INFLUENCE OF CHILD MORTALITY

UPON FERTILITY IN EGYPT

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ABSTRACT

The influence of child mortality on fertility in various geo-cultural regions is probably one of the most widely controversial issues in current demographic debate. Some demographers assert that child mortality and fertility are directly related, whether on a micro (individual) level or a macro (societal) level. Others may argue otherwise. But there is a factual base for the debate in that there have been a number of factual studies showing the impact of prior child loss on an individual's subsequent fertility.

However, though several studies have postulated interrelationship between mortality and fertility, there is no firm evidence that mortality reductions automatically changes childbearing attitudes and levels of fertility.

According to the Demographic Transition Theory, as mortality declines from high to intermediate levels and fertility is sustained at its high level, the growth rate will increase. As soon as mortality moves from the intermediate levels to low levels, fertility begins to respond to the fall in mortality and the rate of population growth is reduced.

Today, child mortality in most of the developing countries is at an intermediate level, while that of the developed countries is at a low level. Egypt, as a developing country, moving through the stage of the demographic transition, faces the same population dilemma which is largely the result of birth rates failing to respond to death rate decline.

The rate of natural increase in Egypt has been accelerating since 1937. This growth has resulted from a high birth rate and a sharp decline in the death rate as a result of improvement of medical care and health conditions.

In mid-1981, Egypt's population stood at 43.6 millions, based on an estimated crude birth rate of 40.9 per 1000 and an estimated crude death rate of 11 per 1000 and annual rate of natural increase approached 3 per cent. In 1983 the Egyptian population reached 46 millions.

In recent years social scientists have postulated different relationships between child mortality and fertility, particularly in connection with fertility decline. The relationship is complicated by a multitude of additional influences acting on each of the main variables, together or separately.

Child mortality experience may affect a couple's fertility - on a micro level - by exerting the so-called "physiological" effect which is related to birth interval and breastfeeding that affects post-partum amenorrhoea and the length of the interval. The behavioural effect takes the form of either replacement or insurance or hoarding.

Replacement effect which is a behavioural and sequential response resulting in an additional birth to make up for actual child loss, while insurance or hoarding effect operates in anticipation of prospective high child mortality rather than a reaction to actual child loss in the family. The impact of either effect (physiological and behavioural) should become apparent upon an examination of individual productive histories.

The present analysis begins by a hypothesis that individual experience of child mortality may induce parents to increase their subsequent fertility, and may affect the parents desired number of children and the mother's decision to cease childbearing. Descriptive and multiple classification analyses were used to estimate the presence and intensity of these effects.

The second attempt is to evaluate the strength of the impact of birth interval duration in infant and child survival chances in the low contraceptives using population of Egypt, where the majority of children are breastfed. Birth interval length is considered as a measure of individual fertility and it can be a result and a cause of child mortality at the same time. Therefore, the duration of birth interval according to the fate of previous child, was studied and the duration length and its effect on the number of children born and the number of deceased children. Then a multiple classification analysis was done to analyse the impact of previous birth interval on the index child according to the fate of the previous child, and to analyse the impact of subsequent birth interval on the index child according to its age at death and the length of the interval in both cases.

The third attempt is to analyse the relationship between mortality and breastfeeding. The death of an infant may shorten lactational period. The interest in studying this effect lies in the fact that the majority of women in Egypt breastfeed their children and they may be unconsciously using it as a contraceptive method. Therefore, the length of time a mother continues to nurse her baby can affect the spacing and number of additional children she has during her reproductive period.

Descriptive and multiple classification analyses were used to evaluate the relationship between breastfeeding and infant mortality, and between breastfeeding and the length of birth interval according to the fate of the index child.

The last attempt is an attempt to quantify the fertility response to child mortality. This technique was designed by Olsen and is evaluated by Olsen and Trussell to see how well it works. It depends upon the regression of number of children born on number of deceased children for each woman to estimate the extent of child replacement. It shows how the raw regression coefficient may be corrected for the effects of fertility on mortality so that the rate at which dead children are replaced may be estimated.

DATA SOURCE:

This study depends upon data from the Egyptian Fertility Survey (EFS) which was carried out in 1980 by the Central Agency For Public Mobilisation And Statistics in Egypt (CAPMAS). It was conducted as part of the World Fertility Survey (WFS) in London, with the collaboration of the World Bank. The EFS was designed as a two-phase survey. The first phase covered all households in the sample. It was administered to Egyptian ever-married women less than 50 years old. The number of households successfully completed were 8788 or 97.9 per cent.

The study is divided into two parts. The first consists of theoretical framework and the second consists of statistical analyses.

PART ONE

CHAPTER ONE

THEORETICAL FRAMEWORK

1.1 Population Growth

In human history, population growth was negligible for hundreds of years up to the 19th Century and even then was slow and fluctuating due to the periodical toll of major epidemics of infectious disease. There were also, and still are, substantial regional differences. In the past two decades, the rate of population growth has been extraordinarily high creating global problems, and as the pressure upon resources becomes more acute it threatens the livelihood of future generations especially in the developing countries of the world, the so-called Third World.

More attention is being devoted to population problems, both nationally and internationally in this Century than at any time since Malthus. The world has seen a number of governments in the developing countries striving as a matter of policy to dampen rates of population increase by means of fertility control.

The population of the world reached 3,900 millions in 1985. It increased by more than 1,000 million between 1950 and 1970, while the increase between 1930 and 1950 was only 400 millions. The rate of population growth has increased steadily to the unprecedented current level of nearly 2.1 per year, which would lead to a doubling of the total population within approximately 35 years. The previous doubling took about 50 years, and the doubling before that took about 110 years.

The world population will achieve a total of more than 6,000 millions by the end of this Century as estimated by the World Bank, 1974.

Population growth during the remainder of this Century will vary greatly between economically advanced countries and developing nations. Between 1968 and 2000, the developing countries could increase considerably more than double, rising from 2.4 billions to 5.4 billions. An increment which would match the total world population, 3 billions, in 1960. In contrast, the advanced countries are likely to increase at about half the rate of the developing countries, and reach a level of some 1.6 billions in 2000 from the total of a little over 1 billion in 1968 (Hauser 1969). These figures explain the increasing national and international awareness of the problems that may emerge as a result of rapid population growth.

Habakkuk, 1972, mentions that the recent estimates of world population made on differing assumptions about mortality and fertility, range from 4.1 to 4.6 billions in 1980, and from 5.5 to 7.5 billions in 2000. At one extreme if fertility remains constant at present levels, and mortality declines to the extent suggested by the experience of the 1950s, world population towards the end of this Century will be growing at about 2.8 per cent a year and at higher rates in the developing areas. If, on the other hand, fertility is eventually halved, and the fall starts soon and takes some thirty years to be completed, the rate of increase at the end of the Century will be about 1.3 per cent per annum and would be falling rather than rising.

Most of the potential population increase is concentrated in the developing countries which accounted for 80% of the increase in world population between 1950 and 1970 and will account for almost 90% in the next two decades. The rate of population growth has been affected by malnutrition, famine, disease and war conditions which have kept death rates high and variable. Such conditions are increasingly coming under scientific, political and economic control, and mortality rates are now generally lower than ever before in the developed countries and they are still declining in the developing countries.

The rapid rise in world population has resulted from relatively stable birth rates and a rapid decline in death rates. In the past twenty-five years death rates have fallen drastically and with fertility rates yielding slowly or not at all to population control campaigns this has given rise to unprecedented population growth. This decline in mortality has been the result largely of public health measures and eradication of major diseases rather than of major improvements in living conditions. In developing countries the rapid population growth began after the second World War when modern medical knowledge and techniques were introduced to countries where the general level of public health and hygiene was very low, mainly from poverty and lack of education. This resulted in a welcome decline in mortality but without a compensating fall in fertility. The recent United Nations projections envisage some decline in fertility in all developing countries during the next three decades. This decline will compensate for the expected fall in mortality and reduce the annual growth rate from 2.4% (during 1970-1975) to 2.1% (during 1995-2000).

In the developed countries, the characteristic pattern has been a decline in mortality and fertility, a decline that originated in the pre-industrial past when the average number of children per woman was double the present number and the average length of life only half as many years as now. In some countries these changes began nearly two centuries ago, in others the fall in fertility and mortality has occurred only since 1900.

Mortality rates in developing countries have still not reached the low rates enjoyed by industrial countries. Developing countries can, therefore, expect gradually to achieve still lower mortality rates as the adoption of public health measures become more widespread. If mortality is likely to decrease slowly with time, fertility rates must fall equally if the rate of population growth is not to increase.

Mortality rates are unlikely not to decrease. Therefore, the principal determinant of future population growth is the fertility level. The available statistics show that a small but steady decline in birth rates has taken place in developed countries since the 1930s, and in the developing countries since about 1960. The level of fertility is considered to be the most conspicuous demographic difference between high income countries and low income countries. The average gross reproduction rates of low income countries are about twice those of high income countries (World Bank 1974).

The only feasible and human way of reducing the rate of population growth is by a reduction in fertility. The early 1970s saw a lively debate between those who argued that general economic development and improved levels of living, education, health, transportation and communication facilities as well as industrialization, urbanization and increased employment of women, would bring about fertility decline in the developing world with little or no promotion of organized family planning - and those who maintained that development itself was threatened by rapid population growth (increased resources being outstripped by the increase in mouths to feed) and that family planning programmes could and should, be allowed to make an appreciable independant impact on fertility. The debate culminated, at the 1974 World Population Conference in the coining of the slogan "Development is the Best Contraceptive" by some demographers (largely influenced by Roman Catholicism). More recently, however, there has been a growing consensus that organized family planning can never replace general development programmes but that they should reinforce them. These programmes embrace education measures to improve literacy, technological advances, especially in medicine and public health with the resulting reduction in mortality rates, improvement in conditions affecting maternal health which lead automatically to healthier and smaller families. Mathia, 1969, has mentioned that in some countries like Japan there is evidence of an association between declining fertility and the rise of an urbanized industrial economy so that this association is not limited to Western European cultures. However, there are countries like Egypt and India where the differential fertility between urban and rural regions is slight or even non-existent. In short, urbanization alone is not always sufficient to bring about a reduction in the birth rate, nor is it certain that small changes in economic organization or slight rises in per capita income will cause a reduction of fertility in countries of early economic development.

It is questionable, therefore, whether the economic and social changes likely to occur in the next two or three decades in many parts of the world will be enough to produce a significant effect on fertility. The level of economic development in European countries prevailing at the time of significant fertility decline might reasonably be regarded as representing the approximate threshold of decline. It appears unlikely that this threshold will be crossed in the next two or three decades in, for example, Egypt, Pakistan and India.

The largest nation in the world, China, has already decided that economic development is not enough. Faced with economic disaster at the end of the Century if population continues to increase, they have instituted a combined programme of intensive almost frantic industrialisation and voluntary (but taxation aided) fertility reduction through the "one-child family".

All developed countries have experienced first an expanding and then a contracting phase in the rate of population growth. There is a widely accepted explanation of this, sometimes referred to as the theory of the three stages of population growth. According to this theory, in the past, human populations maintained their numbers or slowly expanded under conditions of high mortality balanced by high and essentially uncontrolled fertility. In developed countries and during the Industrial Revolution, fertility remained high and was uncontrolled for a while and the average length of life increased. As a result, populations grew rapidly in the western world, at rates higher than ever experienced before. During the nineteenth and early twentieth centuries, birth rates began to fall, first in France and the United States and then in other industrialised countries.

This decline in fertility eventually slowed down population growth. The transitional process from high mortality and fertility to low mortality and fertility which occurred in developed societies two Centuries ago was one of the main features of population history. The advancement of medical services which led to lower mortality did not produce lower fertility rates in developing countries and this resulted in disequilibrium between mortality and fertility rates and therefore rapid population growth.

In terms of the demographic transition theory, developing countries are almost all in the second stage; the decline in the death rate is much steeper and sudden than that experienced by countries which have already succeeded in achieving affluence. There is still great scope for mortality reduction by the use of relatively rudimentary and inexpensive public health measures. Revell and Glass, 1972, pointed out that the demographic transition from high to low fertility and mortality seemed to be chiefly a European, American and Japanese phenomenon. A decline in mortality has occurred in the poor countries of Asia, Latin-America and Africa, where a large proportion of the world's people live but because their death rates have drastically fallen, while their birth rates have hardly changed at all, the populations of these countries, which grew relatively slowly until a few decades ago, are now expanding more rapidly than the populations of most of the presently developed countries ever did; no one knows what tragic consequences lie ahead. Except for their low mortality, the developing countries are much more like Japan and the countries of Europe were two hundred years ago than those countries are today.

Dr. Duza, 1973, has mentioned that more than two-thirds of the world's people live in developing countries and less than one-third in developed countries. The birth rates of developing countries are generally at high levels of the order of 40 per thousand or more, while those of developed countries are less than half that. Death rates in developing countries are also higher than in developed countries, but the differences are substantially smaller than the differences in birth rates. The average rate of population growth in developing countries is about 2.5 per cent per year, while the developed countries have growth rates of about 1.0 per cent, yielding doubling times of 28 and 70 years respectively. There is clear evidence that the gap in death rates between developing and developed countries is narrowing. This is because health conditions in the developing world have continued to improve comparatively rapidly in parallel with socio-economic development, while improvement in the developed countries has slowed considerably with the approach of optimal conditions of sanitation. The developing countries that have made the most progress in medicine and public health, for example, Taiwan or Sri Lanka have lower overall death rates than most developed countries.

Transition theorists, extrapolating from the lessons learned in Europe, postulate that a mix of factors predominantly of economic, social and technological origin explain the several stages in progress from high fertility and mortality rates to low fertility and mortality rates.

The transitional theory tries to explain the pattern of balanced and unbalanced mortality and fertility rates of developed countries and whether or not the developing countries will follow the same pattern. This theory can be summarised in three stages.

The first stage is characterized by low population growth, relatively constant, due to the traditional type of population equilibrium with high mortality and fertility rates which are under a minimum of human control. This was obtained in all parts of the world before the seventeenth Century. The rates of mortality and fertility tend to balance each other at high levels and the population tends to remain relatively stable.

The second stage is characterized by an increase in population growth reaching a plateau of maximum growth, resulting from a disequilibrium between mortality and fertility rates. In this stage, mortality rates decline rapidly as a result the institution of advanced health services while fertility rates are sustained at a high level. This stage of rapid and accelerating growth, characterizes most of the developing countries at the present time.

Stage three is characterized by a slow population growth responding to low and balanced levels of mortality and fertility. In this stage both mortality and fertility are under control. Most of the developed countries are now at this stage.

The transitional theory tries to explain the changes in mortality and fertility experienced by the industrial or developed countries. In this pre-industrial period mortality and fertility rates are both high but in near equilibrium with consequently very slow population growth. The socio-economic changes concomitant with the industrial revolution results in mortality decline but without fertility reduction because there is a time lag between the common perception of lower mortality rates and the economic disadvantage of large families in urban industrial society with an over-supply of labour and resulting unemployment. After a period of disequilibrium and rapid population growth, fertility rates eventually respond to lower infant mortality and to economic pressures, and a new demographic equilibrium emerges. The timing of this stage may be influenced by local cultural and social factors but ultimately it will take place.

Although there is a decline in mortality rates in the developing countries infant/child mortality rates remain high compared with those of developed countries. The decline in infant/child mortality rates may reduce the number of births required to attain a given number of surviving children. This reduces the incentive to produce large families. This is what is meant by the reference in the previous paragraph to the response to lower infant mortality. It is difficult to identify precisely the threshold levels of infant mortality, literacy and industrialisation or urbanisation which lead to a decline in fertility. Some developing countries follow a different pattern. A fall in death rates is due to the application of advanced modern medicine and public health and not due to socio-economic development. Thus they will have a long period of rapidly rising in population growth.

There is another theory to explain the excessive population growth and economic development and whether or not economic development promotes fertility. Malthus argued that economic development would increase the demand for labour. As a result, more young people could financially afford to marry which would increase the proportion of persons marrying and lower the average age at marriage. This change in the marriage pattern would lead to higher fertility. The critics of Malthus rejected his reasoning and attributed the large acceleration in population growth after the Industrial Revolution to lower mortality.

It is possible that both theories may apply. For example Benjamin (1965) has pointed out that the sharp fall in fertility in the United Kingdom at the turn of the 19th Century resulted from a combination of:

(1) legislation against child labour and enforcing compulsory education, and that children were no longer economic assets but economic liabilities, and,

(2) a sharp fall in infant mortality - it was no longer necessary to breed eight in order to save five.

There has been much discussion as to whether all developed countries passed through the same stages and as to the speed with which the transition can occur. Historically, it appears that Europe and Western countries differ between themselves in the pattern and the speed of transition. It happened in some of these countries that fertility decreased first and mortality followed. In others, both mortality and fertility decreased at the same time. The time lag between the decline in mortality and the responding fall in fertility may take as long as 50 years. As to whether the lag is more or less than this, depends upon the degree of development, since there is a threshold of development at which fertility starts to decline.

