LEVELS OF MORTALITY AND RELATIVE CONTRIBUTION BY SOCIO-ECONOMIC AND HEALTH RELATED FACTORS IN ARAB COUNTRIES

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ABSTRACT

All Arab countries are concerned with devising socio-economic policies and programmes which would help to reduce levels of mortality. Conceptual analysis has suggested that socio-economic factors and mortality are linked by an intricate network of extremely complex relationship. Partly due to this complexity and partly due to lack of reliable data it was not feasible to precisely measure the direct and indirect effects of alternative socio-economic policies on mortality. The preseent study analyses the relationships between levels of mortality as depicted by life expectancy at birth and infant mortality rate and 8 variables. Multiple regression analysis is used to determine the degree to which alternative combinations of these factors are associated with levels of mortality.

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Introduction

The years since the second world war have witnessed vast progress made in reducing mortality in the world as a whole and in the developing countries in particular. In some of the deve developing countries, the average annual gains in life expectancy are more than the highest ever recorded for developed countries. Underlying these achievements in the developing countries are marked changes in certain factors which determine mortality. Governments have assumed greater responsibilities for the welfare and provision of health and medical services to their people. Besides, great medical advances have been made in the technology of control of diseases, particularly for the prevention and cure of the infectious and respiratory diseases. Economic growth of the developing countries have provided financial resources for health programmes which helped in reducing mortality. In the oil exporting Arab countries, huge oil revenues have helped in transforming the life of the people and the environment.

Though the decline in mortality in the past two decades has been almost universal,yet the extent and rapidity of decline have not been uniform even within the countries. In some cases there has been a sharp and rapid decline, the beginning of which coincided with the carrying out of large scale health campaigns. Elsewhere the recent trend has imperceptibly merged with a long-term trend due to a progressive improvement in the general economic and social conditions of the countries in question.

Measures of Mortality

An overview of mortality conditions during recent years is best documented by expectation of life at birth, though significant supplementary information is furnished from crude death rates and infant mortality rates. As crude death rate is affected by the age structure of population, it is generally not a very useful tool for comparison of mortality level between countries. The infant mortality rate is especially significant in view of its sensitivity to the social and economic conditions prevailing in the country. Generallym the expectation of life at birth is a very comprehensive measure of total mortality which can be used for assessing mortality differentials and mortality levels. Further , it is not affected by the age structure of population. But the derivation of expectation of life at birth requires reliable data on the distribution of deaths and population by age. These implicitly require the establishment of well organised vi vital registration and census taking systems in the country. Deficiencies and weakness of the data base necssitates the use of indirect methods to estimate mortality.

Status of Mortality Data

There are very few developing countries in the world where reliable data on mortality from complete death registration combined with popualtion census are available. This is true in case of most of Arab Countries. To overcome these deficiencies in basic data, mortality data from other sources are used, These are multi-round surveys

Covering sample areas, single round retrospective inquiries in censuses or surveys about household deaths during some fixed time period, and retrospective questions regarding survival of children. No doubt these sources do not provide as reliable data as registration. Nevertheless, they fill the gap in mortality statistics for these countries till the time they develop their civil registration systems.

Scope and Objectives of the Study

This study consists of two sections. The first section reviews, country wise, the status of mortality statistics and deficiencies, development of civil registration system, and organisation of census and surveys in Arab countries. The second section deals with the inter-relationships between the mortality level and some selected socio-economic and health related indicators as for as these Arab countries are concerned.

Section - One

Review of Development of Mortality Statistics In Arab Countries

In undertaking this review, the Arab Countries have been grouped into four groups primarily on geographical considerations. These groups are:

Group 1 : Arabian Gulf Arab Countries of Saudi Arabia, Oman Qatar, United Arab Emirates, Bahrain, Kuwait and Iraq.

Group 2 : East Mediterranean Countries of Lebanon, Jordan and the Syrian Arab Republic

Group 3 : Yemen and Democratic yemen

Group 4 : African Arab countries of Morocco, Tunisia, the Libyan Arab Jamahiriya, The Arab Republic of Egypt, Sudan, Somalia and Mauritania

1. Arabian Gulf Arab Countries

This group comprises of seven countries namely G.C.C. Countries (Saudi Arabia, Oman, Qatar, U.A.E, Bahrain and Kuwait) as well as Iraq.

