the rates in the urban zones Jaffna and Nallur are relatively low but reasonably high. The overall incidence rate of parasitic diseases is 280.7 per 1000 persons. The incidence rates for the SE groups are 115.5, 308.4, 240.1 and 341.9 per 1000 persons. This reveals that parasitic diseases are more prevalent in poor and upper-middle groups.

Table 03: Frequency Distributions of the Incidence of Parasitic Diseases by DS Divisions and Socio-economic Groups

Dis ease IC D Cod e	DS Divisions						SE Groups					T ot al
	J	N	V	V	V	V	R	U	L	P	U	
	A	A	A	A	A	A		M	M		K	
B01	6	13	16	27	27	41	5	3	3	5	5	13
B05	4	1	5	11	1	7	0	1	9	0	1	0
B09	0	1	0	0	0	0	1	6	1	7	0	29
B19	5	17	8	6	11	8	0	0	5	0	1	1
B26	2	9	4	1	4	7	0	1	0	1	0	55
B30	0	2	0	0	0	0	0	9	1	6	0	27
/33	3	5	4	0	3	1	0	1	9	4	0	2
B50	16	20	24	26	21	25	5	4	9	1	2	16
.0	9	0	0	5	2	5	0	1	0	7	7	13
B51	2	8	16	16	13	6	1	5	4	4	2	41
B54	1	0	0	1	0	0	0	4	3	5	0	61
B74	2	2	5	2	1	2	0	1	9	7	0	2
.0	3	5	3	4	3	3	0	5	2	2	0	14
B76	5	13	13	21	13	23	4	1	1	8	2	21
B77	0	0	1	0	1	1	0	3	7	0	1	88
B86	0	2	1	0	0	0	0	2	0	7	0	3
B88								4	3	1		3
B99								1	3	7		
								1	2	3		
								9	6	7		
								1	0	1		
								1	2	0		
Tot al	20 2	27 8	31 6	35 4	28 9	35 4	6 1	5 3	5 2	6 3	3 9	17 93

(R – Rich, UM – Upper Middle, LM – Lower Middle, P – Poor, UK – Un known)

Higher incidences of parasitic diseases are seen compared to infectious diseases. It is clear that infection of ‘**malaria-fever**’ (B51) is more dominant compared to other parasitic diseases.

Malaria is more prevalent in the poor and upper-middle SE groups. It is important to note that unspecified malaria (or 'chronic malaria') (B54) also reported. The overall incidence rate seems to be 9.5 per 1000 persons. It is clear that the western parts of the peninsula are affected by chronic malaria. This is also seen as more prevalent in the poor SE group, with an incidence rate of 15.1 per 1000 persons compared to other SE groups. Further, the incidence of 'cerebral malaria' (B50.0) is reported with overall rate of 2.5.

It is relevant to mention other parasitic diseases which are prevalent. The overall incidence rates of 'chickenpox' (B01), 'measles' (B05), 'viral hepatitis' (B19), and 'mumps' (B26) are 20.3, 4.5, 8.6, and 4.2 per 1000 persons. These diseases are most common in Jaffna society. However, chickenpox is more incidental compared to others. Further, the incidence rates of 'hookworm diseases' (B76), 'roundworm infection' (B77), and 'scabies' (B86) seem to be not very low. The rates are 2.2, 3.3, and 13.8 per 1000 persons. These diseases are not visible in the rich SE group but are prevalent in other groups. The incidence rate of scabies in the poor SE group 20.0 seems significant.

## 2) Neoplasms, Diseases of Blood and Immune Mechanism & Endocrine, Nutritional and Metabolic Diseases

Three types of neoplasms are malignant, in-situ and benign. Malignant neoplasms (cancer) are sub-grouped as Malignancy in the lip, oral cavity & pharynx (C00-C14), digestive organs (C15-C26), respiratory & intrathoracic organs (C30-C39), bone & articular cartilage (C40-C41), skin (C43-C44), mesothelium & soft tissue (C45-C49), breast (C50), female genital (C51-C58), male genital (C60-C63) organs, urinary tract (C64-C68), eye, brain & central nervous system (C69-C72), thyroid & endocrine glands (C73-C75), ill-defined, secondary & unspecified sites (C76-C80) and lymphoid, haematopoietic & related tissue (C81-C96). In situ neoplasms are grouped as Carcinoma in situ and Melanoma in situ of various parts (D00-D09). Benign neoplasms are sub-grouped as: Known & certain behaviour (D10-D36), and Unknown & uncertain behavior (D37-C48).

The prevalence of malignancy is very few, as only 13 cases were reported. Regional variation is visible. Majority (77%) come from both urban divisions. The western area seems to be free of

malignancy. The majority (about 46%) also come from the 'Lower Middle' class. In-situ and benign neoplasms are more prevalent in Valikamam south-west compared to other divisions. Further, middle and poor SE groups reported more cases, and rich group reported very low. Benign neoplasms in '**bone, articular cartilage, and skin**' (D16/D23) and in '**female genital organs**' (D26-30) are reported to be more prevalent. Overall prevalence rates of all types are 1.7 and 10.3 per 1000 persons.

Diseases of immune mechanism, endocrine, nutritional & metabolic diseases are grouped as: anaemias (D50-D64), haemorrhagic conditions (D65-D69), diseases of blood & blood forming organs (D70-D77), disorders of immune mechanism (D80-D89), thyroid glands (E00-E07), diabetes mellitus & related disorders (E10-E16), disorders of endocrine glands (E20-E35), malnutrition & nutritional deficiencies (E40-E64), and metabolic diseases (E70-E90). Reported diseases were classified by DS divisions and SE groups. Prevalence rates of these diseases for DS divisions are 63.0, 56.7, 44.3, 39.5, 42.1 and 43.1 per 1000 persons. This reveals that these are more prevalent in both urban sectors compared to rural zones. Prevalent rates for SE groups are 85.2, 48.6, 50.4, and 35.1 per 1000 persons, showing that these diseases are more prevalent in rich SE groups than low SE groups. The overall prevalence rate of Jaffna society seems is 48.1 per 1000 persons.