The majority of developing countries are at the second stage of transition where mortality rates are decreasing or fluctuating and fertility rates are sustained at a high level.

The marked falls in mortality in developing countries have been primarily due to medical advances and eradication of the major epidemic diseases. Thus, the fall in mortality rates in developing countries occurred as a result of external factors (public health improvement) and not as a direct result of general economic and social improvement.

The majority of demographers consider that for both mortality and fertility rates to regain a balance at a low level there must be concomitantly high levels of health, nutrition, education, literacy, urbanisation and other improvements in the level of living. Heer and Turner, 1965, pointed out that an increase in the level of economic development may lead to an increase in fertility in the short run. But in the long run, the forces depressing fertility tend to be stronger than the forces increasing fertility and these depressing forces are associated with a high level of economic development. It looks as if reducing mortality is much easier because people are usually concerned about health. They usually accept new techniques and medicines which improve public health, and its impact on mortality rests on ready public consent. On the other hand fertility remains within the sphere of private and individual choice because couples usually tend to resist any interference in their reproductive behaviour, especially if they are not sure of the likely survival prospects of their children. Generally, a decline in fertility depends more strongly upon the alteration of long established customs and attitudes. It appears that parents are not interested so much in having many babies as in having some surviving children. However, it is predicted that fertility in the developing countries will take longer to change because of the high level of infant/child mortality which is still prevailing in many of these countries.

It is probable that infant/child mortality is the factor which most influences the psychology and physiology of childbearing.

It may be evident that western demographic experience is not a secure guide to future population change in the developing countries of the contemporary world, because the theory of demographic transition does not state any essential conditions for fertility decline. Even if there are such conditions it is not known that they may present themselves in the developing countries during a specific interval. Substantial economic improvement may be a sufficient condition for a decline in mortality but it may not be today a necessary condition. Perhaps the decline in mortality may in itself prove a sufficient cause for a fertility reduction. Since much of the reduction in mortality occurs in childhood, it may be that the desire to increase the average surviving family size and the motives of ensuring family continuity and of obtaining support for old age can be satisfied with a smaller number of births.

Pitchford, 1974, mentions that an examination of nineteenth and twentieth Centuries history of western countries shows that with some exception, falling death rates occurred at about the same time as increasing industrialisation and urbanisation and rises in literacy and levels of living. The same period saw considerable and sustained declines in fertility rates, thus weakening the tendency towards rapid growth implicit in the application of the new methods of medicine and hygiene and new ways of living. However, in developing countries, death rates have fallen sharply while birth rates have hardly changed at all. As a consequence, the populations of these countries, which grew relatively slowly until a few decades ago, are now expanding more rapidly than the population of most of the presently developed countries ever did.

Ohlin, 1976, has asserted that in spite of the abundant literature on the relationships between population growth and social and economic change, it cannot be said that there is either a solid theoretical basis or hard empirical evidence for any grand interpretation of past experience or an assessment of the consequences of current rapid growth. There is, he insists, an embarrassing gap between the confident assertions by prominent statesmen and international organisations which blame population growth for most of the evils of the world, and the hesitant and circumspect positions taken by those economist and demographers who have not turned crusaders. In industrial countries like USA, he says, recent commission reports have failed to find evidence that any serious social and economic problems would be less serious if population growth were slower. He argues that they reached the relatively tame conclusion that they could find no argument in favour of continued population growth either, which, however, is a far cry from the alarm voiced by many even in those countries. In the case of developing countries, there are population problems and although they may differ on the nature and seriousness of these problems, many of the arguments have linked population growth and population pressure to the poverty of such countries. In fact, one is tempted to say that the more rigorous the analysis and the more scrupulous the examination of the evidence, the smaller is the role attributed to population as an independent source of economic problems. Ohlin also mentioned that in all developed countries a decline in mortality has been followed by a fall in birth rates, although the process has not been uniform and no clear relationship has been established between the movements in vital rates and various social and economic indices, the universality of this pattern is most impressive.

In developing countries, death rates have recently been falling very much faster than they did earlier in the developed countries.

Habakkuk, 1972, mentions that when the birth rate is too high, the death rate rises and cuts the population back to size. Thus, famine, disease, and even war, since they are more likely to occur. At least in primitive societies in periods of population pressure, are the result of the free rein given to man's prolific powers; they are according to Malthus, "the terrible correctives to the redundance of mankind". High death rates are a consequence of high birth rates and, in Heckscher's phrase "nature audited her accounts with a red pencil". This was the primitive equilibrium in which population growth was principally determined by what Malthus called the positive checks. This primitive equilibrium was first disturbed in the later 18th Century by a fall in death rates, a fall mainly due to improvements in medical knowledge and in public health. But the birth rate remained high and uncontrolled, and consequently there was a period of very rapid increase of population. Until the late 19th Century when the birth rate also became subject to control. As a result of industrialisation and urbanisation and the growth of per capita income, people began to worry about the size of their families and to limit them. Although population continued to grow very substantially for several decades the national rate of growth declined. Thus, after a period of unprecendented population growth, a relative balance of births and deaths was achieved.

The fall in fertility was a response to two developments. The first was the relatively rapid population growth which had continued since the late eighteenth Century.

In general, this growth was accommodated by an increase of investment, particularly by the creation of industrial capacity and the building of towns. Indeed, the population growth itself tended to stimulate the investment which enabled it to be absorbed into the economy. But though in general industrialisation and urbanisation took up the increasing population, there were very many places where, for a time, the increase in investment was not sufficiently rapid in relation to population growth or not sufficiently consistent, to accommodate the increments of population without some pressure on marriages and births.

Cassen, 1974, asserts that death rates respond to improvement in nutrition, sanitation, education, living and working conditions, public health measures and preventive and curative medicine, though in 19th Century Europe, for example, there is considerable controversy over the weight of contribution of each of these factors. Changes in fertility have been ascribed to an enormous range of factors - health, nutrition, education and literacy, urbanisation, alterations in the economic usefulness of children, female participation in the labour forces, religious beliefs, the improved survival of children and the availability of contraception. Because so many of these factors are the concomitants of economic and social development, it is expected that the developing countries will pass through a process of transition as and when development takes place. Researchers have recently began to look at these developing countries where fertility appears to have been declining and have found that fertility starts to decline when there are certain rises in the education, nutrition and per capita income levels; when those levels are rather higher than the prevailing levels in developing countries.

Ford and Dejong, 1970 show that the process of modernisation according to transition theory introduces new techniques for reducing mortality such as disease control measures which tend to be rapidly accepted. Fertility control measures are less likely to be either introduced or accepted, with the result that death rates decline while birth rates remain high, leading to very rapid natural increase. Later, as fertility control techniques are accepted fertility rates decline and the population grows more slowly or may even decline. Without this decline in the birth rate, the death rate would eventually be forced upward and the cycle then would not differ in its fundamental features from a growth cycle under primitive conditions.

Cleland and Hobcraft, 1985, mention that the central findings of the World Fertility Survey run strongly counter to the dominant current theories of fertility transition, with their stress on economic determinism. The detailed studies of the European transition, orchestrated by Princeton University, discredited previously entrenched beliefs that levels of societal development, measured in terms of industrialization, urbanization, literacy or average income, could provide the central explanation for fertility decline. In an analogous manner, the World Fertility Survey casts considerable doubt on the causal primacy of economic forces, either at the societal or family level, in bringing about fertility change in the contemporary Third World.

1.2 The Population Problem in Egypt

Population growth has been a subject of great concern, especially in discussion of the future development of low income agrarian countries. The agrarian low income economy is characterized by high birth and death rates. Birth rates are relatively stable at high levels and death rates fluctuate in response to varying fortunes.

In the post-war period many of these countries experienced a rapid decline in mortality rates with no change in the traditional level of fertility. Consequently, a gap was created between the declining mortality rate and the stable high level of fertility which led to an increase in population growth. The rate of population increase in developing countries is nowadays higher and more rapid than it was in Europe in the 18th and 19th Centuries. But the capacity of the developing countries to absorb increasing population is more limited not only in the facilities to provide employment, but also in the ability to integrate the additional people into social life.

In addition, high rates of population growth are in themselves an obstacle to economic development. The fact is that growth is occurring in many areas which are already poor and which have shown very limited capacity to create capital and to absorb technology. Moreover, it has been found even difficult to maintain the existing levels of this unbalanced relation between the two vital rates which cause a rapid rate of population growth.

Egypt may be considered one of the examples of the dilemma confronting many of these countries. Egypt, as far back as the year 5100 BC had an advanced farming community in the Nile Valley. Around 3400 BC King Menes unified the Kingdom of Upper and Lower Egypt. For the following 3000 years, Egypt was the site of one of the major civilizations in world history. Over the last Centuries, two major developments have taken place in Egypt. In the following Centuries of native rule, the country fell under the influence of a succession of foreign powers. The second development was not unconnected with the first; prosperous Egypt became a universal symbol of exploitation. By the mid-twentieth Century, Egypt had suffered many economic problems.

After the Egyptian revolution in 1952, Egypt went through a complex process of social engineering that transformed the political, economic and social structure of the country, at a pace which has seldom been equalled in the nation's long history. Transitional situations are usually complex, and during the past three decades, Egypt has simultaneously witnessed forward movements, tensions, setbacks, and major achievements.

Economic and social development has not occurred without problems. Chief among these has been the rapid growth of the population. The current annual rate of growth of about 2.7 per cent is not only a problem in and of itself, but is also the root from which many other serious problems stem (CAPMAS 1983).

Today in Egypt efforts for economic progress are underminded by a rapid population growth, population explosion. This is a product of declining death rates brought down by advanced medical science and better nutrition facilities, and a high level of fertility. During the first half of this Century, population growth was kept under control by a high death rate. After the Second World War, mortality rates started to fall without any corresponding change in fertility. This produced an unbalanced situation between the vital rates. The fall in death rate has occurred independently of any changes in the low levels of social and economic circumstances which prevailed at that time. The rate of natural increase rose to 3 per cent and by 1983 the population had increased to 46 millions (one-quarter of this number being concentrated in Cairo). This high rate of population growth caused, especially in rural areas in Egypt, a population pressure against increasingly scarce land and water resources and is stimulating migration to the Cities. This increased the number of people living in urban settings.

Table 1.1 shows that the first Census took place in Egypt in 1882. It was Egypt's first attempt in modern times to make an official count. However, it is regarded as an undercount, because it was carried out during the hazardous and unstable period in which there was a nationalistic movement with a strong opposition to the new British occupation of Egypt.

The second Census took place after 15 years, in 1897, and it was decennial until 1947.

TABLE 1.1

Egyptian Population in the Census Years and its

Rate of Growth in Intercensal Period*

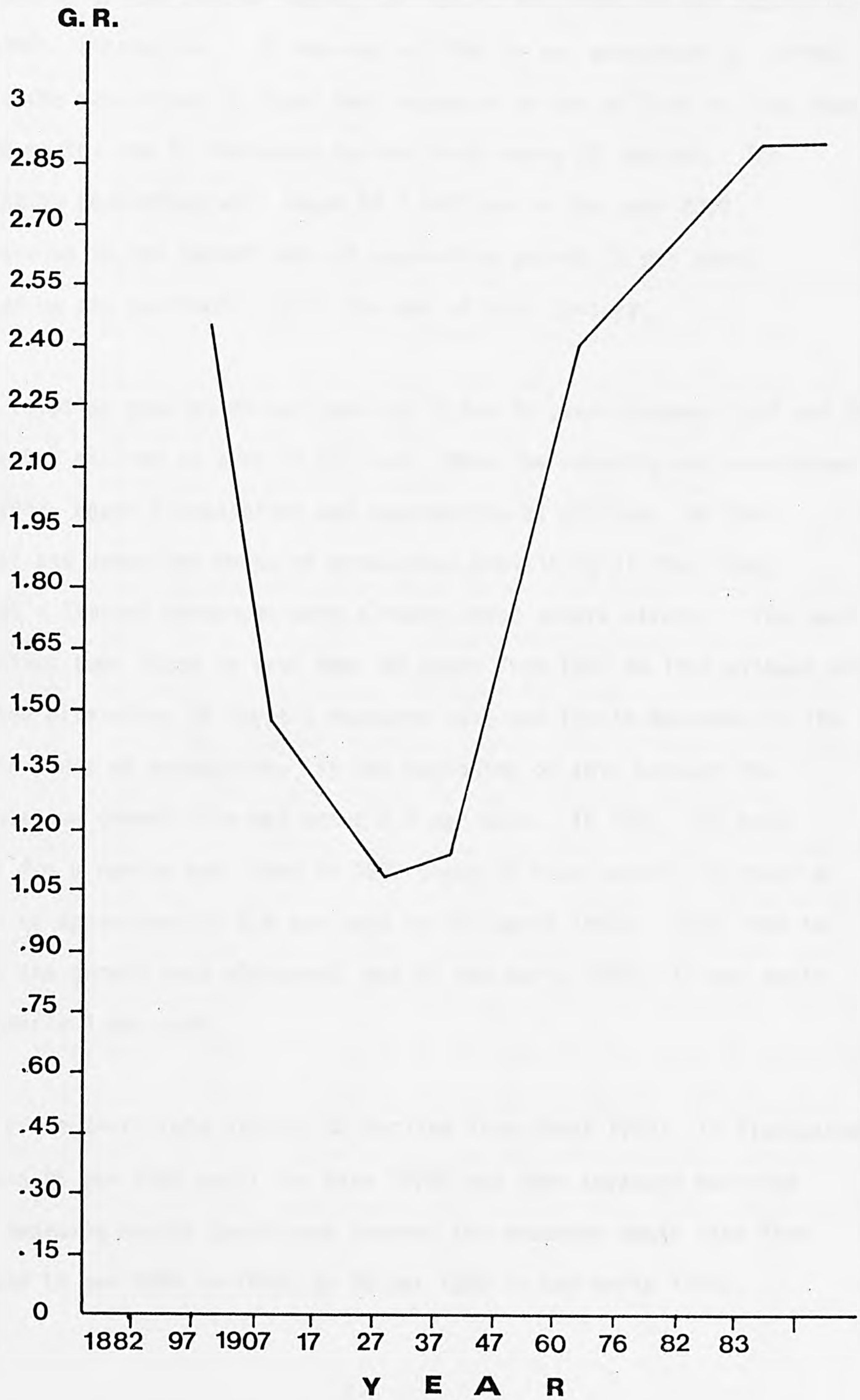
(Population 1000's) Annual Intercensal

YEAR	TOTAL	RATE OF GROWTH (%)
1882	6,810	-
1897	9,747	2.42
1907	11,287	1.48
1917	12,751	1.26
1927	14,218	1.09
1937	15,933	1.14
1947	19,022	1.78
1960	26,685	2.38
1966	30,076	2.54
1976	38,228	2.71
1982**	45,000	2.91
1983**	46,000	2.90

* Central Agency for Public Mobilisation And Statistics (CAPMAS) Statistics Yearbook, Cairo, 1980

** Hamden 1984

FIGURE 1.1
RATE OF POPULATION GROWTH



The 1957 Census did not take place because of the Suez war in 1956, and was postponed until 1960. After 1966 it was decided to carry out decennial Censuses, therefore, in 1966 and 1976 two Censuses were carried out. In 1980 the Egyptian population reached 42 millions according to the Central Agency for Public Mobilisation And Statistics (CAPMAS) estimation. At the end of 1984 it was announced by CAPMAS that the population in Egypt had increased by one million in less than nine months and it increased by one birth every 22 seconds. The Egyptian population will reach 67.5 million in the year 2000 according to the recent rate of population growth (3 per cent) assuming its continuity until the end of this Century.

The Egyptian population was doubled in the 50 years between 1897 and 1947 from 9.7 million to over 19 million. When the monarchy was overthrown in 1952, Egypt's population was approaching 21 million. At that level and under the modes of production prevailing at that time, Egypt's limited resources were already under severe strain. The next doubling took place in less than 30 years from 1947 to 1976 without any marked alteration in Egypt's resource base and little movement in its basic modes of production. At the beginning of this Century the population growth rate was about 1.5 per cent. In 1907, the rate fell for a period and then in 1937 began to rise rapidly to reach a rate of approximately 2.4 per cent in the early 1960s. From 1960 to 1976 the growth rate slackened, but by the early 1980s it rose again to nearly 3 per cent.

The crude death rate started to decline from about 1950; it fluctuated around 25 per 1000 until the late 1970s and then advanced medicine and improved health conditions lowered the recorded death rate from around 19 per 1000 in 1950s to 10 per 1000 in the early 1980s.

However, infant mortality rates estimated by the National Academy of Science, Cairo were 246 per 1000 live births in 1945; 168 in 1960 and 116 in 1976.

It appears that Egypt is moving through the stage of transition from high mortality to declining mortality. In this stage Egypt's population growth rate approaches its peak, since fertility rate is still sustained at a high level.