Among these countries, the level of mortality is considered to be high in Oman and saudi Arabia and lowest in Kuwait. Oman is the only country where no census has been conducted so far. Regarding data on civil registration of these countries only kuwait can be considered to have complete and reliable coverage. In Qatar, the civil registration system has started in 1984.

In view of lack reliable data on births and deaths estimates of mortality are deived through indirect methods for all countries other than kuwait.

Regarding mortality level during the 1960's, no reliable statistics are available for Saudi Arabia, Qatar, Oman and U.A.E, but it is considered that the level was higher compared to the mortality prevailing in Eastern Mediterranean Arab countries (Refer Table 1)

1.1 Saudi Arabia may be considered among those countries with limited demographic information. Two national population and housing censuses have been conducted in the country. The first census of 1962-63 is considered to be largely incomplete. The second census of 1974 covers total population. Besides the data from these censuses, other data is available from vital registration system.But due to incomplete coverage, vital data has limitations for preparing dempgraphic estimates. It is considered that in the settled populations, hardly half of births are registered, and in case of deaths, the registration is even less.

For the period 1970 - 1975 United Nation estimated death rate to be 20, and life expectancy at birth to be 45 years. Although these were still among the rates of high mortality countries, there was substantial improvement over the situation from the early 1950's when the death rate was considered to be 35 and life epectancy was also 35 years (United Nations, 1979). For the year 1980, UN - ECWA (1982) estimated life expectancy at birth about 53.5 years for Saudi nationals using Coale and Demney Regional Model Life Tables. The major reason for rapid changes in mortality is the dramatic extension of medical and public health services.

1.2 Bahrain is one of the countries in the Gulf region which is quite experienced in the acquisition of demographic data. It has conducted six censuses, the first in 1941 and the last in 1981. Despite these achievements there are still a number of deficiencies in the census data such as under-enumeration, and misstatement of age.

The vital registration system in Bahrain was initiated in 1970 under the Registration of Birth and Death Law. However, Vital rates based on data from the civil registration system are substantially less than those based on census data indicating imcompleteness of registration. The Ministry of State for Cabinet Affairs in Bahrain (1979) estimated that in 1978 the crude death rate and infant mortality rate were 8 and 65 repectively, and life exectancy at birth (both sexes) was about 62 years . The Un-ECWA (1982) also estimated the life expectancy about 63 years in 1980 for Bahraini nationals using Abou-Gamrah report on mission to Bahrain . (Abou - Gamrah H., 1980)

1.3 Qatar is of the least experienced countries in the Gulf area in possession of demographic data. The first and the only census was conducted in April-May 1970. The census data indicates considerably underenumeration and age misstatement errors. The Birth and Death Registration Law has been enacted in 1982, and its implementation started in March 1984. Thus, the past data on mortality from civil registration is therefore non-existent. The demographic measures have been estimated by Un-ECWA (1982) which assumed that in 1980, the life expectancey of Qatari nationals and Bahrainis was the same at 63 years.

1.4 The U.A.E. (1977) undertook two national censuses, the first of which was conducted in March-April 1968 and the second in December 1975.

Vital registration in the U.A.E. is virtually nonexistent and socio-economic surveys are also lacking. Various demographic measures rough estimates derived from comparison with countries at similar levels of Socio-economic development.

For 1980. UN-ECWA (1982) estimated the life expectancey at birth about 55 years for the UAE nationals using indirect methods.

1.5 In Oman, the only major statistical surveys are the 1975 Socio-demographic survey in 5 cities and the 1977-79 Socio-demographic survey in 11 towns which were undertaken with the technical cooperation of ECWA. The results of these surveys seem to be inaccurate. The various estimates are based on indirect methods of demographic analysis.

In the early seventies, morbidity and mortality rates were reported to be particulary high. Using the data of 1975 Socio-Demographic Survey in 5 cities, Un-ECWA (1982) estimated mortality rate between 125 and 130 and life expectancy about 51 years for Omani nationals for the year 1980.

1.6 Kuwait : There was little information on demographic characteristics of the population of kuwait upto 1957. Since then, six censuses heve been conducted, the most recent of which was in 1980. The registration of deaths available since 1958, indicates that crude death rate was 3.2 in 1958. These rates went on increasing to 6.1 in 1964. This should not be interpreted as indicating continous increase in mortality during theseth years (1958-64); rather it points improvement in the coverage of registration of death in kuwait. However, a more reliable estimate of mortality derived from data on number of childern and surviving by age of mother collected in the first census held in 1957 showed that life expectancy at birth around 1954-55 was 51 years for kuwaiti nationals and 53.4 years for Non-Kuwaiti nationals. (Hill 1975, 1977).