Diseases of blood, blood-forming organs & immune mechanisms are reported in various '**anaemic conditions**' (D50, D51, D53 & D64). All types of anaemias are prevalent in DS divisions: 9.7, 8.1, 12.2, 10.1, 10.3 and 6.3 per 1000 persons. This shows that except Valikamam East all other divisions have reported higher anaemic cases. Prevalence for SE groups 1.8, 5.8, 7.3, and 17.3 per 1000 persons reveals that prevalence is very high in the poor SE group compared to the other two middle groups. The anaemias is not prevalent in rich SE group. The overall prevalence rate of the region is 9.2 per 1000 persons. Overall rates of specific anaemic cases of iron/vitamin deficiency anaemia and nutritional anaemia seem to be 3.6 and 4.8 per 1000 persons. Prevalence of '**thyroid problems**' is common in Jaffna society as reported by the overall rate of all types of thyroid problems (E02, E05 & E06) is 3.9 per 1000 persons. Prevalence is higher in both middle SE groups together, which is 3.1 per 1000 persons,

compared to rich & poor groups. Considering regional variations, it seems there are not many variations among DS divisions.

Considering the popular disease '**diabetes mellitus**', more people reported the prevalence of '**non-insulin dependent diabetes mellitus**' (E11) with an overall prevalence rate of 27.2 per 1000 persons. The regional variations are 40.2, 29.2, 23.3, 22.3, 24.3, and 25.1 per 1000 persons. This shows that non-insulin dependent diabetes is more prevalent in metropolitan areas. Rates for SE groups 60.6, 29.5, 29.9, and 12.4 per 1000 persons show that the prevalence of diabetes in the rich SE group is very high and five times higher compared to poor SE group. **Insulin-dependent diabetes** (E10) is reported with an overall prevalence as 2.8 per 1000 persons. There are no regional or socioeconomic variations in insulin-dependent diabetes. If we include all types of diabetes (E10, E11, E12, and E14) the prevalence rate is slightly more. That is, the overall rate is 32.5 per 1000 persons. The corresponding prevalence rates for divisions are 42.4, 38.1, 27.7, 27.3, 29.0, and 30.5. This reveals that the difference compared to the rates of non-insulin dependent diabetes is higher in the Nallur division. The same rates for socioeconomic groups are 70.1, 35.4, 36.7, and 14.6. Again, the difference is higher in the rich SE group. This shows that other types of diabetes are more prevalent in the Nallur division and in the rich SE group.

### 3) *Diseases of the Circulatory, Respiratory, and Digestive Systems*

Circulatory diseases are grouped as Acute rheumatic fever (I00-I02), Chronic rheumatic heart disease (I05-I09), Hypertensive diseases (I10-I15), Ischaemic Heart Disease (IHD) (I20-I25), Pulmonary heart disease & pulmonary circulation (I26-I28), Other forms of heart disease (I30-I52), Cerebrovascular diseases (I60-I69), Diseases of arteries, arterioles & capillaries (I70-I79), Diseases of veins, lymphatic vessels and lymph nodes (I80-I89), and Other disorders (I95-I99). Reported diseases classified show prevalence rates in DS divisions as 98.9, 73.7, 63.2, 59.7, 63.6 and 68.1 per 1000 persons, revealing that Jaffna division has the highest rate. An overall rate of 70.9 reveals that of 1000 persons, about 71 have a circulatory disease. Rates for SE groups 85.2, 71.3, 80.7 and 54.6 per 1000 persons show that such diseases are more prevalent in rich and middle groups.

Considering specifically '**hypertensive diseases**' (I10-I15), the overall rate of 20.9 shows for every 1000 persons, about 21 persons have one of hypertensive diseases. The regional variation of this disease by 23.9, 13.7, 25.4, 17.2, 15.9 and 19.7 shows Jaffna and Valikamam south-west have reported higher prevalence. If we consider SE groups with their prevalence rates of 43.5, 24.3, 19.9, and 11.9, it is clear that rich SE group has reported more such diseases. It is relevant to note other circulatory diseases, which are prevalent in Jaffna society with overall rates as '**rheumatic fever**' (I00/I01) : 5.3, '**rheumatic heart disease**' (I05/I08/I09) : 3.9, '**angina pectoris**' (I20) : 15.3, '**myocardial infarction**' (I20/I21) : 5.3, '**ischaemic heart disease**' (I24/I25) : 6.7, '**varicose veins** of lower extremities' (I83) : 3.7, and '**haemorrhoids**' (I84) : 6.7.

Respiratory system diseases are grouped as Acute upper respiratory infections (J00-J06), Influenza & pneumonia (J10-J18), Acute lower respiratory infections (J20-J22), Diseases of the upper respiratory tract (J30-J39), Chronic lower respiratory diseases (J40-J47), Lung diseases due to external agents (J60-J70), Diseases affecting the interstitium (J80-J84), Suppurative & necrotic conditions of lower respiratory tract (J85-J86), Diseases of Pleura (J90-J94), and Other diseases (J95-J99). Classified reported diseases reveal that more respiratory diseases are prevalent than other diseases. Regional variation of such diseases; 193.4, 175.0, 78.7, 54.7, 137.6 and 142.5 reveal that these diseases are highly prevalent in Jaffna, Nallur, Vali south and Vali east DS divisions and comparatively higher than other diseases. Overall, the regional rate of 132.7 shows that for every 1000 persons, about 133 persons have one respiratory disease. Rates for SE groups 125.0, 123.4, 130.2, and 144.4 reveal that, even though these are high for all groups, the poor group has the highest among all groups. Hence, we can conclude that respiratory diseases are prevalent all over the area, comparatively higher than other diseases and have affected everyone.