The crude birth rate declined from over 40 per 1000 in the mid-1960s to 34.4 in 1972. This decline was probably more an effect of 1967 war than a result of family planning programmes and the diffusion of contraceptives in Egypt at that time. Afterwards, the birth rate started to increase gradually to exceed 40 per 1000 in 1980.

The differences between these two vital rates (mortality and fertility) left Egypt with an annual rate of natural increase approaching 3 per cent (crude birth rate (40) - crude death rate (11) = 29 natural increase). It is the highest recorded growth rate in Egyptian history. This high rate of growth affects particularly the age structure. In 1976, about 40 per cent of the population was under 15 years old and only 3.6 per cent at age 65 and over, resulting in a dependency ratio of 0.77. It was found also that only 58 per cent of the population in the age group 15-64 was economically active and the effective dependency ratio was 1.3 in 1976. This will lead to a decrease in the national product and the percentage of people who participate in productive activity. At the same time this shortage in the national product will lead to a decrease in the national income and, in its turn will lower investment.

The problem of a high growth rate is complicated further by uneven population distribution. Population in Egypt is concentrated in a strip of land which is the Nile Valley and its Delta surrounded by desert. This strip is estimated to occupy only 3.5 per cent of Egypt's surface, and 15.5 per cent has been designated as currently habitable. Between 1927-1966 the density rates raised from 410 to 845 persons per square kilometre. It doubled in the last thirty years (1947 to 1976) from 545 to 1100 persons per square kilometre. From 1960 to 1983 it increased from 736 to 1300 persons. These figures are for the inhabitable land only (Hamdan 1984). Densities of this order rival those of Bangladesh or Java, famed for their degrees of crowding. The cultivated portion of Egypt's surface is even smaller, amounting to no more than 2.4 per cent of the total.

More than half of Egypt's population is rural. But in the last few decades it has decreased from 67 per cent in 1947 to 56.1 per cent in 1976. The urban section increased from 17 per cent in 1907 to 33 per cent in 1947 and to 44 per cent in 1976. Egypt's present course is marked by dramatic urbanization and industrialization. The pace of urbanization has been much more rapid than in most other developing countries.

Urban growth is greatly affected by migration from rural to urban areas. This has resulted in overcrowding of urban areas such as Cairo and Alexandria and also shortage in social services, housing, transportation, schools, and hospitals. Thus, Egypt is relatively more urbanized than most other countries at a comparable stage of development.

Egypt, not only reveals rural/urban differences in population density but also shows differences in fertility and mortality. Fertility rates are higher in rural areas than in urban areas. The birth rate in urban areas was 52 per thousand in 1954 and decreased to 30 per thousand in 1970. It was fluctuating in 1980 at 34 per thousand. In rural areas, the birth rate was 57 per thousand in 1954. It decreased to 37 in 1970 and increased to 40 in 1980. Mortality rates were higher in rural areas than in urban areas. In 1966 they were 16.9 and 14.3 respectively, decreasing to 12 and 11 in 1976. (El Nomrsey 1981). Another dimension of demographic setting in Egypt are health, nutrition, illiteracy, education, life expectancy and the status of women. Based on 1976 Census data, the illiteracy rate was 56.5 per cent of the population aged 10 and over, life expectancy at birth was 54 years and 9 per cent of women aged 15-59 participated in the formal labour market (Kelley, Khalifa and El-Khorazaty, 1982).

This scale of population growth (3%) is likely to have a bad effect on the country's economy because it may impede growth of productivity. An increase in the population means a rise in the demand for social services, jobs and less savings. It may cause funds to be diverted from investment for future growth into current consumption and may, therefore, jeopardize any effort to improve the level of living. Even past improvement could be overtaken and negated by excessive population growth. The complacency of Coale (1976 ibid) may be a dangerous message if it should be unwittingly assimulated by developing countries as if directly applicable to them (which it is not).

Habakkuk, in 1972 pointed out that population increase might exert favourable as well as unfavourable influences on economic growth. He supposed that on balance, population increase was a stimulus to the development of the economy. Thus, population growth and economic growth continuously interacted and this interaction was perhaps the principal reason why population increase was sustained.

Population increase might exert unfavourable influences on economic growth because it competes with capital formation. A high rate of population growth results in continuing high dependency ratios, more is spent on children and less on investment. On the other hand, the favourable influence of population growth on economic growth can be summarized as follows:

1. it might lead to an extension of the market, both directly and indirectly, by stimulating the creation of the means of transport and in this way promote a greater division of labour;

2. the creation of new capacity, especially if it affords opportunities for trying out improved methods, which will lead to a more rapid absorption of existing technical knowledge and, therefore, increase the chances of making further technical progress;

3. population growth might accelerate the acquisition of technical knowledge more directly; if it resulted in pressure on savings and natural resources, it

might stimulate the search for methods which substitute labour for capital and natural resources, and these might prove to more than offset the pressure which originally provoked them.

4. population growth might have beneficial effects on economic progress where, because of deficient demand, the rate of investment was below that which was warranted by the availability of resources. In these circumstances, by shifting demand towards capital-intensive goods such as houses, and by promoting urbanization and the expansion of cultivated areas, population growth stimulated investment, raised effective demand, and accelerated the growth of output.

5. population growth might induce individuals to work harder and to be prepared more readily to undertake land-clearance, reclamation and enclosure. On this view, a higher rate of investment might result simply from extra effort on the part of the cultivator.

Coale and Hoover, 1969 mentioned that, if a population was growing by 1.0 per cent per annum and the ratio of capital stock to current output was 3 to 1, then it might invest 3% of its current output to maintain its per capita income. Thus, it can be mentioned that a country like Egypt with a population growing at 3 per cent per annum must, under the same conditions, invest 9 per cent of its current output to achieve the same goal, of reaching the level of economic and social improvement at which the fertility level would be forced to decline. At the same time fertility may be influenced to rise if living standards improve as a result of economic investment. It is likely that the economic investment would first lead to a higher level of living and higher fertility but that later competition for the increased resources would promote lower fertility. The classical economic theory of population growth holds just this, that any rise in incomes tends to lower mortality and increase fertility in the short run but that in the long run fertility declines.

1.3 A Race between Population and Resources

More than half of the Egyptian population is indulged in agricultural activity. Egypt is considered an agricultural country, its land represents its principle non-human resource. That is why land and agriculture are the basis of production in Egypt. In the last few years, a kind of disequilibrium between land and population in Egypt has taken place. Population kept on increasing rapidly although there was only fixed strip of cultivated land (Nile Valley and its Delta). This fact affects both the density and the cultivated and cropped acreage per capita in the rural population. In 1982 the population in Egypt reached 45 millions, 97 per cent of whom are crowded into less than 6 per cent of the total land area of one million square kilometres. The remaining 96 per cent of the land area is desert. This causes a density rate of 45 persons per square kilometre for the total area but over 820 per square kilometre of inhabitable land. But since the cultivated portion of Egypt's surface is no more than 2.5 per cent of the total land area, the effective density is over 1,450 persons per square kilometre (of cultivated land).

The cultivated area per capita of the rural population decreased from .44 feddan in 1947 to .27 feddan in 1976. The total population has increased by about 291.1 per cent but in the cultivated land it increased by 15.9 per cent, an increase in the area under cultivation from 4.7 million feddans (one feddan = 1.038 acres) to 5.9 million feddans. At the same time the population increased from about 6 million in 1877 to 26 million in 1960. Thus, within 83 years the cultivable area increased by 26 per cent while the population increased by 335 per cent.

Hamdan, 1984 pointed out that the changes which occurred in the Egyptian irrigation and agriculture system (1820) was alike the Industrial Revolution which took place in Europe in the beginning of the last Century. The changing of the irrigation and agriculture systems in Egypt led to this high rate of population growth. A Century ago Egypt's governor, Muhammad Ali, searched in vain for sufficient labour to farm the land available. But Egypt's population at that time was only about three millions. In the pre-war period, the country was self-sufficient in food and had a surplus of wheat to export. The post-war period marked the beginning of food shortages and dependence upon imports to provide the basic means of subsistence. In 1952, imports of cereals mostly in the form of wheat in exchange for cotton, accounted for one-sixth of the total food needs. At present Egypt's imports of cereals accounts for more than one-third of the domestic output despite an increase of 37 per cent in wheat production between 1952 and 1960. This import of food has diverted a substantial portion of capital from investment to consumption. Moreover, as a result of rapid population growth throughout the first half of the twentieth century, labour became abundant and cheap. There were too many hands to farm the land. Despite that, the production of cereals annually increased from 1960-1974 by a rate of 2.54 per cent and in the period between 1967-1974 by 1.92 per cent. Simultaneously, the rate of population increase through 1975-1985 was 2.7 per year. That is why Egypt has been transformed from a self-sufficient country until the Second World War to a country which lives on imports.

Cotton, after the middle of the nineteenth century became a principal crop and gradually, cultivation of cotton and its industry and marketing dominated the economy of Egypt. The Egyptian soil and the change of the irrigation system are the main factors contributing to the wide-spread cultivation of cotton. These factors encourage farmers to allocate most of their land to its cultivation. Cotton is known to need many children for the productive field work and for harvesting the crop. This creates the idea in rural areas that children are an asset to their family. Consequently, a family with a large number of children is favoured by owners of large estates. Moreover, a large number of children means an increase in family income. The demand for cotton labour plus the high rate of mortality produced society norms favourable to abundant reproductivity. Average age at marriage was very low (less than 16 years old). Economic progress and higher family incomes went together with high fertility. This pattern prevailed in Egypt for a long time and change occurred when the farmers began leaving Egypt to work in the Arab countries. In the 1930s, it was estimated that half of the rural inhabitants had moved off the land into industry and trade. Efforts have been made to industrialize Egypt since the early part of the Nineteenth Century, with the result that sugar and textile industries are now established on a fairly large scale, because the areas which are devoted to sugar cane have increased recently. But further industrialization has been particularly difficult. At the same time Egyptian authorities since the 1952 Revolution have offered health, education and agriculture improvement, social services, the supply of electiricty from the High Dam and clean water which will extend through the whole country by the end of 1985. All this going along with the impact of radio and television and urban contacts influences the rural village and brings modification in the rural scene.

Since 1952 and with the Egyptian revolution, all the exerted efforts in both fields: industrialization and modernization have only succeeded in maintaining the prevailing per capita income. In 1945 per capita income decreased from 36 to 28 Egyptian pounds, then increased to 32.5 Egyptian pounds in 1957. This per capita income prevailed from 1913 to 1952. Between 1975 and 1976 it increased sharply from 127 to 151 Egyptian pounds. It reached 165 in 1977; an increase of 15 per cent in the last few years. In 1978 it reached 250 Egyptian pounds and it is twice as high in the cities as in the urban regions. The estimated per capita national product was increased between 1960-1973 by 100 per cent compared with 300 per cent in Europe but since 1973 it decreased as a result of the population growth and the constant prices.

This indicates that population pressure on productive resources is very real. It can be safely said that the population has reached a size that resources cannot support.

In Egypt 6o per cent of the manpower is illiterate. Graduates of Universities and academic institutions account for three thirds of a million in the current population. Manpower is about a third of the population which means that three-quarters of the population are dependent on others. Some estimate that dependent people amount to ten per cent of the population, 40 per cent of the manpower is engaged in agriculture and fishing while one-seventh of the active population are engaged in industry, one-fifth in unproductive activities and about one-tenth in trade. Egypt has two kinds of unemployment: traditional unemployment and a concealed unemployment. In 1960 the estimated unemployment was 3.3 millions. In the urban areas it is estimated to be 3.4 per cent and in the country as a whole, 2.5 per cent. In 1976, the total manpower reached 12 millions, with 1.5 millions unemployed. Between 1977 and 1978 the unemployed reached 1.6 millions. In 1979, concealed unemployment in governmental departments and the public sector reached 11.8 per cent but it was estimated by others that it reached 25 per cent. Waterbury, 1983, revealed that there was a heavy sex-bias in the Egyptian employed, arising from the female and child labour in rural areas.

Education, with all that it offers for future employment, is heavily sex-biased, and it is also heavily rural-biased with 70% of all illiterates residing in the countryside in 1976. Impressive percentage gains in the spread of literacy have still left Egypt with more illiterates than ever before. Between 1960-1976 the illiteracy rate for those ten years old or older was reduced from 71 per cent to 56 per cent. But the country's 15.1 million illiterates in 1976 is a figure nearly equivalent to the total population in 1937. Illiteracy, however, is much lower among younger generations who have benefited, in increasing proportions from the development and democratization of the educational system. The percentage of the population at ages 5-24 years enrolled at all levels of instruction, increased from 22% in 1952 to over 60% in 1982. (EFS Summary of Findings 1983). In 1985, literates were 44% and illiterates 56%, within the illiterate groups 21% are females and 42% are males. (Egypt Facts and Figures, 1985).

The level of living in Egypt is considered to be very low compared with developed countries. Despite increase of per capita income it is still lower than some countries in Africa and Asia. In Egypt people spend about 62% of their income on food. This is in itself evidence of the prevailing low level of living.

Egyptian food consists of bread and vegetables with a very low percentage of milk and animal products.

Eventually, the population of Egypt has outgrown its effective productive capacity. The rate of population increase is larger than that of the rate of increase of national income. Egypt suffers a scarcity of everything except mouths to feed.

This unhappy state illustrates the harmful effect of uncontrolled population growth, in competing with capital formation. Such a high rate of population growth results in continuing high dependency ratios. More is spent on children and unemployed and less on investment. In contrast with lower fertility rates not only would output be divided among a smaller number of population, but per capita output would rise faster.

Kelley, Khalifa and El-Khorazaty, 1982 mentioned that economic development at the aggregate level was proceeded at a respectable pace during the 1970s. In the 1970s, output growth per capita exceeded 4 per cent, a rate faster than that experienced in most developing countries. The gross national product has grown in recent years at a rate of at least 8 per cent annually. In terms of the changing structure of production, the shift of output and labour force away from agriculture has been relatively small. On the other hand, while agriculture has been a relatively lagging sector in output growth, the margin between agricultural output growth and population growth is still large by comparison with many developing countries. These authors also show that the high rates of population growth are pressing on the scarce endowments of natural resources, water and land. As a result, the rate of economic growth, and especially that in rural areas may be losing ground to the requirements of simply maintaining the population at the existing level of living.

It is obvious that population growth may not only impede economic development but it may slow its acceleration. Egypt between 1950 and 1985 went through three wars in 1956, 1967 and 1973. These wars were accompanied by fluctuations between socialist and capitalist orientation and contradictory economic decisions which created instability in the development field (economically as well as socially). Furthermore, migration of skilled and unskilled labours to Arab countries, U.S.A. and Europe resulted in a shortage of skilled labour especially of technicians and farmers necessary for development in Egypt. Egypt's population could be an asset not a liability to economic development.

Billions of hard currency were remitted annually by Egyptian labour abroad. However, Egypt's attempt to achieve an adequate level of living largely depends on the institution of adequate measures and conditions under which fertility rates will begin to decline. Industrialization or urbanization does not sufficiently change the social norms of family size. It is difficult to achieve a sustained rate of economic progress faster than the population growth rate. The alternative is to find other ways to control the population growth rate. Thus mortality should be controlled first especially infant/child mortality and be pushed down to a certain level so as to increase the number of families without mortality experience. This will lead to a change in attitudes towards childbearing and this change can be both a result and a cause of development. Economic development pulls women out of their homes, giving them a greater sense of control over their lives, greater access to contraceptive information and a heightened sense of earning which they may lose by having children. Economic development pulls older children out of jobs and into school, thus cutting their direct economic contribution to their parents' households. It also raises couples' awareness that social mobility depends on per capita family expenditures that would be dragged down by the arrival of extra children. This feeling can be fostered by industrialization and by education. Children become less valuable as insurance of old age support as introduction of social security allowances give parents a cheaper guaranteed way to assure themselves of that support.

1.4 Population Policy

Before 1950 very little attention was focused on population growth which began in the 1930s. Over this twenty year period some researchers began to raise the public's consciousness of population issues. But political leaders, remained silent until 1954, when an association for population matters was established, which later became known as the Egyptian Family Planning Association. In 1960s the Egyptian government became aware of the increase in population. In 1962 the Egyptian Charter emphasised the seriousness of the population problem and the need to search for a solution. In 1965 the Supreme Council for Family Planning was established to devise policies for curbing the population growth rate. The Council designed a programme which added family planning services to all health centres and made different contraceptive methods available free.
In 1973, the name of the Council was changed to the Supreme Council for Population and Family Planning. Its focus on traditional family planning services, the provision of contraceptives, communication and training activities. In the second stage between 1972-75 the Council emphasized the need for a balance between population growth and socio-economic development. They stressed the importance of socio-economic factors as an instrument of population change, because they believed that an increase in the demand for family planning hinged on the rate and the nature of socio-economic change, i.e. on raising the standard of living of individuals, expanding functional education, upgrading the status of women and increasing their participation in the labour force, mechanizing agriculture, introducing social security and reducing infant/child mortality. In 1975, the third stage began with a desire to reduce fertility through direct measures such as family planning and indirect measures such as raising educational levels, and raising the level of living.