Sudsequently, the registration of Births and Deaths was made compulsory in 1964. Kuwait has acquired comprehensive data on Population and its characteristics and on vital events. The recent data are fairly reliable and its coverage can safely be compared with some of the developed countries.

1.7 Iraq : Since its independence from Great Britain in 1932,Iraq has had four censuses in 1947, 1957, 1965 and 1977. The 1957 and 1965 censuses were more exhaustive as compared to the first census of 1947.

The level of mortality in Iraq was rapidly improving. In 1965, the infant mortality and life expectancy at birth were 137 per 1000 live births and 48.6 years respectively. These estimates have been prepared through indirect method.(Zachariah, 1970). The estimate for 1980 prepared by UN-ECWA by applying indirect methods to the 1974 surrey results showed the life expectancey to be 57 years and infant mortality rate at 80.(UN-ECWA, 1982).

2. East Mediterranian Arab Countries

This group comprises of 3 Arab countries, i.e. Lebanon, Jordan and The Syrian Arab Republic.

2.1 Lebanon : As for Lebanon, demographic data are based on estimates characterised by varying degrees of reliability and accuracy. Due to the political constraints, the last official census was conducted in 1932. During the period 1943-70, there were a number of attempts to estimate the demographic parameters for the Lebanese population. The most recent prominent surveys are : 1) The 1970 survey conducted by the Ministry of planning, 2) The 1971 National Fertility and Family planning Survey carried

out by the Lebanon Family planning Association, and 3) The 1971 survey on internal migration.

By applying indirect method based on stable population models to the data of 1971 Fertility Survey, an overall life expectancy at birth of 65 years for sexes was obtained , together with infant mortality rate of 45 per 1000 and crude death rate of 8 per 1000 (Chamie,1977) The level of mortality estimated directly from the vital registration data provided incorrect figures because of substantial number of deaths which were unrecorded.Youssef and Philippe(1973) estimated the life expectancy at birth for 1970 at 62.1 years for males and 66.0 years for famales based on the registration and returns of the sample census.

2.2 Jordan : Joudan has so far conducted 3 censues in the years 1952, 1969, 1979. The Vital Registration System is considered to be unsatisfactory as about 60 percent of deaths are estimated to be unreported (Un-ECWA,(1979).

Indirect methods of mortality estimation based on 1972 fertility survey provide the crude death rate of 15 per 1000, life expectancy at birth of 54 years, and infant mortality rate at 89 per 1000 (Jordan Dept of Statistics, 1976). It is rather difficult to decide that these mortality levels are lower or higher as compared to the past. However, considering the substantial social and economic progress which has occurred in Jordan over the past 20 years, it is safely assumed that improvements have taken place in the mortality and the general living conditions. This is supported by the estimates

Prepared by Thavarajah (1970) which place the life expectancy at birth for both sexes in 1965 at 49.2 years. The estimates prepared by UN-ECWA (1982) for 1980 are through indirect methods applied to the 1972 Fertility Survey data which indicate life expectancy 65.7 years and infant mortality rate 69.2.

2.3 The Syrian Arab Republic : In the Syrian Arab Republic, population enumerations were carried out a number of times under the Ottoman Empire as well as the French Mandate, but the results were believed to be of doubtful validity. The first scientific demographic census was conducted in 1960, followed by a subsequent census in 1970.

The data obtained from the Civil Registration System show crude death rate of 4.1 per 1000 for 1970 which is considered unreliable. Thavarajah (1970 b) has estimated the life expectancy at birth for both sexes in 1965 at 49.8 years. Estimates based on the 1977 follow up sample Survey of Vital Events Show the crude death rate of 8.8 for males and 7.4 for females, amd life expectancy at birth to be 63.0 for males and 65.4 for females (Syrian Arab Republic, 1978).

3. Other Asian Arab Countries

This group consists of the remaining two Arab Asian countries, i.e., North Yemen and South yemen .. Though no reliable statistics on mortality are available for them, yet it is considered that, prior to 1960, the level of mortality was higher compared to the East Mediterrean Countries.