Specific disease '**acute upper respiratory infections**' (J01-J06) is highly prevalent. The regional variation by incidence rates 34.7, 22.7, 8.8, 9.1, 13.1 and 12.5 show that upper respiratory infections are more prevalent in urban divisions, average in Vali south and Vali east divisions, but low in two western divisions. The overall incidence rate of 16.7 reveals that for every 1000

persons, about 17 persons were affected by such respiratory infections. The rates 15.1, 13.3, 20.8 and 35.7 of SE groups reveal that lower middle and poor group people were infected more than other groups. Further, ‘acute sinusitis’ (J01) seems to have a higher prevalence with a 5.9 per 1000 persons overall.

Specific disease ‘influenza’ (J10/11), known as ‘flue’ in Jaffna, the incidence rates in the divisions 52.1, 48.6, 7.7, 9.1, 56.1 and 43.1 show that flue is prevalent in all divisions but less in two western divisions. The overall rate of 37.4 reveals that for every 1000 persons, about 37 persons were affected by flu in 2019. The rates for SE groups 49.2, 33.6, 34.0 and 40.0 show that flue is more prevalent in rich group compared to others. Another specific disease in Jaffna society, ‘pneumonia’ (J12/15/18), consisted 3 types due to viruses, bacteria and mixed in our classification. Incidence rates for divisions 9.7, 6.5, 7.7, 7.1, 4.7 and 1.5 show that the incidence of pneumonia is more or less absent in Vali East while very low in all other divisions. The overall incidence rate of the region is 5.9 per 1000 persons. The rates for SE groups 1.8, 8.1, 3.2 and 8.1 reveal that pneumonia is more prevalent in upper-middle and poor groups and less prevalent or absent in rich groups.

A chronic issue more prevalent in Jaffna is ‘asthma’ (J45). We separately considered ‘allergic asthma’ (J45.0), ‘non-allergic asthma’ (J45.1) & ‘mixed/unspecified asthma’ (J45.8/45.9). Prevalence rates for regional variation and SE groups are summarized in Table 04. This table reveals that for every 1000 persons in Jaffna society, about 59 persons have any type of asthma. Among them, 29 have allergic asthma, 21 have non-allergic asthma, and 9 have other types. Allergic asthma is more prevalent in urban divisions, less in western divisions, and high in upper-middle and poor groups. Non-allergic asthma is more prevalent in Jaffna, Nallur and Vali east, but very less prevalent in Vali west. Further, this is more prevalent in lower-middle and poor groups.

Table 04: The Prevalence Rates of Asthma by DS Divisions and SE Groups

Ast hma type	DS Divisions						SE Groups				T o t a l
	J	N	V	V	V	V	R	U	L	P	
	A	A	A	A	A	A		M	M		
Alle rgic	3 6 .	4 2 .	1 9 9	1 4 1	2 4 .	3 2 1	2 4 6	3 0 7	2 3 6	3 4 1	2 8 9
Non - aller gic	3 3 .	2 6 .	1 7 7	7 1 .	1 2 .	2 6 1	1 7 0	1 9 1	2 3 6	2 1 6	2 0 9
Uns peci fied	8 .	6 .	1 1	4 0	1 4	1 0	9 4	8 1	8 1	1 9	9 2
All type s	7 9 .	7 5 .	4 8 7	2 5 3	5 0 .	6 9 .	5 1 .	5 7 .	5 5 .	6 7 6	5 9 1

(R – Rich, UM – Upper Middle, LM – Lower Middle, P – Poor, UK – Unknown)

Mixed or unspecified asthma is more prevalent in Vali south-west and Vali south. Also, it is more prevalent in rich and poor groups but less in middle groups. All types together show higher prevalence in urban divisions and very less in Vali west. All types are more prevalent in the poor group, although these are equally high in other groups.

The prevalence of ‘bronchitis’ (J20/21/42) and ‘acute lower respiratory infection’ (J22) known as ‘respiratory tract infection’ (RTI) are seen. The overall prevalence rates of these diseases are 4.5 and 2.8. The regional variation of bronchitis is given by 4.3, 7.2, 2.2, 3.0, 4.6 and 4.7, which means bronchitis is more prevalent in Nallur than others. Variations in SE groups 1.8, 2.8, 6.3, and 4.9 show this is more prevalent in lower middle and poor groups. Prevalence of RTI seems to present only in Jaffna, Nallur, and Vali East with rates of 6.5, 6.4, and 3.1, respectively and also absent in the rich group.

Diseases of the digestive system are sub-grouped as Diseases of the oral cavity, salivary glands, & jaws (K00-K14), Oesophagus, stomach & duodenum (K20-K31), Appendix (K35-K38), Hernia (K40-K46), Non-infective enteritis & colitis (K50-K52), Diseases of intestines (K55-



K63), Peritoneum (K65-K67), Liver (K70-K77), Disorders of gallbladder, biliary tract & pancreas (K80-K87), and Other diseases (K90-K93). Reported classified diseases show prevalence rates for DS divisions as 140.2, 130.4, 119.7, 89.1, 102.1, and 80.6. This reveals that these diseases are more prevalent in urban areas than in other divisions. The overall prevalence rate of 109.2 reveals that for every 1000 persons, about 109 such diseases. The rates for SE groups are 100.3, 125.2, 100.7, and 107.1. This shows that prevalence is higher in the upper middle group compared to the other.