CHAPTER TWO

FERTILITY IN EGYPT

2.1 Introduction

In the developing countries, birth rates are substantially higher than they were in pre-industrial Western Europe. The difference between developed and developing countries with respect to fertility is far greater than for mortality and there has been little convergence. Indeed, at this time the birth rate is an efficient way of distinguishing developing from developed countries. There is hardly a developing country with a birth rate below 30 per thousand or a developed country with a birth rate above that figure. Human fertility is not ordinarily considered to be a disease, quite the contrary, it is something to celebrate in traditional society. In recent years, as death rates have been lowered in most developing countries birth rate is two or three times the death rate.

In fact, there is a great deal of variation in natural fertility, on both the aggregate and individual levels. These variations are due to variations in the proximate determinants, such as age at marriage, duration of breastfeeding, nuptiality separation, divorce, nutrition, health, socio-economic and biological characteristics. Demographers define natural fertility as the fertility that prevails in the absence of deliberate attempts to limit the number of surviving children. Practices such as prolonged breastfeeding or post partum abstinence lower fertility to well below its biological maximum but also increase the chances of child survival. Natural fertility is further reduced in all human societies by delayed marriage and marital disruption.

It is likely but not certain that the 1960s marked the beginning of a worldwide fall in the fertility of developing countries. The declines are differentially attributable to change in all or some of the proximate factors like age structure and marital patterns as well as changing marital fertility.

Caldwell, 1976, pointed out that transition from high to low fertility is due to institutional changes that reverse the traditional flow of wealth from the younger to the older generation thus increasing couples' motivation to have fewer children. Mass education is one institutional change that influences families to lower their fertility by increasing the transmission of wealth from the older to the younger generation.

Cartwright, 1983, revealed that the change in motivation from large to small family size according to the classic fertility transition theory to European population (from high fertility level to low level) was the change in macro-developmental variables, such as urbanization, industrialization, literacy and the like. This resulted in a shift from major dependence on relatively self-contained local institutions to dependence on larger social, economic and political units. The family gave up many of its functions to larger, specialized institutions which were of growing importance. Greater literacy and the development of effective communication and transportation networks were essential to all these changes. With development the burden of children increase, partly because they interfered with the new non-familiar activities and partly because the improved level of living, the increased education and the opportunities in the new expanded system, led to rising aspirations.

Parents wanted more for themselves and their children. They were more likely to be able to satisfy the new aspirations with fewer children than with more.

In developing countries parents expect and receive significant economic support from their surviving children, especially sons, in their old age. The decrease of this reliance on children is traditionally thought to be one of the main ways in which economic development reduces fertility. Caldwell, 1983 showed that fertility is significantly lower in countries with social insurance benefits established for the elderly with other variables held equal.

Easterlin, 1978, pointed out that modernization alters the demand for children, because the children's economic contributions fall off considerably in modernizing societies as education gains importance, children become obsolete or unnecessary as the labour force shifts out of agriculture or as children are replaced by other institutions in providing security against risk in old age and as greater social mobility and weaker family ties reduces dependence on children. The value of parental time rises. All these components together produce a decline in demand for children with modernization. But early in modernization, before children's labour contribution is much reduced, the demand for children rises slightly.

Caldwell, 1983, pointed out that in all countries and all eras fertility follows changes in the demand for children, driven by consideration of both economics and taste. Fertility fails to fall in the early phases of most countries' development, and falls thereafter, for a straight-forward reason, that the relative costliness of extra children fails to rise until a fairly advanced stage in development, i.e. until it appears therefore, that the fertility transition parallels the long-term pattern of child costs and benefits.

The employment of women may help in reducing fertility. It has long been recognized that some types of work are more compatible with having and raising children than others. In the early 1960s it was found that fertility is inversely related to womens labour force participation. In fact researchers see the promotion of female employment as a powerful means of reducing fertility. It is widely inferred that in low income countries, high levels of fertility would be encouraged to the extent that female labour force participation was low, i.e. if there were few opportunities for income earning, the cost of childbearing would be reduced. Work is more likely to affect fertility negatively. It is found that women who worked because they wanted to do so appeared to have lower fertility than those who worked from economic necessity or for a higher level of living. Because this interest in work has typically been correlated with high status career jobs, making it likely for women to have relatively low fertility. Some studies have found no inverse relationship between fertility and female labour force participation in rural areas of low income countries and the inverse relationship exists only in the urban areas of these countries. It is observed that fertility levels of women working in what is called cottage industries and agricultural field work in the family farm were similar to those of the economically inactive and that only women who worked away from home had lower average fertility. Davanzo and Lee, 1978, mentioned that it is generally accepted that women doing agricultural work, in particular those on family farms where work schedules have been assumed to be flexible and child care can be combined with work rather easily, therefore they have a high fertility rate.

2.2 Egypt's Demographic Characteristics

Despite the high annual rate of population growth in Egypt (3%) which results in an estimated population size of 43.6 millions in 1981 and 46.0 millions in 1983 (CAPMAS), Egypt is going through rapid and important changes in economic and social fields. These changes are taking place as a result of a deliberate policy aimed at improving the welfare of the Egyptian people. These changes started with the electrification of rural Egypt due to the completion of the High Dam, the expansion of educational opportunities which leads to an increase in the levels of literacy and encouraging women's participation in schooling and labour force, the development of health services and public sanitation which results in mortality decline; mechanization of agriculture, the transformation of the economy from an almost exclusively agricultural base towards a mixture of industry and agriculture; improvement of roads and other networks of transportation helped the remote and isolated areas in rural Egypt to integrate in the national life.

All societies have a collection of beliefs and culture norms which affect family life. Studying the features of Egyptian society may help in understanding its fertility behaviour. Egyptian society is dominated by certain traditions, religion and culture norms associated with an agricultural country. Land is the basic source of income for the peasant. Although about half of its population now living in urban and semi-urban localities, the majority are descendants of peasants who cultivated the Egyptian soil for generations, and emigrated from rural areas loaded with all their ruralism as a way of life. Ruralism is a way of life relying on nature and climate in their agricultural activities. Several aspects of an illiterate's life are predestined, fatalism and conservation. In other words, all religious, economic and social values encourage large families. Early marriage for females is common. The status of women depends upon the procreation process. Children of lower and middle class begin work in the fields at an early age, and children are seen as a gift of God. Children are highly valued in rural Egyptian society and to some extent an increase in the level of wealth has resulted in an increase in family size in recent years.

Social and economic changes which are taking place in Egypt now may affect many facets of family life, including decisions about marriage, age at marriage and reproductive norms. Furthermore, the whole process of economic change weakens the force of traditional customs and beliefs. For example, trade, small industry and services now co-exist with the predominantly agricultural economic structure, there is an increase in individualism, and a decline in rigid traditional principles, and an increasing number of parents aspire towards education of their sons.

The Egyptian Fertility Survey results, 1983, pointed out that mortality, nuptiality, age at marriage and fertility have been changing, particularly in the urban and more modernized sectors of the population in Egypt. Farid, 1984 studied fertility patterns in the Arab countries and Egypt by examining the broader national patterns of nuptiality, fertility, child mortality, family size desires and contraceptive prevalence using

WFS data. He concluded that in most countries that have undergone the economic transition from an agrarian to an industrialized, market-oriented economy, a trend toward the small family norm has begun in the urban groups at the higher end of the socio-economic scale and has spread to smaller cities, lower income groups and eventually to rural areas.

In Egypt, the family is the basic social and economic unit in which people specifically live and work. Reproduction is almost entirely authorized, expected and confined to married women to whom the responsibility for child care is assigned. Therefore, in Egypt, the normative system supporting the family has been so deeply ingrained and linked with traditions and sentiments, that the basic features of the family are taken for granted and treated as sacred. Marriage is one of many social contracts which form the basic fabric of Egyptian Society, but it is perhaps the most fundamental, as most social and economic activity is embedded in the family relation. Therefore, marriage and fertility have been viewed as interrelated as a social and demographic process and as sequential phases in the life cycles of women. But now Egyptian families are undergoing major and extensive transformation. These profound changes include the weakening of the extended family bonds. Egypt used to have a patrilineage family, it extended beyond the nuclear family to encompass parents, siblings and cousins of the spouses. The economic and social development and transformation has no doubt, introduced factors of change across the demographic scene of the country, affecting mostly the formation of the family. Thus, the nuclear family has begun to emerge in towns, cities and even between the immigrant people form rural areas to urban areas.

2.3 Fertility Trends in Egypt

Through the past three decades, the Egyptian birth rate ranged from 41 to 44 per thousand. (Table 2.1). Going further back between 1906 and 1950 the birth rate was fluctuating between 39 to 43 per thousand. Between 1915 and 1919 the birth rate was low (39), this period was exceptional, because they were the years of an Influenza epidemic. It is evident that from the beginning of the Century and up to 1960 the registered birth rate was fairly stable except for the two periods 1915-1919 and 1940-1944, which may reflect the disturbing effects of the First and Second World Wars. In 1957 the birth rate fell to 38 per thousand which may be due to the 1956 Suez War. Fertility started to decline in the late 1960s (Table 2.1), and apparently reached its lowest level in the early 1970s. This decline may have been caused by a reduction in marital fertility, due to a reduction in the proportion of married women, resulting from the military mobilization which entailed compulsory military service and displaced the civilian population from the war zones. It may also be due to the fact that in earlier years smaller generations of girls were born. Egypt was involved in two wars in 1956 and 1967 and this created an economic depression and social frustration which might have affected the birth rate. Wars that drained the economy further and further continued until 1973. Since 1976 and 1977 the fertility rate has risen gradually. The birth rate from 1979 until 1985 has been around 40 per thousand. It may be possible that Egypt has been experiencing something of a post-War baby boom since arising from the psychological effect of rising expectations of rapid industrialization promotion of exports, imports, (arising from the open door policy initiated after the war) and the raising of living standards.

TABLE 2.1

Crude Birth Rates in Egypt (1906-1980(a))

YEAR	CRUDE BIRTH RATE	NATURAL INCREASE	YEAR	CRUDE BIRTH RATE	NATURAL INCREASE
1906-1909	43	17.5	1966	41.2	25.3
1910-1914	42	15.5	1967	39.2	25.0
1915-1919(b)	39.8	8.2(b)	1968	38.2	22.1
1920-1924	42.8	17.4	1969	37.0	22.5
1925-1929	43.9	17.4	1970	35.1	20.0
1930-1934	42.7	15.7	1971	35.1	21.9
1935-1939	42.8	15.9	1972	34.4	19.9
1940-1944	39.6	12.8	1973	35.7	22.6
1945-1949	42.4	19.0	1974	35.7	23.0
1950-1954	43.6	24.9	1975	36.0	23.9
1955-1960	40.6	23.4	1976	36.4	24.7
1961	44.1	28.3	1977	37.3	25.5
1962	41.5	23.6	1978	38.6	28.0
1963	43.0	27.5	1979	40.9	29.9
1964	42.3	26.6	1980	40.9	30.0
1965	41.7	27.6	1981(c)	38.9	27.8
			1982(c)	36.9	26.6

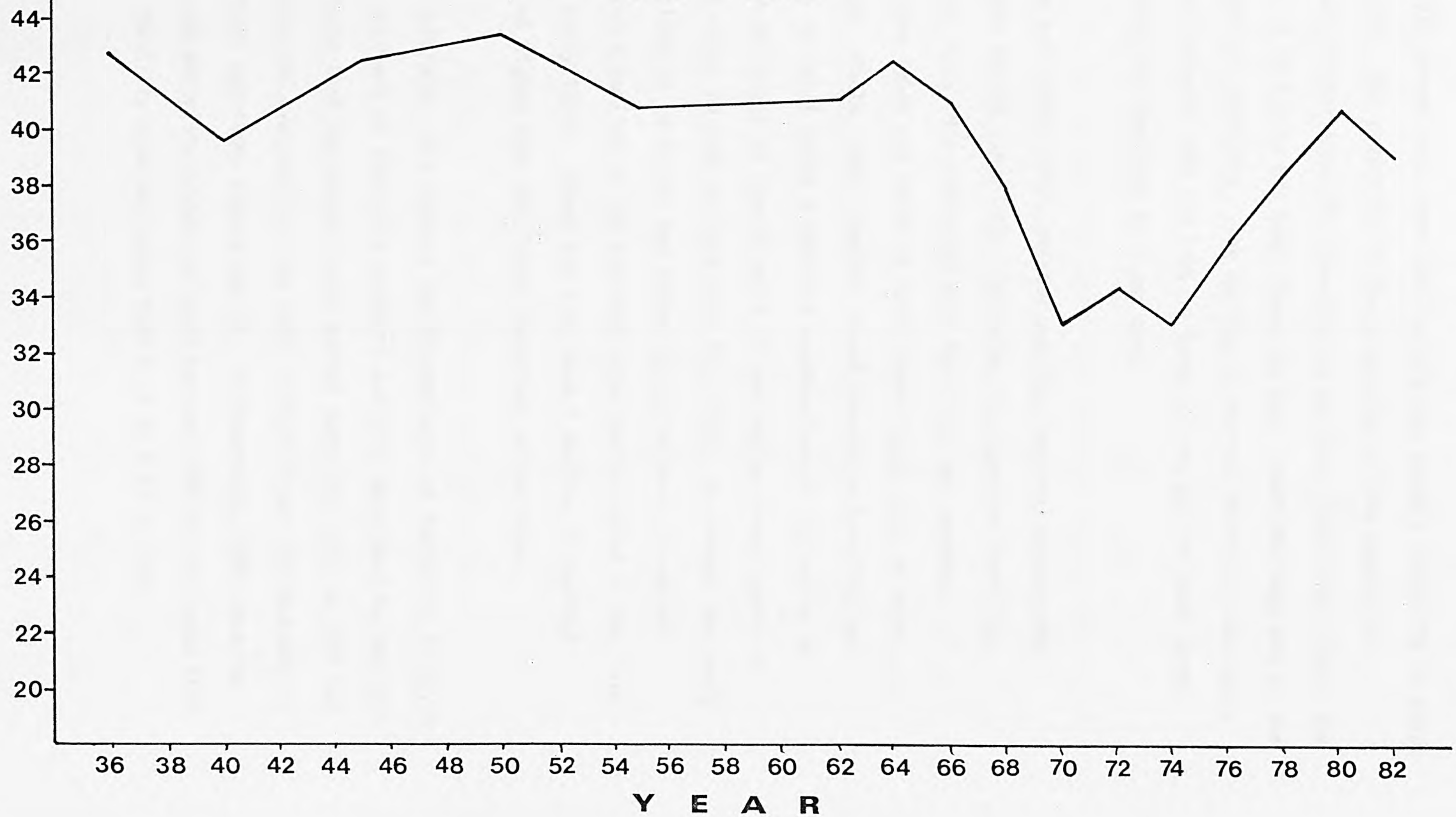
N.B.

(a) The period 1906-1919 is taken from Kiser 1944
The period 1920-1960 is UAR Yearbook of Vital Statistics
The period 1961-1978 is from CAPMAS (1980, p10)
1979 and 1980 are estimated by CAPMAS (Press Release)

(b) Influenza epidemic

(c) Provisional

FIGURE 2.1
CRUDE BIRTH RATE IN EGYPT
1936 — 1980



Hassan, 1979 showed that from 1960 to 1976 the overall fertility in Egypt fell by 18%. The reduction in the proportion of the population married was greater than the reduction in marital fertility. Thus, the reduction in fertility has been caused by both later marriage and by the fall in marital fertility. The decline in marital fertility was about 20 per cent between 1960 and 1976 in large cities but in lower Egypt marital fertility declined by 5 per cent.

Casterline and Ismail, 1983, pointed out that national demographic data for the period since 1950, including the Egyptian Fertility Survey (EFS) data 1980 indicated that fertility was somewhat higher in the 1950s and 1960s in rural lower Egypt than in rural upper Egypt. Coale, 1983, studied recent trends in fertility and nuptiality in Egypt using a detailed examination of tabulation of births and marriages by single years of age and by single years of occurrence prior to 1980 derived from EFS, 1980. He showed that much of the decline in fertility was caused by an increase in age at marriage and a decline in the marriage rate that occurred in the late 1950s and early 1970s. There has also been a decline in marital fertility at higher ages and longer durations of marriage.

Nawar and Hobcraft, 1983 studied the determinants of fertility in Egypt using the approach of fertility exposure analysis described by Hobcraft and they found that the actual total period fertility rate in 1977 was only 5 births and over half of the total reduction was attributable to delay of first marriages beyond age 15. El-Noumrousy, 1981 studying fertility and mortality trends in Egypt between 1950-80 concluded that the total fertility rate decreased from 6.14 to 5.51 in 1976.

The Egyptian Fertility Survey (EFS) 1983 showed considerable differences in achieved fertility levels by type of locality, with total fertility in metropolitan areas of Cairo and Alexandria being below 4 children per woman and the total fertility exceeding 6 children per woman in rural upper Egypt.