3.1 Regarding North Yemen,the registration of births and deaths was virtually non-existent. The first population and Housing census was conducted in May 1973 whose coverage has been considered

to be reasonably complete with the exception of certain mountainous regions. prior to these censuses,the Brilisn has conducted censuses in the Aden Colony in the years 1941 and 1955, which provide limited demographic information concerning the population of Aden though the accuracy of these figures is considered questionable.

Due to incomplete Vital Registration of these two countries, the information on mortality is Limiled. The life expectancy at birth for the period 1960-65 for both sexes was estimated to be 39.7 years by the United Nations, the same as for Saudi Arabia (United Nations, 1979). Calculations based on the Survey of S anaa, the Capital city yielded an infant mortality rate of 210 which implies an expetancy of life at birth of 39 years for females and 37 years for males in 1972 (Yemen,1974).

3.2 In case of South Yemen, the only estimates on mortality are those as prepared by the United Nations which calculated the crude death rate in 1975 at 21 per 1000 and life expectancy at birth to be about 45 years (United Nations, 1979).

4. African Arab Countries

For the purpose of this study, this group consists of eight countries :Algri, a, Egypt, Libya, Morocco, Tunisia, Mauritania and Somalia. For drawing estimates of mortality for these countries, more reliance is to be placed on survey data rather than the civil registration data in view of their unknown completeness. Egypt seems to have perhaps more complete civil registration among these countries . an investigation in 1974-75 in Egypt indicated that death registration was 87 percent complete (CAPMAS 1976) Estimates for Algeria Morocco and Libya suggest

that death registration is below 75 percent .

There are, however, several multi-round surveys as well as some single round retrospective inquiries which provide adta to estimate mortality level. probably the best information on mortality can be drawn from the Algerian and Tunisian multi-round surveys (conducted for underregistration) and from the Egyptian Civil Death Registration Statistics believed to be 87 percent complete.

4.1 Mauritania : Among these countries, Mauritania appears to have the highest mortality. An estimate based on indirect method of children born and survivors by age of mother shows that, in 1964-65, infant mortality rate was 185. and life expectancy at birth was 35 years in Mauritania. Further data collected in 1976-77 census provided an estimate of 169 of infant mortality rate. Besides, the country suffers from periodic drought conditions resulting in large population migration and upsurge in mortality due to massive under nourishment during those years. This hampers in deriving a trend in mortality over a period.

4.2 Somalia :No census has been conducted so far in Somalia; neither does the civil registration system exist in the country.

According to estimates prepared by the United Nations, the life expectancy in 1960 was about 36 years, infant mortality was about 175, and death rate was about 28. Later on, the World Development Report of 1983 indicated that the life expectancy in 1981 was about 39 years, infant mortality rate was 145, and death rate was 25. Thus, these estimates indicate that mortality conditions have not improved much during the last two decades.

4.3 Sudan : Next to Mauritania and Somalia, Sudan is the country which has higher mortality compared to other 6 Mediterranean African Countries. prior to the first census of 1955-56, the country has practically no data to estimate the vital rates. Even the 1955-56 census data suffers from many inaccuracies and inconsistancies. Also, the vital statistics system at that time was very rudimentary, as Harvie (1950) estimated that only about 20 per cent births and deaths were being registered. The 1955-56 census data showed crude death rate of 18.5, and infant mortality rate of 93.6. With the same census data, and using quasi-stable population theory, Krotki (1961)estimated crude death rate around 32. The joint study of United Nations and Government of Sudan (1970) also on the 1955-56 census, showed crude death death rate between 20 and 25, and life expectancy in the range (35-45)years. Demney (1968) used also the same set of census data with stable population theory and he estimated crude death rate as 21.3, which is within the range of U.N. estimates.

Later on, Sudan conducted Population and Housing Survey in 1964-1966 in urban areas of six Northern provinces. But that study had serious limitations as the rural areas and Southern provinces constituting 90% of population were excluded, and as such estimates based on data of this survey should not be taken to represent the whole country.

An estimate for 1968-73 utilising census data on child mortality and orphanhood, in addition to intercensus analysis places life expectancy at birth in Sudan 43 years and infant mortality at 160.