Regional variation on '**dental caries**' (K02) by 57.6, 65.6, 46.5, 35.4, 44.0 and 34.4 per 1000 persons show Nallur division has more dental caries. The overall rate of 47.2 reveals that about 47 persons have problems with dental caries. Rates for SE groups 54.9, 56.2, 41.7 and 43.3 show that rich and upper-middle groups have more issues. Another reported disease is '**ulcer**', including '**gastric ulcer**' (K25), '**duodenal ulcer**' (K26) & '**peptic ulcer**' (K27). Divisional rates 55.4, 36.4, 42.1, 33.4, 37.4 and 30.5 show that ulcer is more prevalent in the urban area. The overall rate of 38.5 reveals that about 38 persons have ulcer problems. Rates for SE groups 35.9, 40.5, 37.6 and 37.7 show that its prevalence is higher in upper middle group than others, which are equally high. Overall rates of 22.8, 4.7 and 10.9 for the 3 types reveal that gastric ulcer is more prevalent in Jaffna. Regional variation of '**Hernia**' (K40-K46); includes inguinal, femoral, umbilical, ventral and abdominal; given by rates 8.6, 4.0, 11.1, 9.1, 4.7 and 3.9 show it is high in Jaffna division compared to other. An overall rate of 6.5 indicates that about 6 persons have one type of hernia. Rates for SE groups 1.8, 8.6, 4.5 and 8.6 show hernia is more prevalent in the upper middle and poor groups than others.

Overall rates 1.7, 1.7, 2.0, 3.4 & 2.2 of diseases '**stomatitis**' & related lesions, and diseases of '**lips, oral mucosa & tongue**' (K12-K14), diseases of '**oesophagus**', (K20-K22), '**dyspepsia**' (chronic indigestion) & related diseases of '**stomach**' & '**duodenum**' (K30/K31), '**appendicitis**' (K35-K38), and diseases of '**intestine**' (K58/K59/K63) show that they are less prevalent. Of 1000 persons, about 3 have appendicitis, 2 have chronic indigestion, and 2 have intestine diseases such as irritable bowel syndrome or constipation. The regional variation of '**alcoholic and toxic liver diseases**' (K70/K71)

by 3.2, 4.8, 5.5, 0, 4.6 and 1.5 shows this is absent in Vali West. Overall rate of 3.2 shows that for every 1000 persons, about 3 have alcoholic toxic liver disease. Rates for SE groups 1.8, 2.8, 3.1 and 4.3 show that liver diseases are more prevalent in middle and poor groups.

#### 4) *Diseases of Skin and Subcutaneous system and of Musculoskeletal System and Connective tissue*

Diseases of Skin and subcutaneous tissue are grouped as Infections (L00-L08), Bullous disorders (L10-L14), Dermatitis & eczema (L20-L30), Papulosquamous disorders (L40-L45), Urticaria & Erythema (L50-L54), Radiation-related disorders (L55-L59), Disorders of skin appendages (L60-L75), and Other disorders (L80-L99). Reported diseases were classified for DS divisions and SE groups. Rates by divisions 46.7, 41.3, 34.3, 27.3, 36.5 and 39.9 reveal that skin disease prevalence is high in urban divisions and in Vali East and low in Vali West. The overall rate of 37.8 reveals that about 38 persons have one type of these diseases. Rates for SE groups 41.6, 36.5, 34.9 and 41.6 per 1000 persons show this is high in the rich and poor groups. The middle groups have less prevalence.

'**Infections of skin & subcutaneous tissue**' (L02/L03/L08), include cutaneous abscess, furuncle, carbuncle, cellulitis & other local infections. Regional variation 13.0, 11.3, 18.8, 13.1, 11.2 and 12.5 reveals that these are more prevalent in Vali south-west. The overall rate of 13.1 shows that about 13 persons were infected. Rates for SE groups 7.5, 9.2, 11.3 and 20.0 show that prevalence is more on lower middle and poor groups. Regional variations by rates 3.2, 11.3, 2.2, 2.0, 7.4 and 7.8 of Atopic dermatitis, including '**eczema**' (L20) show that eczema is more prevalent in Nallur, Vali south, and Vali east and very low in two western divisions. The overall rate shows that about 6 persons have eczema or other atopic dermatitis. Rates of SE groups 5.6, 5.2, 5.9 and 7.5 show that the poor SE group has more eczema. The rates of '**all other dermatitis**' (L21-L30) in the divisions 20.6, 14.5, 13.3, 10.1, 14.9 and 17.2 show that these are highly prevalent in Jaffna and Vali east. The overall rate is 15.1 per 1000 persons. Rates for SE groups 24.6, 17.9, 14.0 and 11.9 show that other types of dermatitis are more prevalent in rich group.

Diseases of the musculoskeletal system & connective tissue are grouped as Arthropathies (M00-M25), Systemic connective tissue disorders (M30-M36), Dorsopathies (M40-M54), Soft tissue disorders (M60-M79), Osteopathies & chondropathies (M80-M94), and Other disorders (M95-M99). The reported diseases classified reveal that the prevalence rates of these diseases for DS divisions are 51.1, 42.1, 32.1, 33.4, 19.6 and 17.2 per 1000 persons. This shows that these diseases are more prevalent in the urban divisions and less in Vali South and Vali East. The overall prevalence rate 31.9 reveals that about 32 persons have these diseases. The rates for SE groups 39.7, 35.3, 36.3 and 20.5 show that these types of diseases are more prevalent in rich and less prevalent in poor groups.