2.4 Stages of Change in Fertility

There are two contrasting views about the effect of economic development on fertility. The first view is that economic development has an inhibiting effect on fertility and this is expressed in the transitional theory. The second view supports the idea that economic development promotes fertility because it would increase the demand for manpower. Fertility in the developed countries passes through three stages:

1. The balanced stage: where infant mortality is high throughout the society without any differences among various socio-economic classes. Consequently, fertility tends to be as high as mortality and positively correlated with class position. European experience prior to 1850 indicates that there were no class differences in fertility. Notestein, 1953, demonstrated that there was an increase in fertility in China with an increase of wealth among farm families, and data from India lend to confirm this pattern of association. Khalifa et al, 1982, concluded that fertility increased with wealth ownership in the form of real assets.

2. The transitional stage begins with the improvement of the socio-cultural environment, i.e. better sanitation, medical science and practices, so that class differences show up in infant mortality. Usually the privileged classes experience an early decline in infant deaths which gradually induces attitudes favourable to smaller families. Once mortality starts to decline in the lower socio-economic categories more than in higher categories, the second phase of fertility decline gets underway.

3. The final stage: begins by the end of the transitional period which marks the disappearance of the inverse association of fertility with class position. Finally, fertility returns to the early pattern of direct assocation with socio-economic status, but at a relatively low level.

Economists and demographers have tried to explain the nature of the complex interaction between economic development and fertility. The complexity of this interaction emerges from the fact that while economic development could raise fertility in the short run, social and economic changes which are concomitant with the development, help to reduce fertility in the long run.

2.5 Factors that cause high fertility in Egypt

Reproductive behaviour is a form of human behaviour, and the study of this behaviour may help to gain understanding of the difficulties and complexities involved in human behaviour. Till now, there have been no well-established theories or conceptual models that adequately explain why different families achieve different family size.

The source of differences in fertility derive from the proximate and the remote factors that affect fertility and the interrelation between them. The proximate factors include age at first marriage, the impact of union dissolution, infant/child mortality, use of contraceptives, period of infecundity following any birth through lactation, induced abortion, foetal loss, coital frequency and fecundability. Therefore, the proximate factors are the biological and behavioural factors which directly affects fertility. The remote factors are those factors which have an indirect effect such as women's role and status the value of children, education, employment, religion, preference of sons as a source of pride, assets, security and extended families, In sum all the socio-economic, cultural, institutional and community factors that operate to alter fertility related behaviour.

Children especially males are considered one of fertility determinants. There are three different economic reasons for wanting surviving children:

1. Children as a source of labour in Egypt make significant economic contributions. Work starts at an age well below 10 and the value of children's labour approaches that of an adult.

2. Children for old age security. Savings, pensions, and social security incomes help to support many aging parents in developed countries. But these sources are not available in Egypt for the majority of people in rural areas where the majority are working in agricultural activities. Therefore, they rely on their children (sons) for care and economic support in old age. Thus, preference for sons may have an impact on fertility in rural areas. For example, women in villages in upper Egypt have higher fertility and are less likely to be using contraceptives because they expect to receive help of some kind from their children in the future (WFS 1983).

3. Children as an insurance against economic risk. Households living close to subsistence level are highly vulnerable to fluctuations in income or food supply. Perhaps the most serious threat to a household's economic survival arises when the head of the family dies or become seriously ill or permanently disabled and there is no son to assume responsibility for the family. Parents will minimize the risk by increasing the number of children (sons) surviving to adulthood.

Nawar and Hobcraft, 1983, point out that much of the variation in fertility has arisen from differences in age at first marriage which can be affected by the mother's level of education.

They showed also that lactational infecundity had most impact in the most traditional segments of Egyptian society and least in the modern sectors; that contraceptive use was higher in the modern sector than in the traditional areas; and the type of locality still occupies a prominent explanatory role which means that there are deep-seated cultural differences between the various localities which are not captured by standard socio-economic variables.

Hassan, 1971, studied factors affecting fertility in rural areas of lower Egypt based on data obtained by a sample survey conducted in 1965 and 1966, and concluded that there was an inverse relationship between age at marriage and fertility. Women who marry younger (less than 16 years of age) have an average number of pregnancies of 5.23 while it is 4.70 for women who marry at ages 20-24. He showed that whenever duration of marriage increases, the average number of children born seems also to increase.

Kelley et al, 1982, studied Egyptian fertility and mortality. The statistical analysis showed that marriage is delayed for women who possess at least a primary education certificate, which in turn reduces the number of children ever born. Infant/child mortality has a low effect on children ever born, particularly in upper Egypt because the family size desired by women may be sufficiently large that the occurrence of a child death does not markedly change behaviour: age at first marriage has a potent effect on completed family size.

Loza, 1983, in her study about the determinants of fertility and the demand for family planning based on a review and assessment of studies and how they explain the Egyptian experience, showed that the status of women and the value of children may have a salient role in decreasing fertility. Egyptian women have a lower social status than men; this role is to marry and procreate. Early marriages are encouraged because they remove the parents' responsibility for protecting their daughter and hand the responsibility over to her husband. The woman's fear of divorce and polygamy causes her to feel insecure. Fertility is viewed as an indication of youth and femininity. This traditional view of the role and status of women is modified by the level of education of the woman, her employment status, her level of urbanity and the degree of involvement in decisions related to the welfare of the family. All these variables are assumed to reduce the importance of the role of childbearing and to increase the quality of relationship between husband and wife.

The value of children emphasizes the role of children in the family. If parents perceive that having children has a positive value as opposed to a costly negative value, they will do nothing to deliberately avoid an extra child.

Parents may have children because they are seen as a gift of God and within God's domain, and they fear that any interference will anger God. They may see them also as a source of security, income, prestige and power. On the other hand, children may be costly in terms of financial burdens, time, worry, emotions and responsibility. In other words, goods and services are provided by children to parents and parents in turn contribute goods and services to the children. If the cost of children outweighs the benefits realized then parents will seriously consider limiting the family size and vice versa.

Dr. Loza showed that the level of education of women affects fertility through raising age at marriage and it reduces the desired number of children, increases knowledge of contraception and contraceptive use for birth spacing and at a lower parity. Furthermore, there is no evidence that employment negatively affects fertility. Extended family structure is usually associated with more traditional norms, including large families, because mothers have help and support and child-rearing benefits may reduce the costs involved in rearing a large number of children. She concluded that infant mortality, and preference for a son has a positive impact on fertility.

The Egyptian Fertility Survey's major findings, 1983, were that:

1. Egyptian women start their childbearing experience at more or less the same pace regardless of their background characteristics. After an initial period of high fertility, certain groups of women start to regulate their fertility. These groups include women residing in Cairo, Alexandria and the urban areas of lower Egypt, those with at least secondary education, and those whose husbands are in professional or clerical occupations.

2. Age at first marriage is strongly associated with place of residence and has a positive relationship with the level of education. It may be inferred that increasing educational opportunities for

young Egyptian women has been largely responsible for the recent decline in early marriage and the upward trend in age at marriage, particularly in urban areas.

3. The mean family size for all ever married women is 4.13 but the average woman of age 45-49 at the date of Survey had seven live births and the data shows a high level of fertility for women of all ages. Furthermore, the average number of children ever born differs according to region, education, occupation and income. The richer and better educated in the more developed regions have lower fertility than others.

4. Total fertility fell from 7.1 births per woman in 1960-65 to 5.3 in the period 1975-80 representing a 26 per cent reduction. If this decline is compared with the recent rise in age at marriage and with socio-economic differentials in cumulative fertility, it is possible to conclude that the decline in total fertility was initially caused by rising age at marriage.

Sayed and El-Khorazaty, 1980, examined the levels of fertility in Egypt and their socio-economic differentials using a regression analysis based on the National Fertility Survey, 1974/75 data and prepared by the Central Agency for Public Mobilization And Statistics (CAPMAS).

They showed that the average number of children ever born was between 6.7 and 7 children for ever married women aged 45-49 years for all Egypt, and it was higher in rural areas than in urban areas. They also concluded that the socio-economic standing of a woman's family of origin, residence and religion had no effect on fertility behaviour expressed in terms of mean number of children born or surviving when the duration of marriage was held constant. Women's labour force participation had very little effect on fertility behaviour, but wife and husband's education affect fertility behaviour and reduced its level.

Sayed, 1982, studying fertility and family planning in rural Egypt, based on data from the Second Rural Fertility Survey 1982, found that rural Egyptians favour early female marriage. And in upper Egypt where the percentage of childless women was highest (12.2%), women tended to marry at younger ages than in lower Egypt. The mean parity in both areas was the same, i.e. 4.4 children and according to different surveys carried out at the same period (1979-1982) the mean parity was generally between 4.3 to 4.6 children. Wife's education and employment analysis showed a high rate of illiteracy (87.5%) and low rate of working women (6.6%). The results also indicated that the majority of women intended to use contraceptives to stop having children rather than to space them. Consequently, these women are not expected to start usage before achieving their desired family size.

All the previous studies show that fertility trends in Egypt remain at a high level but are not increasing.

This gives the impression that Egypt is passing through or approaching a new stage of transition. If mortality rates decline more and socio-economic development reaches a certain threshold, such as increasing the non-agricultural economic activity and the access to local industries especially in rural communities, this will lead to a decrease in fertility. In that case the labour value of children will be lower, the costs of children will be greater as a result of increased opportunity for schooling which will involve some financial costs. Industrial development may also generate non-familiar employment opportunities for women and this may change woman's status and level of education. The accessibility of health services, free medical treatment, pure water, child and maternity care, female informal education in feeding and raising healthy children, improvement in housing and recreation facilities reaching lower social strata where levels of mortality and fertility are high, will motivate couples to limit their fertility especially as a larger number of births survive to adulthood. Extension of the social security programme at old ages seem essential to break this motivation for large families. All these efforts need to be concentrated in the rural areas where more than half of the population characterized by high fertility live.

CHAPTER THREE

MORTALITY IN EGYPT

Population growth is the net outcome of the increment from fertility, the decrement from mortality and the excess of immigration over migration (or vice verse). Birth is the beginning of life and death its termination but death may occur at any age, whereas birth occurs at only one age - zero.

Mortality, as one of the determining forces of population increase, declined in developing countries after the Second World War. This decline increased the number of adults surviving without the corresponding increase in productivity which had earlier occurred when death rates declined in the developed countries of the West. This decrease in mortality was a direct result of several causes acting simultaneously such as innovations in the field of public health, lowering costs and improving efficiency, and especially internationally assisted disease control measures which have been largely independent of economic development.

Populations of this century have enjoyed a decline in mortality from rates which had fluctuated at a high level over the first half of this century. This decline was of an unprecedented scope and magnitude. Life expectancy at birth in the whole world has grown from less than 30 years to more than 50 years (Preston 1978). Despite the rise in life expectancy during the past quarter of this century, the developing countries have relatively much higher levels of infant/child mortality than those of the developed countries.

The most extreme differentials are for young children from one to five years. This age-group constitutes a large fraction - sometimes a majority - of all deaths. Newland, 1981, found that under primitive physical conditions, between one-fifth and one-quarter of all babies could be expected to die. This was about the rate that prevailed in the present developed countries during the eighteenth century and with some exceptions for most of the nineteenth century. This level of mortality can be found in several regions and countries today - those where extreme poverty is combined with an almost complete lack of modern medical care or public health measures such as mass vaccination. In most, but not all, of the advanced industrial countries, the period since World War II has witnessed a continuing steady decline of infant mortality rates. This is an age of antibiotics, widespread public health measures, and increasing sophistication and availability of medical care all of which supplement the effects of improved levels of living. In France, Switzerland, Japan, for example, fewer than ten babies in a thousand die in the first year of life. In North America and West Europe the infant mortality rate is between 10-20 per thousand. During the course of one century infant mortality rates in the most advanced countries have been dramatically reduced to less than one-tenth of their former level.

Today, mortality levels and trends in the developing world are characterized by wide divergence within and among regions and countries. In the developing countries, infant mortality rates as high as any previously recorded in history can still be found. During the Seventies, there were only two countries on the entire African mainland that reported infant mortality rates lower than 100 per thousand. Rates closer to 200 were common, both in Africa and Asia.

The most rapid progress in reducing infant mortality has, in recent years occurred in countries where it was already relatively low. Thus, the disparity between the world's highest and lowest infant mortality rates is probably greater now than ever before.

The relatively high death rates in some countries today, and in all countries in the recent past, are chiefly attributable to a high incidence of infectious disease. The incidence of infection is largely determined by environmental conditions, and when incidence is high even modest improvements in the environment are very rapidly reflected in a reduced death-rate. This reduction mainly affects young children and infants. [It is worth recalling that this was the situation in the West up to the end of the 19th Century - for example, in England and Wales in 1901 deaths from infectious disease accounted for one-third of all deaths.]

Infant/child mortality has an important influence in the family building process, because there is a sizeable disparity between the number of children born and the number who survive to adulthoood. Most of this loss occurs very early in life.

Societies can be divided, according to mortality levels, into:

1. The traditional society with a high level both of mortality and fertility and a low level of family planning adoption.

2. Less modernized society or transitional society with mortality rapidly declining to reach what is called the intermediate level. This intermediate level of mortality is the level which now obtains in most of the developing countries and which in the face of stable fertility at a high level (low family planning) causes a large increase in population growth.

3. A society with low levels of mortality and fertility a high degree of family planning and minimal population growth.

When the mortality level is high, couples are biologically incapable of bearing as many children as they would like. Hence, on the one hand, a high mortality level results in only slightly higher fertility than do intermediate levels of mortality, and, consequently, the rate of population growth is somewhat lower at a high level of mortality than at the intermediate level. On the other hand, when mortality is low, as in the developed countries, the desired number of births drops precipitously and the rate of population growth begins to decline. Therefore, the mortality level which is prevailing now in the majority of developing countries ought to be intensively reduced. Although disease control will undoubtedly be still further expanded. Much of the future progress in reducing mortality will depend on improving socio-economic conditions which governs nutritional standards, environmental sanitation, medical care systems and improvement in drainage and water supply.

These all contribute to a fall in mortality and thus to a narrowing of the gap in death rates between developing and developed countries. This is because the developing countries will continue to improve their health and socio-economic conditions rapidly while improvement in the developed countries will have slowed considerably with the completed implementation of advanced sanitation and public health measures and the maturity of economic advancement.

In developing societies, the loss of children is so common that every woman grows up with the certain knowledge that she will lose at least one child and probably more. In sharp contrast, in developed countries the loss of a child is a rare tragic event that is experienced by only a few unlucky mothers.

3.1 Cause of Mortality Decline

There is a considerable controversy over the decline of mortality during economic development and whether it has been principally a product of social and economic development as reflected in nutrition, housing, clothing, transportation, water supply and so on, or whether specific medical intervention either curative or preventive has played the principal role. Another possibility is that technical changes reduce the relative costs of maintaining good health. The major technical changes that have taken place comprise immunization against many infectious disease, the eradication of the major epidemic diseases and chemotherapy for other diseases. These measures had to be embodied in social programmes in order to affect the mortality of general population of developing countries.

Newland, 1981, mentioned that economic, social, environmental and medical factors all play a part in determining the direction of change in the infant mortality rate, and they in turn may reflect more general strains in a society. Omran, 1977, concluded that mortality decline occurred in response to social, economic and environmental improvements that constituted the modernization complex. In the early stages of development such shifts owe little to medical measures in contrast to the shifts of the twentieth Century which are more strongly influenced by medical progress, widespread sanitation or organized health services, housing, nutrition and the ecological recession of certain diseases.

Parlange et al, 1983, show that mortality rates are primarily related to overall development and that unless there are improvements in the economic and health status of families in the developing countries fertility would not respond to the decline in mortality.

Economic development involves evolution from a predominantly agrarian peasant economy to an economy with a greater division of labour, using more elaborate tools and equipment, more urbanized more oriented to the market sale of its products, and characterized by rapid and pervasive changes in techniques. It may also involve improvements in transportation, communications and productivity, and these improvements may have the effect of bringing a striking reduction in death rates. The reduction in death rates may be ascribed partly to greater regularity in food supplies, to the establishment of greater law and order and to other fairly direct consequences of economic change.

Other factors which may contribute to the decline are improvements in sanitation, the development of vaccines and other means of preventive medicine, great and rapid strides in the treatment of disease. All these factors can be considered as somewhat indirect consequences of economic change. Advances in medical knowledge can occur more readily in secularized, less tradition-bound society that has resources available to support medical research. Habakkuk, 1972, considers that the marked falls in mortality in the developing countries since World War II have been primarily due to medical advances and that it is very likely that they will not continue at the same rate. As further falls in mortality depend increasingly upon improvements in social and economic conditions, they will, it may be argued, be more gradual. On the other hand, there is still a great deal in the medical locker, and it may be that health will improve more rapidly than anyone expects, even in the absence of marked improvements in nutrition and living conditions.