4.4 Egypt : Regarding other five North African Arab Countries, recent available data shows that life expectancy at birth in these countries ranges fetween 55 and 60 years. Among all the Arab conutries, Egypt has the longest series of demographic data derived form periodic censuses and continuous system of vital registration . the first national Population census in Egypt was conducted in 1882, and the latest was in 1976. The Egyptian death rates have, since 1955, been computed with reference to the data for localities which have health bureaux. These localities are estimated to contain about 45 percent of the whole population of Egypt.

Different estimates on the expectation of life at birth have been prepared by different experts, which can all be challenged, as the basic data on age-sex specific death rates are defective. The estimales of 38.6 years for the expectation of life at birth (both sexes) for 1936-38, and 24 years for 1947 for Egyptian population are, at best, only rough indication of an order of magnitude, The death rates for younger age groups derived from the registration data appear to be relatively adequate and consistent. Furthermore, the 1947 Egyptian population structure can reasonably be assimi-lated to quasi-stable population. Thus the life expectancy at birth for 1947 was derived through the application of stable population analysis. Valaoras(1972) estimated the life expectancy to be equal to 49.3 years for males and 50.1 years for females for the year 1965, where as the official life table showed a life expectancy of 47.8 years for males and 51.2 years for females for the same year (Egypt, 1974). United Nations ECWA (1982) estimated that the average life expectancy in Egypt went up from

47.5 years in 1960 to about 57 years in 1980. The vital registration data showed that, during the 10-years period of 1966-1976, death rate has declined from 16 to about 11, and infant mortality rate also declined from 127 to 100 .

4.5 Libya : For Libya, vital registration data were available since 1954. But the extent of under registration is evident from death rate of 4.2 in 1964 in based upon registered death as compared to 18.4 estimated through indirect method using model life Table death rates and the age data of 1964 census. At this level, the life expectancy at birth was estimated to be 48.5 years In addition estimates of mortality were available for 1972 and 1968-73, which show that the infant mortality rate was about 130, and life expectancy was between 50 and 55 years.

4.6 Tunisia : In Tunisia, where the history of censuses goes back to 1921, the vital statistics started improving only after the 1957 Law of Civil Registration However the registration of deaths remained grossly incomplete during the early years of 1960s as it provided crude death rate between 10 and 12.For instance, the registered data showed death rate of 10.6 for the year 1966, whereas Zaghloul (1970) estimated death rate as 17.8 by using the specific death rates of the Model life Table (South, level 13) and the adjusted age distribution of 1966 census. This estimate of death rate, 17.8 for 1966, seemed more plausible than the death of 10.6 based upon registered data.

The registered death rate adjusted on the basis of the results of the 1968 demographic survey showed a decline from 18 in 1960 to 14 in 1970. The Life Table constructed from the data provided by the demographic survey showed life expectancy at birth of

54.6 years for both sexes in 1968, which could be slightly on the high side considering the omission of deaths in any retrospective survey.

4.7 Algeria : In respect of Ageria, vital statistics were available from 1922 onwards for each year, except for the war years. It seems that deaths of infants who died before registration are omitted Based on registered deaths, the death rate was 15.4 for 1958-60, and 10.1 for 1963-65. Though neither of these may be accurate, yet the indicated decline in mortality may be true. In the absence of any data from which an independent estimate could be derived, the difference between birth rate and rate of natural increase provides an acceptable estimte of death rate of 19.0 for 1965. Taking the age-sex composition of population, this crude death rate of 19 corresponded to Model Life Table (South Level 12.6) with life expectancy of 47.7 years (Zacharaian 1970 b). The results of the demographic surveys conducted during 1969-1971 provided an adjusted death rate of 17, and life expectancy of 52.1 years for males and 54.5 years for females for the year 1969. Further, a gain in life expectancy at birth of 7 years was obsered between 1948-51 and 1969-70 which is not considered rapid by comparative standards. There is some evidence to suggest that mortality rate decline accelerated after the cessation of warfare in the country.

4.8 Morocco : Prior to attainment of independence in 1956, compulsory civil registration in Morocco was introduced in the Southern Zone in 1954. However, the coverage was incomplete,and it was thought that only 20 percent of births and deaths were registered. The first postindependence census was conducted in

1960, which was followed by a Multi-purpose sample survey (1961-63). Data collected in this multi-purpose survey shows that life expectancy at birth was 47 years, infant mortality rate was 149, and crude death rate was 19 during the period (1961-1963). A later study by Nawar and Vaidyanathan (1975), indicated that there was some improvement in mortality conditions, raising the life expectancy to about 48.5 years, and reducing the infant mortality rate to 136.