**'Arthritis'** (M00/M05/M06/M13), which includes pyogenic, seropositive, rheumatoid, & other types, is prevalent as seen by regional variations 13.0, 15.3, 19.9, 23.3, 7.4 and 9.3 and it is more prevalent in two western divisions. The overall rate of 14.4 reveals that about 14 persons have one type of arthritis. Rates for SE groups 15.1, 19.1, 16.3 and 7.0 show that upper middle and poor groups have more and less prevalence. Another reported disease is **'soft tissue disorders'** (M75/M79), which includes **shoulder lesions, rheumatism, myalgia, and pain in limbs**. Regional variations 13.0, 12.9, 5.5, 5.1, 1.8 and 4.6 show that soft tissue disorders are more prevalent in urban divisions and less in all rural zones. The overall rate is about 7 per 1000 persons. Rates for SE groups 5.6, 5.7, 9.5, and 5.9 show that lower middle group is more prevalent. Less prevalent diseases reported are **'joint disorders'** (M20-M25), **'intravertebral-disc-disorders'** & **'dorsalya'** (M51/M54), and **'disorders of muscles'** (M60-M62). Overall rates of these diseases are 2.9, 2.6 and 2.6.

#### *B. Overall Morbidity Variation and Relationships*

We considered groups of diseases separately and described by incidence and prevalence rates for administrative divisions and socioeconomic groups. We now combine all groups of diseases together and analyze overall morbidity variation and relationships. We assign codes for disease groups as: A–Infectious diseases, B–Parasitic diseases, CD–Neoplasms, DE–Diseases of blood, blood-forming organs, immune mechanism, endocrine, nutritional, & metabolism, G–Diseases of the nervous system, H–Diseases of eye, adnexa,

ear & mastoid process, I–Diseases of the circulatory system, J– Diseases of the respiratory system, K–Diseases of the digestive system, L– Diseases of skin & subcutaneous tissue, M– Diseases of musculoskeletal system & connective tissue, N–Genitourinary system. The frequency distribution for combinations of diseases is given in Table 05.

We applied correspondence analysis on frequency tables of DS divisions & SE groups separately. Two-dimensional symmetrical configuration for the correspondence between **'disease groups'** & **'DS divisions'** is shown in Figure 4.2.1. The first two components together explain 82% of total inertia. Two-dimensional symmetrical configuration for the correspondence between **'disease groups'** & **'socioeconomic groups'** is shown by the Figure 3. The first two components together explain 96% of total inertia.

Figure 02 shows that there are associations between disease groups and DS divisions. About 85% of the time, urban divisions are associated with disease groups 'Diseases of eye, adnexa, ear & mastoid process' (H). Western divisions Vali south-west and Vali west are associated with the disease group 'Parasitic diseases' (B). Other rural divisions Vali South and Vali East, have not shown any clear pattern of association. Infectious diseases (A) & diseases of the nervous system (D) have no association with any divisions. Figure 4.2.2 shows that there are associations between disease groups and socioeconomic groups. About 82% of the time poor SE group was associated with 'Infectious diseases' (A). Further, rich socioeconomic group is closely associated with 'Diseases of the blood, blood-forming organs, immune mechanism, endocrine, nutritional, and metabolism'. The figure also reveals that the upper middle socioeconomic group has very less association with all groups of diseases. The lower middle socioeconomic group seems to have a close association with 'Neoplasms' (CD) and 'Diseases of the genitourinary system' (N).

Table 05: Frequency Distribution of Groups of Diseases by DS Divisions and SE Groups

Disease IC Code	DS Divisions						SE Groups			
	JAF	NAL	VAS	VAS	VAS	VAS	R	UM	LM	P
A	76	124	80	72	86	83	26	13	13	20
B	202	278	316	354	289	344	61	53	52	63
CD	13	17	18	8	9	12	61	21	29	20
DE	58	70	40	39	45	55	45	84	11	65
F	16	28	17	14	15	14	65	35	40	22
G	15	25	15	16	10	11	40	40	29	29
H	71	110	50	35	74	74	47	18	14	90
I	91	91	57	59	68	87	45	12	17	10
J	178	216	71	54	147	122	66	21	88	67
K	129	160	18	88	109	33	53	12	28	18
L	43	51	31	27	39	12	23	67	77	77
M	47	52	29	33	21	21	22	61	80	38
N	23	40	21	77	29	30	12	40	59	38

(R – Rich, UM – Upper Middle, LM – Lower Middle, P – Poor)

C. Hospital Episodes for Various Treatments

In the preceding sections, diseases affecting individuals are described in detail. For every individual, we recorded a particular disease only once, if that disease needed medical attention. For example, we recorded ‘malaria’ with code ‘B51’ for a person but did not record how many times ‘malaria’ affected him during the period. Hence, we countered all admissions of all diseases described. This included one-day clinical examinations and treatments at OPD and continuous treatments by ward admissions at

private and government hospitals of a duration of more than one day.