Factors that might contribute to mortality decline can be summarized as follows:

1. The development of antibiotics, insecticides and immunization against infections, parasitic and epidemic diseases. In other words, the adoption of modern medicine and public health programmes which directly contribute both to disease prevention and control.

2. The evolution of effective public health organization in low-income areas which facilitate access to and application of medical technology.

3. Environmental sanitation and the invention of suitable low cost methods of sanitation and the ecological recession of certain diseases have drastically reduced the incidence of major causes of death attributable to polluted food and water.

4. Improved personal hygiene has greatly reduced the ravages of many diseases.

5. Economic improvement, by increasing productivity may lead to an increase in the standard of living which helps in improving housing, clothing, communication and food (nutrition). Considering the relationship between food production and population, it was recently published that in the last ten years, in Africa, the population has increased by 33 per cent and food production by 18 per cent, while in the Western countries population increased by 3 per cent and food production by 19 per cent. China achieved an increase of 50 per cent in food production while the population increase was 14 per cent. In Latin America, population has increased by 24 per cent and her food production by 35 per cent.

It was noted that mortality did not fall progressively when living standards improved to the extent that it rose when living standards deteriorated. A long time might elapse before the economic improvement would lead to a reduction in deaths.

6. The emergence of stable government over increasingly greater territory has tended to eliminate internecine warfare and to improve communications among nations and thus make possible better distribution of goods and services particularly the transfer from areas of surplus to areas of deficit.

3.2 Child Mortality Trends and Fertility

Throughout the last three decades, mortality in Egypt has been falling with progressive speed. Mortality is an inescapable dimension of human experience. Control of mortality has been one of mankind's most startling achievements in the quest to manipulate the environment to advantage. Infant/child mortality is a good indicator of social, economic development and more effective health, medical and social programmes. Differences in infant/child mortality can furnish clues as to the general level of mortality although the connection between child and adult mortality can vary. Infant/child mortality is an important component of overall mortality especially at higher levels of mortality. [It is worth noting that the substantial extension of the expectation of life in developed countries in this Century has been largely due to the dramatic reduction in infant mortality.]

The Egyptian Fertility Survey, 1983, records that in Egypt the death of a child remains a common feature of family experience with the result that there is a sizeable disparity between the numbers who are born and the numbers who survive to adulthood. Most of this loss occurs early in life. This pattern is generally to be found where there is little effective planning of fertility. In these circumstances infant and early childhood deaths, themselves often largely determined by reproductive factors, represent just one of the contributors to a general state of uncertainty with regard to complete family size.

The magnitude of mortality risks vary from country to country and also vary within most countries. A notable feature of Egyptian demography is the large regional variations. Infant/child mortality varies also within the country's regions. In rural Egypt the estimated mortality rate between 1975-80 was 110 infant and 175 childhood deaths per thousand live births. In urban Egypt during the same period, an estimated 110 out of every thousand children born alive died in infancy and 150 in the first five years of life. In upper Egypt, it was estimated that 170 out of every thousand children born alive died in the first year and 220 in the first five years of life. It appears that infant/child mortality is lower in urban than in rural Egypt. But in both cases it remains high. In upper Egypt mortality levels are the highest and this excess mortality is a consequnce of profound differences in social and economic living conditions. The World Bank, 1979, concludes that mortality levels were highest in upper Egypt and lowest in lower Egypt with the urban governorates of Cairo and Alexandria occupying an intermediate position.

TABLE 3.1

Crude and Infant Death Rates

In Egypt between 1933 and 1980

YEAR	RATES		YEAR	RATES		YEAR	RATES	
	CRUDE	INFANT		CRUDE	INFANT		CRUDE	INFANT
1933	26.5	160.6	1949	20.5	135.5	1965	14.1	113
1934	27.0	-	1950	19.0	130.0	1966	13.9	127
1935	26.9	-	1951	19.2	129	1967	14.2	116
1936	28.9	163.8	1952	17.8	127	1968	16.1	131
1937	27.3	165.5	1953	19.6	146	1969	14.5	119
1938	26.3	163.4	1954	17.9	138	1970	15.1	116
1939	26.0	161.2	1955	17.6	136	1971	13.2	103
1940	26.4	161.8	1956	16.4	124	1972	14.0	116
1941	25.7	150.2	1957	17.8	130	1973	13.1	98
1942	28.3	168.4	1956	16.6	112	1974	12.7	101
1943	27.7	160.2	1959	16.3	109	1975	12.1	89
1944	26.1	152.3	1960	16.9	109	1976	11.7	87
1945	27.8	152.8	1961	15.8	108	1977	11.8	85
1946	25.1	140.8	1962	17.9	134	1978	10.6	73
1947	21.5	126.8	1963	15.5	119	1979	11.6	70
1948	20.4	138.6	1964	15.7	117	1980	10.9	68

Sources:

The period between 1933-1949: United Nations Vol. 1, 1954

The period between 1950-1980: Vital Statistics Yearbook (Central Agency for Public Mobilisation and Statistics (CAPMAS) 1970, 1978, 1980).

FIGURE 3.1
THE CRUDE DEATH RATE
FOR EGYPT
1936 — 1980

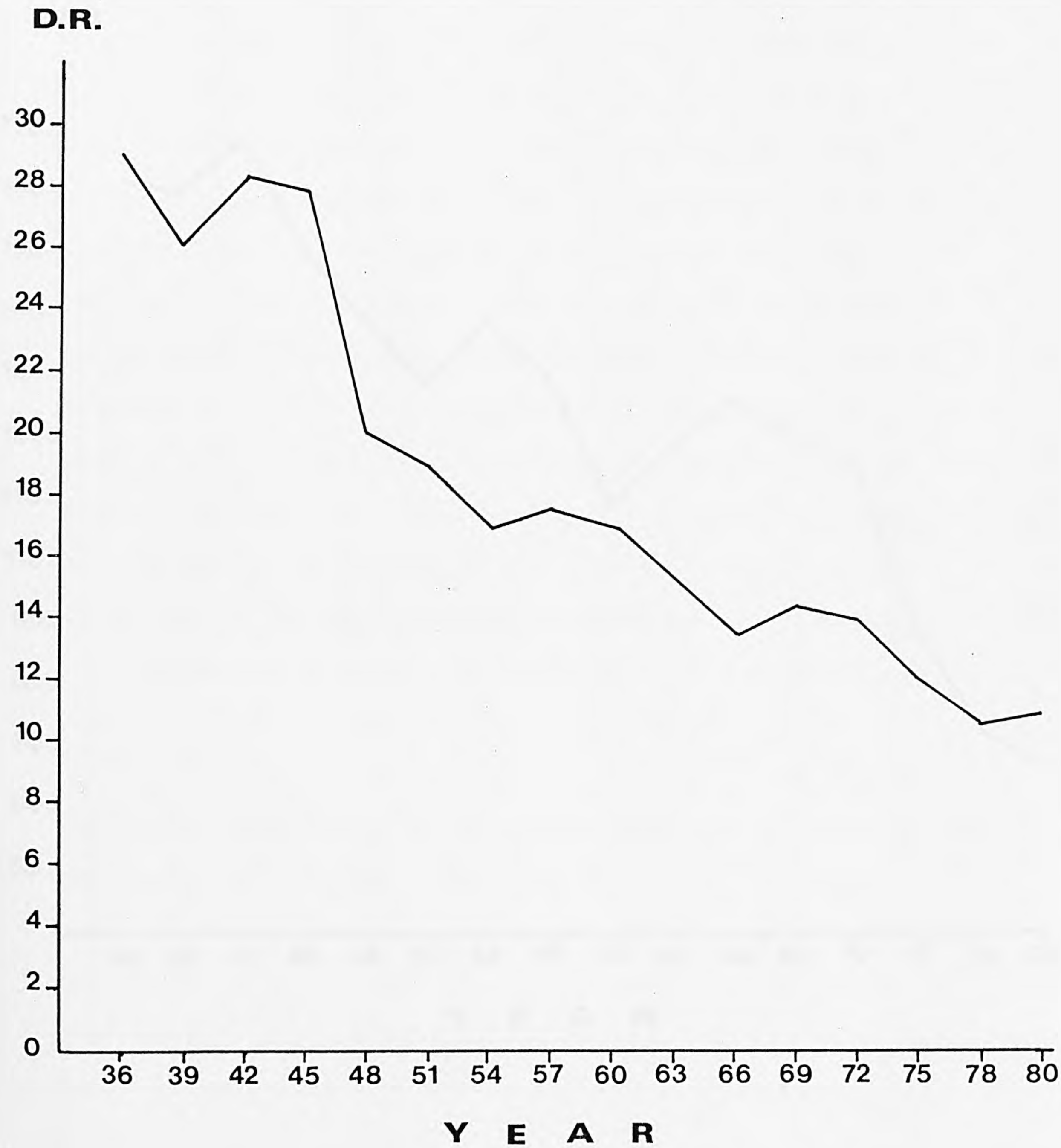
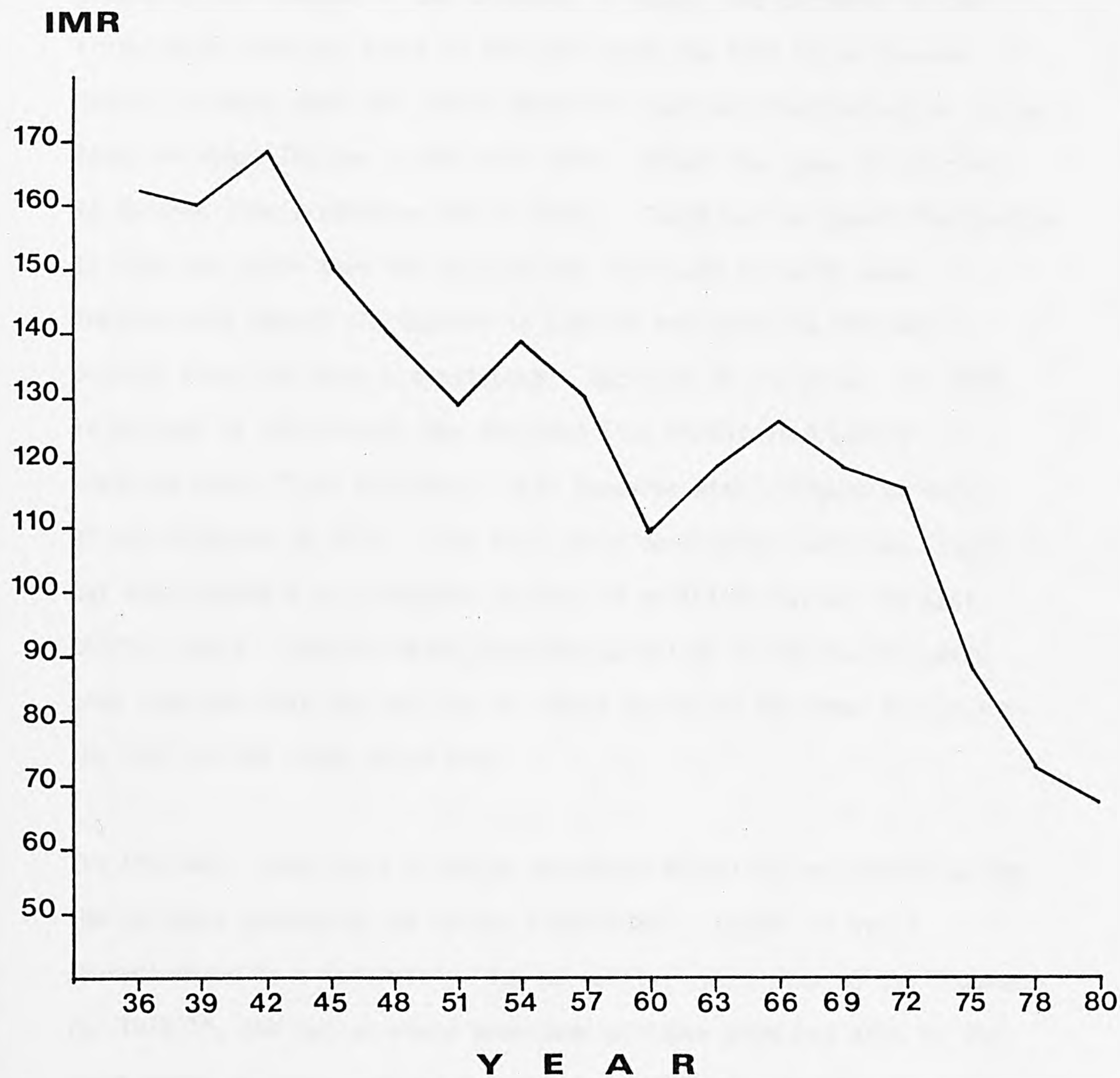


FIGURE 3.2
INFANT DEATH RATE IN EGYPT
1936 — 1980



The crude death rate per thousand in Egypt fluctuated between 31 and 25 through the period between 1910 and 1944 and it reached its highest peak in 1918 (31%) due to the influenza epidemic. After 1920 the rate was lower for a time but then an upward trend intervened during the period 1930 to 1941 due to Malaria and Typhus (Khalifa, 1981). Table 3.1 shows the crude and infant death rates throughout the period between 1933 and 1980. Since 1946 the crude death rate has declined gradually and reached 11 per thousand in 1980. The decrease in the crude death rate was about 50 per cent over the last three decades. Table 3.1 shows that the infant mortality rate was fluctuating at a high level of about 160 per 1,000 until 1943. After that year it started to decline slowly reaching 130 in 1950. There was an upward fluctuation in 1953 but since then the decline has continued but with some considerable upward fluctuation in 1962-63 and again in 1966-68. Overall there has been a considerable decrease in the rate. In 1966 an average of 127 infants per thousand live births died before reaching their first birthday. This compares with a figure of only 87 per thousand in 1978. Like most other developing countries, Egypt has experienced a considerable decline in mortality during the past thirty years. Studies about Egyptian mortality in the recent years have reported that the decline in infant mortality has been faster than the fall in the crude death rate.

The EFS, 1983, shows that although childhood mortality was halved during the 30 years preceding the survey (1950-1980), Egypt is still characterized by a moderately high mortality. According to the figures for 1975-79, one out of every seventeen children born had died in the first month of life; nearly one in seven during the first year; and, one in five of all children born had died before reaching the age of 5 years.

Even among those who survived infancy one out of fifteen children were estimated to have died during their next four years of life. Contrary to general expectation, the chances of survival are slightly lower among girls than among boys (but this could be due to the under-registration of girl deaths in a civilisation where girls count less than boys).

Vaidyanathan and El Baradie, 1982, in their study of demographic effects of mortality decline in Egypt concluded that the central death rate for children under age 5, declined from 128.4 in 1936 to 83.6 in 1947 and to 45 in 1970 for males and from 111.7 in 1936 to 73.5 in 1947 and to 53.5 in 1970 for females. Males tended to contribute more than females to the reduction of mortality for both sexes combined (62.9 per cent for males and 37.1 per cent for females). The improvement in expectancy of life at birth was larger for males than for females. The average annual number of years gained was 0.58 for males and 0.49 for females during the period 1937-1947, and was 0.37 for males and 0.24 for females during the period 1947-1966. The age which befitted most from mortality decline were those of childhood (0-14) among both males and females (the increase in expectation was .62 years for males and .42 years for females). The least benefit was in the age groups 60-74 for males (the increase was only 0.31 years and at age group 15-29 for females (the increase was .18 years). The largest relative increase in mortality decline was at age 15-29 for both males and females (0.60 years for males and 0.48 years for females). This means that it was relatively easier to save lives in this age span than in others. The least relative increase was in the higher ages 60-74 for both males and females (0.08 years for males and 0.10 years for females).

Shanawanay, 1983, in her study about child survival and development efforts in Egypt, concluded that the estimated crude death rate in Egypt in 1940 was 27.2 per 1,000 population, but with the health programme intervention initiated since the forties, the rate dropped to an estimated 16.5 by 1966 and since that time has decreased gradually to reach 12.6 by 1976. Regarding age distribution of total deaths, infant deaths (below 1 year) accounted for 32.9% of the total deaths in 1966, against a figure of 27.2 in 1976. Deaths in the 1-4 years group constituted 26.61 of the total in 1966, against 16.9 in 1976. Together, deaths among those under five years accounted for 44.1% of total deaths in 1976, compared with 3.8% for the 5-14 age group and 9.4% for those aged 15-44, while those 45-64 years represented about 14.8% of the total and those in the age group 65 and over represented 27.8%

Neo-natal mortality underwent a sharp decline during the period 1966-1976, from 23.7 deaths per thousand live births in 1966 to 14.9 in 1976 and accounted for 18.6% and 17% of infant deaths respectively. A breakdown of neo-natal deaths by age in 1976 reveals that 39.8% of the deaths occurred during the first week of life and another 29.1% during the second week, indicating the extreme importance of immediate post-natal care during this period. The neo-natal rates for rural areas was less than half the rate for urban areas. The post-neo-natal rates for rural areas were again lower than the corresponding rates for urban areas but the magnitude of the difference was more acceptable. The obvious implication is that deaths of infants less than one month are grossly under registered in rural areas. Shanawanay, also found that the death rate for females was higher than for males in the 1 to 4 age groups (19.1 and 15.6 respectively). This is believed to be the result of differential child care, health care and nutrition provided during this period stemming from the extreme importance placed upon the bearing and survival of sons in Egyptian society. An analysis of the child death rate by rural urban distribution in 1976 indicated higher rates in rural areas. The rates for the 1 to 4 age group was 20.5 per thousand for the rural sector, compared with only 12.3 for the urban sector. The trend towards higher mortality rates for the younger age groups in rural areas is associated with a number of factors, including inadequate environmental conditions, low health knowledge and awareness, and unavailability or inaccessibility of health services in the more remote rural areas. The leading cause of death for 1 to 4 years age group was gastro-intestinal diseases, accounting for 53 per cent of the deaths in that age group, followed by respiratory infections which account for another 35 per cent.