The above review broadly indicates that most of the these Arab countries have made sufficient progress in developing their civil registration systems and census-taking organizations. Yet the registration of deaths in these countries, except in Kuwait, is still for from complete and suffers from unknown and varying extent of omissions. The above review brings out that though there may be reservations about the exact and precise levels of mortality rates in the Arab countries during these years, yet there is no doubt about the decline of mortality in all these countries over the period. Secondly, considering the estimates of mortality provided by various sources over time, the current level of mortality for each country can broadly be assessed. On this broad assessment of current level of mortality, these Arab countries are grouped into the three mortality categories.

1- Low Martality with life Expectancy 60 years and odove.

Bahrain - Jordan - Kuwait - Lebanon - Syria - UAE - Qatar.

2- Medim Mortality with life Expectancy 50 - 59 Years.

Iraq - Egypt - Algeria - Libya - Morocco - Tunisia - Saudi Arabia.

3- High Mortality With Life Expectancy Below 50 Years.

Democratic Yemen - Yemen - Sudan - Mauritania - Somalia- Oman.

Section Two

RELATIONSHIP BETWEEN MORTALITY AND SOCIO ECONOMIC AND HEALTH RELATED VARIABLES IN ARAB COUNTRIES

1. Contributory Factors Towards Decline in Mortality

Two broad groups of factors have contributed towards the decline of the mortality rates in the world. On the one hand, there is progress in the economic and social development and raising levels of standard of living which has a strong influence on health. On the other hand, there are measures taken specifically for the improvement of health and the prevention of diseases and death.

New scientific and technical knowledge has helped in achieving high levels of standard of living in areas where survival was hazardous earlier. Great progress has been achieved in general education. Better education, not only affects the level of living, but is also closely related towards all the factors influencing health.

Increased production and availability of food have improved the nutritional status of many populations. The expansion of health services and increasing supply of physicians have influenced the reduction of mortality by providing medical services and treatment to larger proporation of populations.

The medical research has provided tools to control certain diseases which were the major causes of death, especially among certain sections of population. The control of infectious diseases has played a leading part in the decline of mortality.

The role of clean water supply, proper drainage and sewage disposal have conquered major epidemic diseases such as cholera, dysentry and typhoid. The activities of maternal and child health services heve helped reducing the maternal and infant mortality.

Thus, the great reduction in mortality has been made possible by advances on a broad front including vector control, medical research, sanitation, medical services, education, nutrition and level of living.

2. Association between Mortality and Socio-economic Variables

The statistical association between a population's socio-economic level as measured by such indicators as income, occupation, social class, and the mortality level is well documented (UN,1982) .

The negative relationship between the infant mortality rate and the level of economic development has generally been quite strong, historically as well as cross-sectionally. The former has often been considered a reliable paramenter of the latter . According to the study made by the United Nations for 31 developed countries of the world it was found that the "correlation between life expectancy for females in more developed countries in the mid 1970_s, and GNP per head for 1974 was found

to be nearly as high as that of infant mortality and GNP,+0.86 for the former compared with-0.89 for the latter. The relationship between male life expectancy and GNP, however, was much weaker, with a correlation coefficient of only +0.57".

A study (UN,1982 c) analysing the factors determining life expectancy at birth made by the United Nations for 21 developing countries showed that a large part of the variance (the coefficient of determination R^2 =0.86) in life expectancy in these countries can be explained by the seven socio-ecnomic following variables.

1- Gross Domestic Product Per Capita.

2. School Enrolement Ratio.

3- Population Urban.

4- Female/Male school Enrolement Ratio.

5- Share of the Poorer 40 percent of the population.

6- Proportion literate aged 15 years and over.

7- Female aged 15-19 ever married.

3. Relationship between Mortality and Socio-economic Variables in Arab Countries

The importance of studying inter-relationship between demographic, socio-economic and health variables in these days of planning can easily be over-emphasized. It is generally observed that mortality in community orregion is associated with these Variables. Infant mortality and the expectation of life at birth are considered as the most sensitive and important indicators of mortality. This attempt is made to study both these indicators of mortality with the socio-economic and health services indicators.

objectives of the Study

1) To sstudy the inter-relationship between demographic and health variables among the Arab Countries.

2) To study the contribution of each variable explaining the morlatity variation.