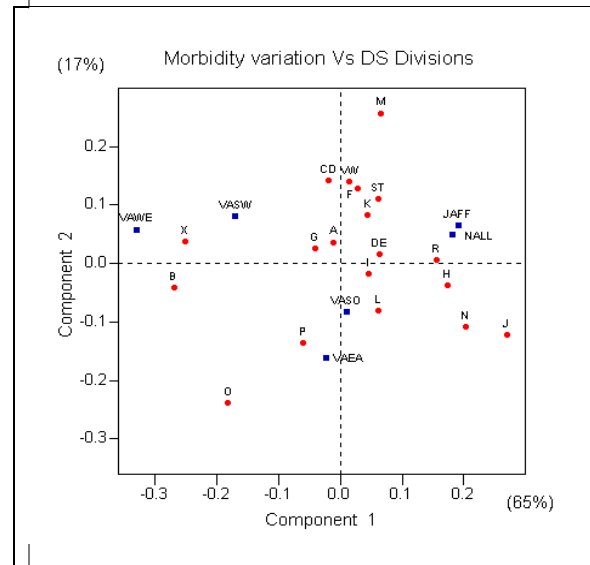


Figure 02: Symmetric Plot between Groups of Diseases and DS Divisions

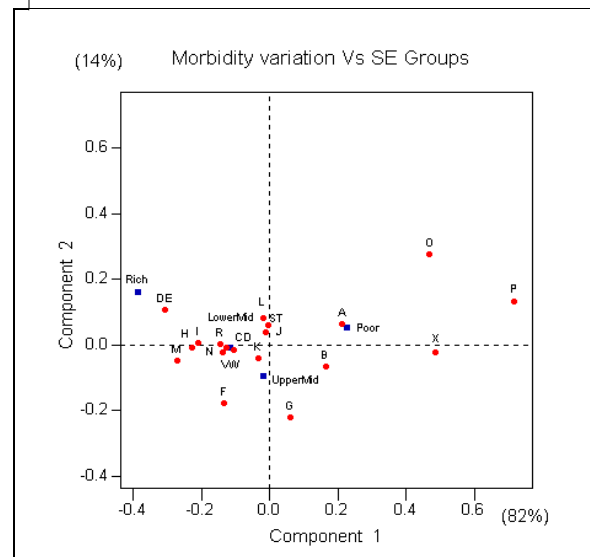


Figure 03: Symmetric Plot Groups of Diseases and Socioeconomic Groups

Number of admissions at clinics and hospitals were classified by types of admissions. Major categories are Medical, Surgical, Pediatric, Psychiatric, and of peripheral sub-systems. We report the percentage of people who have undergone different treatments.

1) Medical and Surgical Admissions

Medical admissions are related to the majority of disease groups shown above. We classified them against DS divisions and SE groups, as shown in Table 06. Surgical admissions include surgeries for treatments due to diseases, injuries, accidents,

exposures & assaults. We classified them against DS divisions and SE groups, as shown in Table 07.

44.8, 56.7, 51.2, and 58.7 reveal that more admissions come from the people of upper middle and poor SE groups.

Table 06: Frequency Distribution of hospital Admissions on Medical Treatments by DS Divisions and Socio-economic Groups

Number of Admissions	DS Divisions						SE Groups					Total
	JAF	NAL	VAS	VAW	VAS	VEA	R	UM	LM	P	UK	
0	395	533	405	471	510	593	291	746	1075	73	320	297
1-2	167	256	193	156	231	357	90	37	3	41	186	130
3-5	205	263	178	277	211	283	80	34	41	41	270	133
6-10	91	109	76	76	57	46	38	19	40	13	63	45
11-15	48	57	29	35	50	57	23	77	16	58	0	27
16-25	11	14	14	8	6	9	5	19	18	14	1	62
>25	3	2	7	4	3	2	1	10	22	8	0	21
Total	920	1234	902	997	1107	1515	515	1272	1808	1188	848	638

(R – Rich, UM – Upper Middle, LM – Lower Middle, P – Poor, UK – Unknown)

This table reveals that about 54.5% of the people have undergone at least once for medical treatments. Regional variations of people on medical treatments by 57.0, 56.8, 55.1, 52.3, 52.2, and 53.5 per cent show that more than half of the people were admitted to medical treatments at least once during 2019. Percentages for SE groups

Table 07: Frequency Distribution of Hospital Admissions on Surgical Treatments by DS Divisions and Socio-Economic Groups

Number of Admissions	DS Divisions						SE Groups					Total
	JAF	NAL	VAS	VAW	VAS	VEA	R	UM	LM	P	UK	
0	791	137	75	87	97	141	46	15	19	16	78	55
1-2	93	164	92	68	86	90	5	0	0	0	6	93
3-5	32	30	31	36	31	31	13	14	21	17	0	19
6-10	3	3	4	6	2	5	0	7	5	5	0	23
>10	1	0	0	0	0	0	0	6	9	8	0	1
Total	920	1234	902	997	1107	1515	515	1272	1808	1188	848	638

(R – Rich, UM – Upper Middle, LM – Lower Middle, P – Poor, UK – Unknown)

This table reveals that about 12.6% of people have undergone at least once on surgical treatments. Regional variations of people on surgical treatments by 14.0, 15.9, 14.1, 11.1, 11.1 and 9.8 percents show that people of urban and Vali south-west have undergone to more surgical treatments compared to others. Percentages for SE groups 12.8, 13.0, 12.4 and 12.7 show no differences among SE groups regarding surgeries.

2) Overall Pattern of Hospital Admissions

We produced distributions of various treatments by the percentage of people who had undergone to the particular treatments for DS divisions & SE groups. Now, we consider all treatments together to see the relationships of types of treatment with divisions and groups. We counted the number of times a particular treatment was given to DS divisions and SE groups. In other words, health

services by different treatments are countered and compiled in Table 08.

Table 08: The Frequency Distribution of Various Hospital Admissions by DS Divisions and SE Groups

Type of Admission	DS Divisions						SE Groups			
	J	N	V	V	V	V	R	U	L	P
	A	A	A	A	A	A		M	M	
	F	L	S	W	S	E				
	F	L	W	E	O	A				
Medical	2	3	25	24	2	2	1	4	5	4
	5	4	2	91	4	6	1	8	4	6
	9	6	5		9	9	2	3	6	4
	4	9			9	8	8	7	8	3
Surgical	3	3	28	28	2	2	1	5	5	5
	0	8	4	7	6	8	3	4	9	2
	8	8			0	7	7	8	5	5
Pediatric	7	1	1	14	1	1	6	1	1	2
		4			0	6		7	0	9
Maternity	4	8	72	93	1	1	2	9	1	2
	8	5			0	0	0	9	0	8
					2	7			1	5
Psychiatric	5	9	49	36	3	3	2	1	1	5
	3	5			7	6	3	0	1	2
								6	8	
Other	3	4	28	30	4	3	1	6	7	5
	2	7	3	6	2	8	7	5	4	7
	8	3			3	4	6	8	5	8

(R – Rich, UM – Upper Middle, LM – Lower Middle, P – Poor)

We applied correspondence analysis on these two-way frequency tables for divisions and groups separately. The two-dimensional symmetrical configuration for correspondence between ‘different treatments’ and ‘DS divisions’ is shown in Figure 4.3.1. The first two components together explain 88% of the total inertia. The two-dimensional symmetrical configuration for correspondence between ‘different treatments’ and ‘SE groups’ is shown in Figure 4.3.2. The first two components together explain 99% of total inertia.