Eid and Casterline, 1983, in their study of differentials in infant and child mortality in Egypt concluded that sex differentials in infant and child mortality were found in many societies. Male mortality was normally higher than female mortality through infancy and childhood, apparently due to biological factors, but where the status of males is high relatively to females, the differential may disappear or be reversed. In Egypt such a reversal occurs after infancy. The Egyptian Fertility Survey (1983) report, maintained that the child mortality pattern was characterized by higher female than male child mortality. Other estimates of the Census 1976 data at the governorate level indicated that female deaths exceeded male deaths beyond age 2 years.

Children born in Egypt have a high mortality rate in the early years of life mainly in neo-natal mortality which is influenced by biological factors and post-neo-natal infant mortality which is largely affected by social customs such as the age pattern of childbearing, mother's methods of feeding and lack of adequate antenatal and post-natal care. The high mortality rate in the early days of life, particularly in the first week after birth may be related to mother's age, parity, period of gestation, birth weight and sex of the child.

3.3 Causes of high Mortality

The causes of infant/child mortality vary quite considerably in the early and the later periods of the first few years of life. These causes can have either a direct or indirect effect on mortality. The direct causes of infant/child mortality today do not yield easily to direct medical action. Malnutrition, diarrhoea and respiratory diseases cannot be controlled by vaccination or by eliminating a specific vector of infection. Rather they are functions of social and environmental conditions that must be addressed as a part of a larger process of development, and development in this context is not just a reflection of economic activity but also as a measure of benefit to general well-being.

The death of children is not necessarily accidental but rather is likely to be the result of parental behaviour. Infant/child mortality rates are not completely explained by biological or environmental factors beyond parental control. It is suggested by previous studies that sometimes mortality occurs when an infant is relatively unwanted whether because of its high birth order, close spacing, number of living children already in the family or the sex composition of the family in relation to that child's sex and to sex preferences for children, or occasionally because the infant is "difficult" or physically unattractive, or otherwise less acceptable. This mortality is most of the time brought about by unconscious behaviour that reflects a family's or culture's attitude to population or its way of regulating family size, where the control of the number of pregnancies is complicated. Thus, families who find themselves with more children than they want would let excess infants die off.

The cause of high mortality in Egypt can be summarized into four groups of direct effects:

1. Infections and infestations which may affect the majority of children who die before they are a year old or during the first five years of life. Often they are born with a condition that kills them like a physical immaturity, congenital deformity, genetic diseases, or a birth injury. The children of deprivation have a larger share of these problems but the impact of these handicaps is swamped by a tidal wave of malnutrition and infection. Maternal infection during pregnancy is believed to contribute to low birth weight and neo-natal mortality. During the first five years of life, a child will inevitably experience many respiratory or gastro-intestinal infections. These infections are major causes of child mortality (Chen, 1983) and have shown interaction

with malnutrition (Newland, 1981). Kohli et al, 1983, studying infant and child mortality in Kuwait concluded that infections and parasitic diseases of the respiratory system and congenital malformation and diseases of early infancy were the major causes of 85% of infant deaths in the first year of life.

Shanawany, 1983 showed that over 50 per cent of neo-natal (less than a month) deaths were attributable to low birth weight while diarrhoeal disease and respiratory infections contributed another 16 per cent and 11 per cent respectively, followed by congenital diseases accounting for 7.5 per cent of neo-natal deaths. The reoccurrence of diarrhoea is associated with shortage of clean water infrequent washing of hands, unsafe sanitation and the lack of health education. Diseases like measles, diphtheria, tetanus, whooping cough, poliomyelitis and tuberculosis are estimated to kill five million children a year in the developing countries and account for approximately one-third of all child deaths. In Egypt measles indirectly is still considered a major contributor of infant mortality. (It should be understood that it is not measles but the secondary infection that it admits that actually kills. And it is low nutrition that facilitates this admission).

2. Parental factors which include mother's age and parity, the interval between births and maternal nutritional status. These factors affect the mother's biological resources for providing adequate nutrition to the foetus during pregnancy and to the infant during breastfeeding, and may also affect the quality and intensity of child care throughout the maturation process. A considerable proportion of neo-natal, post-neo-natal and early childhood deaths arises in conjunction with the characteristics not only of a child (its age and sex) but also of the mother. It is known from the statistics of the developed countries, that children born to very young mothers and mothers over the age of 35 years are more likely to die in infancy. The World Fertility Survey's results support this finding for the developing countries. Gupta and Rao, 1976 in their study of child loss experienced in rural areas concluded that the mean number of deceased children increased with age and parity. Arora, 1980, studying infant mortality and family planning in India revealed that mortality takes a "U" shaped curve with age and parity indicating that the chances of infant mortality are higher in the extreme age groups and extreme parities. Earlier and later age groups

and parities are exposed to maximum risk. One way to reduce such infant deaths is to identify high risk pregnancies particularly earlier and later ones and to provide the necessary health and medical facilities in good time. Decline in post-neo-natal mortality is indicative of improvement in health condition. Devi, 1978, studied the effects of perception of infant mortality on actual family size. She found that women who started childbearing while in their teens or prolonged it to their mid-thirties increased the chance that their children would die in infancy. Pregnancy and childbirth were safest for both mother and child when the mother was in her twenties.

Edmonston, 1983 studying demographic and maternal correlates of infant and child mortality in Bangladesh showed that there was an association between mother's age and parity and mortality, but that prior birth interval emerges as the strongest predictor of mortality risk. It appears that part of the mortality risk of mother's age and parity actually stems from association with shorter prior birth interval. Mother's age is an important variable since in the Bangladeshi population where childbearing begins at a young age, higher mortality is expected for children of young mothers, declining with mother's age and increasing again for older women. Children born following a short interval since the previous birth are at high mortality risk and since this risk persists for the first two years of life, concern for these children cannot be relaxed immediately after birth. There are several explanations for the adverse influence of short birth intervals on infant death. The mother may not have fully recovered her maternal nutritional resources, metabolic balance or muscular or circulatory efficiency. The child may be born prematurely, or of a normal gestational age but of low birth weight and more susceptible to a variety of mortality risks, including infectious diseases and other environmental hazards. Children born shortly after each other are more likely to suffer from sibling competition for food, maternal care and scarce family resources important to infant health. Clearly, intervention is desirable to encourage longer birth intervals.

Chen, 1983, reveals that childbearing at very young ages, (under 17) and very old ages (over 35) enhances mortality risk. Similarly, parity appears to affect childhood mortality. The risk associated with first birth is high declining during the second and third births, and usually rising monotonically thereafter.

Although most studies emphasize the effects of age and parity on perinatal and infant mortality, age and parity effects have been observed during the second year of life as well. Indirect evidence suggests that children at highest risk are those of young, high-parity mothers who would also have experienced shorter birth intervals. There may be correlations between the length of the preceding and succeeding intervals, some women may be biologically and socially more likely to have brief intervals between all births.

The deleterious effects of rapid childbearing on infant and early child survival chances have been the subject of study for a long time. A mother with repeated pregnancies and, especially short birth intervals does not have enough time to regain her strength, both physically and nutritionally and she will be exposed to have pregnancy losses and lower birth weight babies which leads to poorer survival chances even into early childhood. Being small at birth decreases chances of immediate survival and also leads to lower average size and weight at higher ages. Lower weight children seem no more likely to catch infections but are more vulnerable to prolonged infection with consequent greater weight loss and greater chance of death.

Another impact of short birth interval is called competition. Larger numbers of children require feeding and old siblings may take precedence in access to the limited available food supplies, or all may be at higher risk due to sharing out too meagre resources. This effect appears when there is a rapid subsequent pregnancy, which often induces too early weaning, with consequent deleterious effects on survival of the preceding child.

Leridon and Cantrelle, 1971, showed substantial increases in mortality in Senegal when the mother was pregnant at the time of weaning, with specific duration of age at weaning. Eid and Casterline, 1983 studied mortality trends in Egypt using the Egyptian Fertility Survey data, they concluded that closely spaced births depleted the strength of the mother and could lead to low birth weight children, which were more susceptible to disease and infection. Moreover, closely-spaced children competed for the same limited household resources, including food, clothing and parental attention.

Scrimshaw, 1978, Hobcraft et al 1983, drew attention to both maternal depletion and competition that undoubtedly act in almost all societies, and moreover, to the possibilities of volitional neglect or infanticide as a direct response to accidental repeated childbearing.

Another indirect association between child-spacing and infant/child mortality was income which was likely to be related directly to nutritional provision within a family and may also be negatively associated with rapidity of childbearing. Other socio-economic attributes of the parents, especially of the mother, may have both direct influences on child care practice and on living standards, while being negatively associated with close child-spacing.

Swenson, 1978, studied early childhood survivorship related to subsequent pregnancy spacing and concluded that child mortality was significantly higher among children whose birth was followed by another pregnancy in less than 12 months compared with those whose birth was followed by another pregnancy in more than 12 months. This relationship is apparent when the second pregnancy of the interval results in live or a non-live birth. These results suggest that a second closely spaced pregnancy adversely affects the older child even when the second pregnancy does not terminate as a live birth which competes for breast milk and other maternal attention. The period of competition from the second closely spaced pregnancy does not appear to have a significant affect on the survivorship of the older child. However, children followed by a short interval and a live birth have a higher mortality than children followed by a short interval and a non-live birth.

Knodel, 1968, studying infant mortality and fertility in three Bavarian villages showed that the risk of dying before age one declined sharply as the length of the previous birth interval increased, provided that the preceding child survived to the end of the interval. If the previous infant does not survive, the relationship did not hold. When the preceding child was older, i.e. the birth interval was longer, the mother did not need to give as much attention to it and was able to give greater care to the newborn infant, thus enhancing its chances for survival. Where the preceding child died before the following birth, two infants would not be present at the same time to compete for their mother's care and thus the relationship no longer held. It is not surprising that the overall infant mortality was higher for births following infant deaths than for births terminating after intervals during which the preceding infant survived, since it is likely that mortality risks among siblings are positively correlated.

Infant/child mortality can be a cause and a result of short birth interval. Infant death may abbreviate the birth interval which leads to high risk of mortality. Preston, 1978, showed that women with child mortality experience are more likely to experience briefer intervals because of the biological effect of infant death.

Trussell and Pebley, 1984, studied the potential impact of changes in fertility on infant, child and maternal mortality. They revealed that if childbearing were confined to the reproductive ages of 20-34 then infant and child mortality rates would fall by 5%. The elimination of fourth and higher order births would reduce infant/child mortality by about 8%. Universal adoption of an "ideal" spacing pattern in which all births subsequent to the first were spaced at least 2 years apart might reduce infant mortality by about 10% and child mortality by about 21%. Eid and Casterline, 1983, found that the infant mortality rate in Egypt could be reduced by as much as one-third if all birth intervals of less than two years were prevented.

Maternal nutritional status is associated with infant mortality risk, maternal infection, maternal initial pregnancy weight and weight gain during pregnancy and the length of the preceding interval may work as a determinant of infant mortality, since low birth weight itself is associated with reduced nutrient reserves for withstanding post-birth hazards.

3. Diet and feeding factors: the health of mothers and children can be greatly improved and the rate of infant

mortality reduced if the mother's diet during pregnancy and lactation is enhanced. Breastfeeding has an impact on infant mortality because mother's milk is healthier for the child than other foods. But breast milk alone cannot provide complete nutrition beyond 4-6 months, continuation of breastfeeding and the timeliness, adequacy and pattern of supplementation assume significance until the child is able to consume a regular diet. Breastfeeding is important to infant nutrition, its health, morbidity, mortality and to post-partum amenorrhoea which prolongs the birth interval. Innumeral studies show a clear association between artificial feeding and increased illness and death among the very young. An infant who is breastfed is provided with important immunities against infections as well as the essential nutrients, antiallergenic properties, psychological bonding (warmth and love) and the better hygiene a child receives through close attachment to the mother while the process of breastfeeding is taking place through the first few months of life. One of the advantages in the developing countries is that breast milk is cheaper and more sterilized. In addition the prolactin which breastfeeding releases in the mother's own body is also a natural contraceptive. It prevents several million conceptions every year, although it is an unreliable form of family planning but it is used in the majority of developing countries.

Infant mortality may have an impact on breastfeeding. The death of an infant will terminate breastfeeding which will affect the subsequent birth interval and perhaps induce genuine child spacing mortality effects. In most traditional rural societies extended breastfeeding is nearly universal. In Egypt, Eid and Casterline, 1983, found that roughly half of the births occurred at least two years after the previous birth, and almost one-quarter occurred at least three years later. A substantial proportion, however, followed the previous birth by less than 18 months (18 per cent).

Chen, 1983, showed that there had been an unfortunate trend in many urban areas of developing countries for poor mothers to abandon breastfeeding. This may have contributed to higher than necessary infant mortality rates. Comparative studies of infant mortality rates between fully breastfed and artificially fed infants have demonstrated markedly high mortality levels among the latter group.

4. Child care factors: particularly health care services availability and child care behaviour in response to illness. With the power of modern medical technology many common childhood diseases in developing countries can be successfully treated. Marriage at a younger age would render mothers biologically unprepared to bear and bring up a child.

The death of infants shortly after marriage does not provide women enough time to learn how to cope with the problems involved in child care. Mother's understanding of child care is a crucial factor in determining the level of infant and child mortality. Even in a poor family a mother who knows something of elementary hygiene can protect her child very much more than an ignorant mother. Many deaths are due to infectious diseases and malnutrition and may be either prevented by immunization or treated successfully with curative services by antibiotics and nutritional rehabilitation. This presupposes modern knowledge and medical technology which in medically poor societies is not available certainly not in remote villages in rural areas in Egypt. The knowledge has to be acquired through painful experience. Most of this knowledge will be taken from the ancestors which in most cases are presumably as ignorant as their daughters and this will result in more infant deaths until the mother acquires some knowledge about the rearing process. The development of medical technology and sanitary practices today renders assistance to those who have the means to seek scientific consultation in the case of child illness. This leads to indirect factors (socio-economic and environmental determinants) at the family, community and national levels that operate through proximate variables at the individual level.

Indirect determinants are parents' education, work and time demands for child care, economic level of the household conditions and cultural beliefs.

Maternal education has recently received increased attention because of its inverse relationship to childhood mortality. Chen, 1983, in a review of 24 cross-regional, cross-national and cross-individual studies has reported on the relationship between education (maternal and paternal) and childhood mortality, which was noted to be remarkably consistent. Maternal education, in particular, was found to be an extremely important determinant of child survival. This relationship was maintained even after controlling for income and several other variables. Somoza, 1980, concluded that infant mortality was higher among the children of women with lower education or who were illiterate. In the 25 countries included in a comparative study by Hobcraft et al, 1983, it was estimated that giving all mothers seven or more years of education would lower infant mortality by 41 per cent and child mortality by an average of 60 per cent other things being equal. Khalifa, 1976, studied the influence of wife's education on fertility in rural Egypt. He showed that there was an inverse relationship between the number of live births, pregnancy loss and infant mortality and mother's education.

Maternal education may be considered to be one of the social characteristics that affects mostly infant mortality and particularly post-neo-natal mortality. Mother's education is postulated to inculcate health knowledge, beliefs and practices which enable a mother to meet the challenges of a hazardous environment more successfully. It helps also the mother to improve the effectiveness of health behaviour like feeding practices and child care. It helps to change the mother's role within the family, enabling her to take the necessary measures to promote child health, including effective use of modern health services. Newland, 1981, mentions that Professor Caldwell reasons that education has an important impact on maternal capability on a mother's ability to do her job. It increases her skills, her knowledge, and her ability to deal with new ideas, especially those from outside her own culture. Better information about nutrition and hygiene can lead directly to prevention of some of the most common childhood diseases. An educated mother is also better able to judge the gravity of an illness, to understand the capabilities of modern medicine and therefore, to seek appropriate care for a sick child at the right time. She can see more clearly which traditional ways of caring for children are valuable and can be selective in applying them.