Method and Materials

The basic data around 1980 on demographic, socio-economic and health sevice variables has been compiled for 20 Arab countries from various international sources, i.e., World Development Report, Population Reference Data Sheet-Princeton University, and World Health Annual Report. The data was thoroughly scrutinised before its analysis. The following variables (indicators) have been considered to be correlated with mortality variation (life expectany and infant mortality rate) on a priori grounds in the Arab Countries.

Dependent Mortality Variable :

i) Life expectancy at Birth which gives an average number of years a new born is expected to survive under the existing mortality pattern.

ii) Infant mortality rate which gives number of infant deaths within 1 year per 1000 live births.

Independent Demographic Indicator

i)) Total fertility rate which is the sum of age-specific birth rates of women over their reproductive span in a given year.

Independent Socio-economic Indicators

i) Urban population which is measured by the percentage of total population residing in the urban areas as specified by the census authorities of that country.

ii) per capita Gross National product which measures the per capita income.

iii) Adult literacy rate which is measured by the percentage of persons aged 15 years and above who are able to read and write.

Independent Health-Service Indicators

i) Daily percapita calorie supply as percentage of requirement : It is obtained by dividing the calorie equivalent of food supply in an economy by the population.

ii) Hospital facilities : It is measured by the number of hospital beds per 10,000 Population.

iii) Availability of Doctors : It is measured by the number of physicians per 100,000 population.

iv) Percetage of population with access to safe water

Method of Analysis

Multiple linear regression model has been fitted by taking life expectancy at birth as a dependent variable, and the selected socio-economic and health-services indicators as independent variables. The model is in the form :

$$Y = A + B_1 x_1 + B_2 x_2 + \ldots B_n x_n + E$$

where Y represents the life expectancy at birth in different Arab countries, the B's are the regression coefficients of the

selected indicators,and E is the error term. A is a constant term. Similar analysis was carried out separately with infant mortality rate as dependent variable. Thus the multiple regression and correrelation techniques have been used as the method of analysis in the study. Data used for this study is shown in Table (1)

4. Results

4.1 Correlation Analysis

The direction and degree of association between variables are determined by means of a simple linear correlation analysis The correlation coefficients are ahown in Table (2). As may be seen, there is a high inverse correlation (-.965) between life expectancy at birth and infant mortality. The high degree of correlation between the two variables of mortality implies similar pattern of realtionships between the socio-economic and health related variables. Although life expectancy is a more comprehensive measure of mortality, yet the results for Arab countries show that both these mortality measures, life expectancy and infant mortality are correlated to equal extent with the other socio-economic and health related variables. Further all these socio-economic and health related variables are significantly at 5 percent level with the mortality indicators. Only the fertlity variable the total fertility

Table : 1 Demographic, Socio-economic and Health Indicators for Arab Countries Around 1980

Country	Infant Mortality	Total Fertility Rate	Life Expectancy at Birth (YRS)	Urban population %	percapita Calorie as % Of Requirement	Gnp per capita	Adult Literacy Rate	Phys per 100,000 Population	No.of Beds per	% of population with access to S. Water
Algeria	116	7.0	56	52	100	2129	35	38	290	77
Egypt	102	4.9	56	44	117	654	44	123	200	66
Libya	99	7.3	57	52	144	8560	45	152	500	100*
Morocco	106	6.6	57	41	109	869	28	6	120	70**
Sudan	123	8.6	48	25	100	380	32	12	90	7
Tunisia	98	5.6	59	52	115	1417	62	28	210	70
Mauritania	142	6.9	43	23	88	484	17	6	40	24*
Somalia	146	6.1	43	30	92	282	60	8	180	24*
Bahrain	53	7.6	66	78	100*	7490	50	100	300	84*
Iraq	77	6.9	56	72	109	3020	44	56	190	62
Jordan	68	7.2	61	60	97	1623	70	58	80	61
Kuwait	31	6.1	70	90	144	25350	68	146	420	100
Lebanon	41	4.0	66	78	100	1200*	70	189	380	62
Oman	127	7.1	49	8	93*	5924	38	66	200	46
Qatar	53	6.8	66	87	113*	27790	59	75	300	84
Saudi Arabia	112	7.2	54	70	119	12720	25	38	160	84
Syria	61	7.3	65	48	113	1569	58	45	110	75
U.A.E.	53	6.8	63	74	117	25660	56	196	430	84*
Yemen North	160	6.8	43	12	93	459	21	15 50	50	24
Yemen South	144	6.9	45	38	87	512	40	13	150	40