Figure 04 reveals that there are associations between types of hospital admissions and DS divisions. Medical and surgical admissions are closely associated with urban areas and Valikamam south-west. Psychiatric and pediatric admissions have independent behaviour with DS

divisions. However, the miscellaneous type of admissions, ‘On peripheral sub-systems’ seems to have close association with Valikamam South and Valikamam East. Valikamam West has no close associations with different types of admissions. Figure 5 shows some associations. Psychiatric and paediatric admissions have no association with any of the SE groups. Both middle-class SE groups seem to be closely associated with medical, surgical, and other types of admissions. Surprisingly, poor socioeconomic group has no association with any type of hospital admissions.

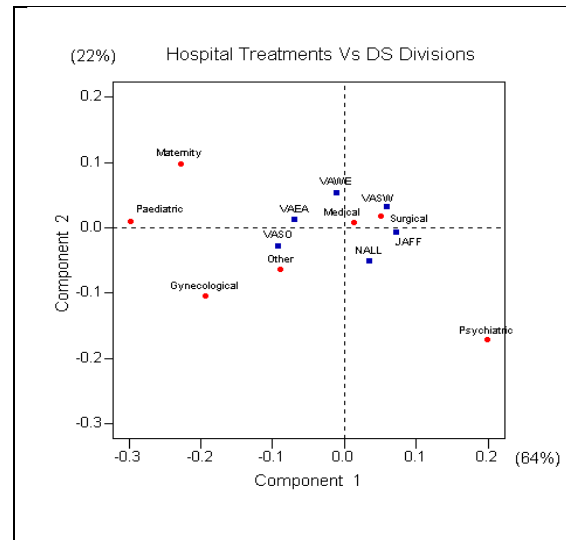


Figure 04: Symmetric plot between various treatments and DS Divisions.

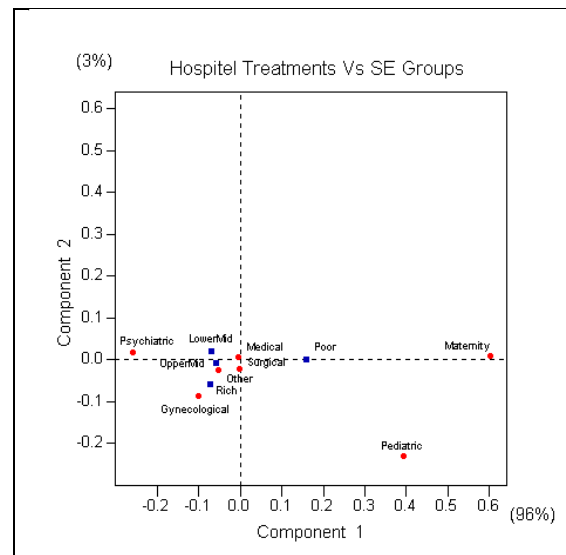


Figure 05: Symmetric plot between various treatments and SE groups.

### 3) Hospital Usage of Individuals for Various Treatments

The hospital usage of an individual is defined as the total number of days spent by that person during 2019 on all types of treatments. This

includes total duration of treatments given by hospitals on all diseases. We constructed frequency distribution of persons on ‘hospital usage’ (total number of days spent in clinics & hospitals) by Table 09.

Table 09: Hospital Usage of Individuals by DS Divisions and Socio-economic Groups

Number of Days	DS Divisions						SE Groups					Total
	Jaffna	Nallur	Valikamam East	Valikamam West	Valikamam North	Valikamam South	Rich	Upper Middle	Lower Middle	Poor	Un known	
0	273	363	301	358	350	43	218	539	795	518	270	288
1-2	168	216	146	134	191	29	91	318	351	313	115	154
3-5	190	261	160	207	290	28	84	418	371	271	64	217
6-10	141	177	100	114	124	16	62	245	277	233	47	187
11-15	79	100	74	83	84	8	32	114	125	117	19	149
16-25	33	64	41	41	52	5	12	74	90	0	2	81
26-50	24	39	33	31	27	2	62	43	58	5	1	79
51-100	90	103	13	97	98	4	218	117	115	2	5	44
>100	3	2	4	3	4	3	16	6	6	6	0	19
Total	920	1204	907	987	1118	111	511	278	288	204	84	638

(R – Rich, UM – Upper Middle, LM – Lower Middle, P – Poor, UK – Un known)

This table reveals that about 67.3% of the people have used the health services at least one day during the said period. About 26.7% of people have never used any health services provided by hospitals, clinics and dispensaries. Regional variations of hospital usage are given by

percentages 70.3, 70.5, 66.6, 63.7, 67.2 and 65.3. Though most of the people of the divisions have used such health services, the utilization by urban divisions is higher than the other rural divisions. The percentages for SE groups 58.7, 69.2, 63.9, and 71.9 reveal that the rich SE group has low utilization and the poor SE group has high utilization. The utilization by the upper middle class seems higher than the lower middle class.

Health services is categorized by hospital usage as ‘None’ – (0) days, ‘low’ – (1-5) days, ‘Medium’ – (6-15) days, ‘High’ – (16-25) days, and ‘Very high’ – (>25) days. We applied correspondence analysis to see ‘Hospital Usage’ relationships with divisions and groups. Figure of the two-dimensional configuration of the relationships between hospital usage and DS divisions showed that the first two components together explain 90.6% of total inertia. Figure of the two-dimensional configuration of relationships between hospital usage and SE groups showed the first two components explain 97% of total inertia.

These reveal that the urban zones Jaffna and Nallur have high and medium level utilization of health services. Very high utilization of health services is not associated with particular divisions. Valikamam East has no specific association with utilization of health services. Valikamam West seems to have close association with ‘none’ category of hospital admissions. This means that the people of Valikamam west have very less or absent utilization of health services compared to other divisions. Also about 87% of the time, poor people are associated with high and very high utilization of health services. Upper middle SE class people seem to have medium and low utilization. The people of the Lower middle and rich SE classes have very less or no utilization.

#### IV.FINDINGS AND CONCLUSIONS

The age-sex distribution of 6388 individuals from 1123 sampled families constructed by population pyramid shows the demographic structure of the study population. We summarize below the general and specific findings as pin-pointed. Infectious diseases are more prevalent in the urban Nallur division and in poor SE group. The severity of these phenomena in the Jaffna peninsula is about 230% compared to the rich SE group. The overall incidence rate of the study region seems to be 81.5 per 1000 persons. We found that parasitic

diseases are more prevalent in the western parts of the peninsula. The overall incidence of parasitic diseases in the region seems 280.7 per 1000 persons. Parasitic diseases are more prevalent in poor and upper-middle SE groups.

The prevalence of malignant neoplasms is very few. Regional variation of malignancy exists as 77% come from the two urban divisions. The western area of the peninsula seems to be free of malignant neoplasms. Most of these (about 46%) also come from the 'Lower Middle' class. The prevalence of malignant neoplasms is less in Jaffna society. If we consider In-situ and benign neoplasms, Valikamam south-west has more prevalence compared to other divisions. Middle and poor SE classes have reported more cases. Overall malignancy and other neoplasms rates are 1.7 and 10.3 per 1000 persons.

Prevalence of diseases of the blood, endocrine, nutritional and metabolic diseases are high in urban sectors compared to rural zones. These diseases are more prevalent in rich SE groups than low SE groups. The overall prevalence rate for Jaffna society is 48.1 per 1000 persons. If we consider diseases of blood, blood-forming organs and immune mechanism, '**anemic conditions**' was reported in all divisions except Valikamam East. Prevalence is very high in the poor SE group compared to the two middle groups and is not prevalent in the rich SE group. The overall prevalence rate for the region is 9.2 per 1000 persons.

Jaffna division has the highest rate of circulatory diseases. Overall prevalence reveals that for every 1000 persons, about 71 persons have any one of the circulatory diseases. Further, the circulatory diseases are more prevalent in rich and middle groups. If we consider the prevalence of specific diseases, '**hypertensive diseases**' seem to be more prevalent. The overall rate shows that for every 1000 persons, about 21 persons have one of the hypertensive diseases. Jaffna and Valikamam south-west divisions have reported such higher prevalence. Further, the rich SE group has reported more hypertensive diseases.

Respiratory diseases are highly prevalent in urban, Vali South, and Vali East. Overall prevalence shows that for every 1000 persons, about 133 persons have one of respiratory disease. Even though the prevalence rates are high for all the SE groups, the poor group is the highest among all the

groups. Therefore, we can conclude that respiratory system diseases are prevalent all over the area and comparatively high compared to the other diseases. Diseases of the digestive system are more prevalent in the urban areas. The overall rate reveals that for every 1000 persons in the region, about 109 have problems due to these diseases. Further, the prevalence is higher in the upper middle group compared to the others. '**Dental caries**' and '**Úlcer**' seem more prevalent in Jaffna society.

Diseases of the genitourinary system are more prevalent in the Nallur division and less prevalent in Vali West. The overall rate reveals that for every 1000 persons, about 23 have diseases of the genitourinary system, which are equally high in all the SE groups. Another reported disease is '**urinary tract infection**'. This is less prevalent or absent in Valikamam West. The overall rate reveals that for every 1000 persons, about 3 of them have complained of urine infection, which is also high in the rich and lower middle SE groups. We combined all disease groups and analysed the overall morbidity variation and relationships against DS divisions and socioeconomic groups. We found that there are some associations between the various disease groups and DS divisions.

The number of admissions under different types of admissions was classified. Types included are medical, surgical, pediatric, psychiatric and other admissions. About 54.5% of people have undergone at least once for any type of medical treatment. More than half of people were admitted for medical treatments at least once during 2019, and more admissions come from people of upper middle and poor groups. About 12.6% of people have undergone it at least once for surgical treatments. Some associations between various types of hospital admissions and DS divisions were identified. Medical and surgical admissions are closely associated with urban regions Jaffna and, Nallur and Vali south-west. Psychiatric and paediatric admissions have independent behaviour from DS divisions. Miscellaneous type of admissions have close associations with Vali South and Vali East. Vali West has no close associations with different types of admissions.

We analyzed the hospital usage of all the people and found that about 67.3% of the people had used health services at least one day during the two years before the present study. Hence, about 26.7% of the people have never used any health

services provided by hospitals, clinics and private dispensaries. The regional variation of hospital usage shows that even though most of the people of all the divisions have used such health services, the utilization by urban divisions is higher than the other rural divisions. The variations and relationships of health services were studied by hospital usage. We found that the urban zones Jaffna and Nallur have high and medium-level utilization of health services. The very high utilization of health services seems to have no specific association with the particular DS divisions. The DS division Valikamam East seems to have no specific association with the utilization of health services. We also found that about 87% of the time, the cluster of poor people is associated with high and very high utilization of health services.

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