Sources : 1. The Population Reference Bureau. Data Sheets 1983
2. World Bank Development Report 1982
* Estimates

Table : 2

CORRELATION MATRIX

	IMR	TFR	Life Expectancy	Urban Population	per capita Calorie supply	GNP per Capita	Adult Literacy Rate	Physic. /100.000	Hosp. Beds/ 100900	Access To Water
IMR		.165*	-.965	-.865	-.525	-.572	-.725	-.706	-.588	-.740
TFR			-.143*	-.120*	-.052*	.144*	-.361*	-.350*	-.187*	-.095*
Life Expectancy				.847	.590	.550	.682	.656	.600	.834
Urban Population					.545	.642	.593	.597	.623	.768
Percapita Calorie supply						.572	.299*	.555	.655	.827
GNP per capita							.315*	.533	.614	.618
Adult Literacy Rate								.530	.485	.388*
Physicians/100.000									.841	.598
Acess to Water										.713

* Not Significant at 5% Level

rate is not significantly correlated with the mortality variables.

The results also show that certain explanatory variables are highly correlated among themselves, eg.physicians/100.000 population and Hospitad Bed/100,000 population (.841), Access to safe water and per capita calorie supply(.827). On the other hand no significant (at 5 percent level) correlation was found of Adult literacy rate with per capita Calorie supply (.299), with per capita GNP (.315) as well as with Access to clean water (.388) . This is besides the fertility variable (TFR) wich is found to be not significantly correlated with any of the variables under study.

4.2 Multiple Regression Analysis

The way in which the socio-economic and health related variables as a group are related to mortality variables, the life exectancy at birth and infant mortality rate is studied through multiple regression analysis. Linear multiple regression coefficients were obtained for these variables through step-wise multiple regression analysis. The results are shown in table ((3))

In case of infant mortality rate , all the 8 independent variables when considered simultaneously explain 92 percent of the variability (R^2). When only 5 variables, i.e. urban population, adult literacy, physicians/100,000 Population, hospital beds/100,000 population, and access to clean water are considered, even then they explain 91 percent of variation in infant mortality and the inclusion of the other variables: per capita GNP,per capita

Table : 3 Summary Results of Step-wise Multiple Regression Analysis

Independenr Variable	Life Expectancy at Birth as Dependent Variable				Infant Mortality Rate as Dependent Variable			
	Multiple R	R^2	B	Beta	Multipl R	R^2	B	Beta
Urabn Population	0.84735	0.71800	0.0379	0.1073	0.86549	0.74907	-0.5717	-0.3585
Access to water	0.89444	0.80002	0.3507	0.9628	0.95421	0.91051	-0.7749	-0.4589
Adult Literacy Rate	0.93243	0.86942	0.1961	0.3244	0.90468	0.81845	-0.7917	-0.3363
Percapita calorie supply	0.94106	0.88559	-0.1546	-0.2884	0.95710	0.91604	0.3527	0.1457
Hospital Beds/100,000 Pop.	0.94662	0.89610	-0.0277	-0.4286	0.93536	0.87490	0.1430	0.4907
Physicians/100,00 Pop.	0.96277	0.92693	0.0398	0.2860	0.92071	0.84771	-0.3203	-0.5099
Total Ferility Rate	0.96490	0.93103	- .0781	-0.1100	0.95862	0.91896	-1.1668	-0.0264
Per Capita GNP	0.96602	0.93320	0.0001	0.0751	0.95844	0.91861	-0.0003	-0.0606
Constant)								
50.5213								

calorie supply, and total fertility rate explain only one percent additional variability in the infant mortality. It is also noted from the results that the three variables, urban population, abult literacy, and physicians/100.000 whose correlation coefficients among themselves are below 0.60,explain 85 percent of the variability in infant mortality.

Regarding life expectancy at birth, 93.3 percent of the variability (R^2) is explained when all the eight variables are included. And even the three variables, urban population, access to water and adult literacy explain as much 87 percant of the variability.

The results of the analysis shows that comparatively larger part of the variance is explained by these eight variables in case of life expectancy at birth than infant mortality rate. Furthermore among the three variables which explain 87 percent of the variance of life expectancy at birth and 85 percent of infant mortality, two variables are social variables and these are percent urban population and abult literacy rate.

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