She is, in other words, more likely to intervene effectively when problems with a baby's health arise, and more likely to prevent them from materializing in the first place.

Family income may also be considered to be an indirect factor which affect the mortality rate. Income may improve family purchasing power and thus enhance the quality and quantity of maternal and child diet and it also leads to better housing, clothing and pure water and sanitation facilities which result in reducing the risk of infection as well as providing access to most effective use of health care services. In other words, poor families may not be able to provide their children with food of sufficient quantity and quality with uncrowded and well ventilated housing, with enough clean water to keep them healthy, or with medical help when they fall sick.

There are now several studies from different parts of the world that demonstrate conclusively the link between a mother's education and family income and the children's survival chances. Perhaps it is more significant that it is the poor households whose members are least likely to be educated and therefore to understand the origins and the prevention of the kinds of sickness to which their children most often fall prey. Many studies argue that ignorance is a more deadly foe of young children than poverty.

However, the two so often go together that it is difficult to separate their effects.

Another factor that is related to both income and education is the physical environment which surrounds the newborn and may jeopardize survival chances. It also heavily depends not only on parents economic and personal resources but also on their ability to cope with the challenges of seeing an infant through the first year. It is determined not only by their income but also by their knowledge of the resources available to them and their skills in using them. We are concerned with an environment which suffers from the hot climate shortage of water supply and poor sanitation and personal hygiene, and improper feeding practice and a low level of health knowledge and awareness of those factors which affect children and mothers' health. In such an environment an infant is constantly exposed to agents of infection especially when the baby begins to crawl around and explore its surroundings. One of the very few protections available to these babies is the breastfeeding that most of them have during their first several months of life or longer. When a child is exclusively breastfed, its exposure to contaminated foods and utensils is limited. Furthermore, a mother's milk contains antibodies that increase her child's resistance to infection.

In Egypt environmental factors play an important role with respect to child survival chances because of the inadequate supply of safe drinking water and the absence of proper sanitary and garbage disposal measures, together with poor personal and environmental hygiene practices; all these factors create ideal conditions for the breeding and transmission of various diseases. The majority of inhabitants in rural areas lack health care because sometimes there are no facilities or trained people within reach and no medical care before, during or after birth, because of the limited outreach capacity of the health delivery system which remains largely concentrated in the central village leaving peripheral areas and satellites with little or no coverage of services. Moreover, still in rural areas the majority of people believe in traditional treatment for most of the diseases and due to such beliefs and practices there is a common failure to identify and treat illness correctly and a corresponding under-utilization of health services which are often utilized as a last resort when all traditional methods have failed. The overall wealth of a village may have an effect on the quality of the diet, shelter, and clothing of its inhabitants. In Egypt, infant/child mortality is lowest in metropolitan areas, intermediate in other urban areas and highest in rural areas. These disparities in mortality levels may be a result of different characteristics associated with the standard of living, access to health facilities, knowledge, economic capacity for child care, social and physical environment.

The last and important factor that affects mortality (and can be affected by it) is the number of children a woman bears. The relationship between infant/child mortality and family size is a two-way relation but only the effect of mortality on fertility is considered here.

CHAPTER FOUR

FERTILITY RESPONSE TO INFANT AND CHILD MORTALITY IN EGYPT

Mortality is an inescapable dimension of human experience. Control of mortality has been one of mankind's most startling achievements in the quest to manipulate the environment to advantage. Much of the rapid growth in population since World War II in developing countries has been the consequence of rapid mortality decline and it has been asserted that this decline has been caused by modern medical and technological diffusion without changes in living standards. It is then likely that these specific changes will not result in the necessary pressures engendering fertility reduction.

It was argued that one of the explanations for high fertility in developing countries was the influence of high infant/child mortality. It has been explained that so long as parents do not expect most of their children to survive, it may be unreasonable to expect them to be interested in fertility reduction. Otherwise low fertility will lead to population decline and possibly extinction if the mortality rate is high. Experience with or fear of child mortality may lead parents to have additional children either to replace those who have already died or as insurance against expected deaths. Habakkuk, 1972, pointed out that fertility is high in poor, traditional societies because of high mortality. A high frequency of childbirth was necessary for the continuation and security of families and this found strong support in the prevailing values and customs.

Although an association between infant/child mortality and high fertility has been widely accepted, still the direct causal linkage through which a decline in child mortality contributes to reduce fertility is under challenge. It has been suggested that a reduction in child mortality may not necessarily lead to a reduction in fertility. A few historical studies have shown that fertility may fall before mortality. This does not mean that they are responding only to independant forces and that there is no linkage with mortality. It is difficult to predict factors influencing fertility reduction, because these factors will differ according to the developmental stage of the country, and it is difficult to explain the complex motivations which lead to or inhibit fertility reduction. Parents may or may not respond to the loss of their children by replacement or over-compensation. Replacement fully or partially or over-replacement may not be important in maintaining high levels of fertility. Taylor, Newman and Kelly, 1976, pointed out that a wide variety of indicators of higher fertility were associated with a similar variety of measures of experience and/or fear of child mortality. They also found that the ideal number of children was greater for couples with mortality experience and among those who expressed fear of child loss.

Population growth today derives from the unbalanced acceleration of a long transitional process from the high birth and death rates that characterized most of human history to the low birth and death rates that are now characterizing modern societies. Developing countries are going through the stage of disequilibrium between mortality and fertility. The great human achievement in medical sciences lowered mortality without, as yet, corresponding achievement of lowered fertility.

Therefore, the vast majority of the acceleration in world population growth during the twentieth century is attributable to mortality decline rather than to a rise in fertility.

The relationship between infant/child mortality and fertility has been for the last twenty years one of the topics of major concern in developing countries. Demographers consider it one of the most significant and controversial subjects. In a society where child/infant mortality is very high, it is quite understandable that couples will produce a large number of children in order to assure the survival of the number they consider ideal. Most studies have asserted that infant/child mortality and fertility are directly related whether on an individual or a societal level. Others may argue otherwise. But, the weight of scientific opinion seems to lie on the side of the view that reduction in child mortality does lead to a reduction in fertility. Infant mortality and fertility may show a parallel decline because of common antecedent conditions, evidence of the direct effect of infant mortality on fertility decline is therefore limited. As a consequence programmes aimed at reducing infant mortality cannot be expected to have an important impact on fertility. Recent evidence from countries where infant mortality is rapidly declining confirm this view. Figa, 1984, pointed out that in Guatemala, the effect of reduced infant mortality on fertility would require at least one generation. Coale, 1976, reported that, individual and aggregate evidence from a variety of low income countries indicated that the relationship between fertility and child mortality was positive and statistically highly significant in such varied environments and time-periods as Bangladesh, Puerto Rico, Taiwan, Chile and Philippines.

Parents are motivated to rear children to accrue benefits from their mature survival. Child mortality decreases the number of survivors and at the same time will increase the number of births required to obtain a survivor. If the family exhibits a tendency to reduce its completed fertility as the incidence of child mortality declines, this would constitute evidence of a tendency towards demographic stability within the family.

Although infant/child mortality is declining in the majority of developing countries, it is still at a high level. Parents conception of their children's chance of survival are based on observation of infant deaths in their communities. When more infants appear to be surviving, parents begin to realize they need not have so many children to achieve the desired number of children. When mortality rates are high it is therefore rational for families to optimize their number of children so that some may survive to adulthood.

With the rapid decline in child mortality in developing countries there is considerable interest in understanding its effect on fertility. This relationship has been studied for many years but often in an unspecific, ambiguous and mechanistic manner. It was only recently that specific paths have been outlined through which the impact of child mortality on fertility may be assumed to operate. The prevailing assumption is that high fertility is a necessary biological and behavioural response to high mortality. The demographic transitional theory has demonstrated the relationship between mortality and fertility. It states, in its simplest form, that mortality decline is eventually followed by fertility decline after a lag of time, as countries go through the process of economic development.

Thus, the time lag of fertility decline behind mortality decline that characterizes developing societies is attributed to slowness in depressing the proportion of women with child death experience as well as in changing the pattern of expectation. Such a delay produces the well-known demographic gap which results in higher fertility and declining mortality. Population continues to grow at a higher rate until mortality rate begins to reach a certain significant decline or a threshold that fertility will respond to it. Developed countries appear to have had prolonged periods during which the fall in death rates was not matched by a fall in birth rates. Easterlin, 1980, mentioned that a lag of fertility decline behind mortality decline was much more common among recently developing countries and had generated higher rates of natural increase than ever prevailed in the transition period for England, Japan or the Scandinavian countries. Across the interwar period British India experienced a rapid reduction in death rates without any downward trend in the birth rate. Recently, birth rates in India have begun to decline but the decline has not been large enough to halt the rise in the rate of natural increase. The same experience was shared by Egypt where birth rates failed to decline before the 1952 Revolution and have declined only slightly since. Cartwright, 1983, noted that the European transition data indicated that contrary to common belief, declines in infant and other mortality often did not precede declines in fertility. In many provinces fertility and mortality declined together without the postulated lag. The main findings of the European fertility study was that large changes in economic development were really necessary to increase motivation towards a small family. Easterlin noted that several low income rural populations (China, Kerala, India, areas of Indonesia, Sri Lanka and

Thailand) had experienced substantial fertility declines due to improvements in health and education for both boys and girls, in institutions providing food subsistence and in communication and transportation networks. Srivastava and Pandey, 1979, studying infant mortality and fertility, concluded that fertility and mortality are closely related, and infant mortality is one of the strongest and most consistent predictors of fertility level.

Preston, 1978 accepted that mortality reduction would lead to a fertility reduction but noted that the strength of the effects may differ. In Ceylon and Taiwan mortality reduction had not been accompanied by fertility reduction. Hassan, 1966, showed that a substantial decline in infant deaths is probably the most important prerequisite for a decrease in fertility.

The sudden drop in infant/child mortality in Egypt recently may increase the number of surviving children in the family. Gradually, when the family's experience of infant/child death is lessened, this will bring about a change in parents attitude towards their reproductive behaviour. There will be less demand for a large number of children, once it becomes obvious that medical and environmental changes have minimized the risk of child deaths and parents are no longer insecure. At the beginning when more children survive, parents are proud that they are able to raise so many sons and daughters. But with the shortage of resources, people may then begin to think that having so many children is a disadvantage and they start searching for means to limit their number of births.

The relationship between mortality and fertility is a two-way relationship. Mortality affects fertility and in its turn is affected by it. Some of their interactions are direct and some are indirect. It is worth noting that the interaction between them is a complicated one with a multitude of additional influences acting on each of the main variables and moreover, this relationship can be self-reinforcing with the influences operating in both directions. Both mortality and fertility are related to many socio-economic variables (background variables) which affect one or both simultaneously. The interaction between mortality and fertility on one hand and between them and other variables on the other hand are difficult to separate. Hence, mortality seems to affect fertility directly and indirectly through other variables. Thus, child mortality affects fertility directly through breastfeeding and birth intervals (biologically) and indirectly through the desired number of children, mother's perception of mortality and attitudes and knowledge about contraception (behavioural factors) and through socio-economic variables like parents' level of education, occupation and standard of living, etc. Hassan, 1971, studying the effects of religion and child mortality on fertility in Egypt, pointed out that if it is true that child deaths are an effect rather than a cause, one would expect couples who experience the loss of children at higher parity and after an elapse of a considerable period subsequent to marriage not to have a high rate of reproduction and there will be no reason to believe that high fertility is induced by the incidence of child mortality. Conversely, if couples experience child deaths at a lower parity and shortly after marriage, both time and motives permit a high rate of reproduction to make up for the actual or expected losses.

Such a rate varies in magnitude according to the intensity of emerging fear of childlessness. In other words, high fertility cannot be regarded as a cause of high child mortality while the reverse is undoubtedly true. Demographers have concluded that, because fertility plays an active part in establishing high or low infant mortality, consequently mortality must play a similar causal role in determining fertility. According to this theory, parents who expect a high number of their children to die, insure themselves against such losses by having more children than they would if they were confident that all would survive.

Shanawany, 1983, concludes that the total number of children that an Egyptian woman bears in her lifetime and the timing and spacing of her pregnancies have major impact on each of her children's chances of survival. Indeed, among all the factors that have an influence on infant mortality, fertility is one of the most important. In most populations, high fertility and high mortality go together, as do low fertility and low mortality.

Matthiessen and McCann, 1978, studying the role of mortality in the European fertility transition, mentioned that in the late nineteenth and early twentieth centuries within a time span of about two generations, the levels of fertility and mortality of the populations of Europe fell dramatically. The fact that the changes in fertility and mortality were both bracketed by the same relatively brief time span has inspired persisting speculation that the shifts are causally linked. The standard conjecture is that the decline in mortality generated or contributed to the fertility transition. One line of reasoning is that the decline in fertility is, at least in part, the result of a response of couples to the improving survival chances of their children, and the diffusion of birth control practices. Another theme stresses the implications for fertility of population pressure following a reduction in mortality. Lower mortality implies larger cohorts surviving to the adulthood and competing for scarce resources and for the means of support. People respond to this pressure by marrying later and limiting the number of children for whom they must care within marriage. It seems also to be true that if a reduction in fertility is strictly a consequence of increased child survivorship, then a decline in mortality should temporarily precede the decline in fertility. The amount of time required for the fertility consequences of any mortality reduction to be substantially realized should depend on the manner in which mortality influences fertility. If, for example the fertility decline is due largely to a reduction in those births intended by couples to replace infants and children lost to mortality, the bulk of the response might well occur within as little as two years. If the reduction in fertility is mainly a reaction of couples to the projected implications of improved survivorship for living or contemplated offspring, it would be reasonable to set a somewhat greater lag. This is because some time can be expected to elapse between the time that a reduction in mortality sets in and the time that its effects are appreciated among members of the population generally.

Rutstein and Medica, 1978, analysed data from four surveys of rural and semi-urban populations of Colombia, Costa Rica, Mexico and Peru. They found that parity progression ratios were scarcely affected by the number of previous child deaths. Bulakrishnan, 1978, re-analysed the same data sets, using as a dependent variable the mean number of subsequent births to women who had attained a certain parity. He found that at the third attained parity, the prior loss of one child compared with the prior loss of no children seemed to have some effect in Costa Rica, where the practice of contraception was most prevalent.

Chowdhury, Khan and Chen, 1976 studying the relationship between mortality and fertility in Pakistan and Bangladesh, showed that a consistently positive relationship was demonstrated between the number of children ever born and the number of child deaths. They found that women with child mortality experience are more likely to experience briefer intervals between births because of the biological effect of infant death. They also concluded that elimination of infant mortality in Bangladesh would reduce fertility by prolonging the average period of post-partum sterility.

Heer, 1983, studying the relationship between infant/child mortality and the demand for children reveals that the number of previous child deaths to a married couple will be positively associated with that couple's demand for subsequent births and this association is stronger at lower than at higher parities and it also depends on the sex composition of existing children. Nevertheless, for all women the number of surviving children demanded will be inversely associated with the number of previous child deaths. Moreover, he finds that the magnitude of the perceived level of child survival in the community will be negatively associated with the demand for surviving children.

Studies about the relationship between infant/child mortality and fertility distinguish between three kinds of experience of child mortality; a couple's response to the death of a child of their own, community wide response to infant/child mortality and societal experience. A couple's response will affect their fertility directly through biological or behavioural effects. Community experience of child loss is that which reaches the couple by knowledge of child deaths that have occurred among family, friends, neighbours or the community in general or knowledge or feeling about the child mortality level in the community or local areas. Societal experience would operate indirectly through social customs, a collection of beliefs and practices, certain norms, values that exist in the society to ensure that the community fertility level is brought into some sort of balance with the community level of child mortality, through early marriage, family size, sex preference and family planning. For example, when child mortality declines the gap between family size and family size, norms will increase. This may lead to too many surviving children under the given socio-economic conditions and this will lead to some sort of strain on the family resources. These strains will be relieved through a corresponding decline in the reproductive norms, that may affect the intermediate variables leading to a decline in actual fertility. Several studies have reported that a woman's experience of child mortality has considerable influence on her completed family size. Improvements in health conditions and the consequent reduction in infant/child mortality can therefore result in a decline in fertility. Also an awareness among the public about these changes appears to be a pre-condition for lowering fertility, for, if couples are not aware of the improvements in health conditions leading to a reduction in child mortality, they may not readily take to fertility preventive measures even after achieving the desired number of children because of the lingering fear of losing one or more of their children.

Suchindran and Adlakha, 1984, studying the effect of infant mortality on subsequent fertility of women in Jordan, conclude that infant mortality has a statistically significant effect on women's reproductive behaviour. The loss of an infant shortens the length of a succeeding birth interval and, at higher parities, women with infant loss are more likely to go on to have an additional birth.

Saksena and Srivastava, 1984, also conclude that parents who see around them many child deaths and expect a high proportion of their children to die, ensure their family survival by having more children than they would if all the children planned had a good chance of survival. In India and similar developing countries there is evidence of a strong inter-relationship between fertility and child mortality.

Hassan, 1966, concludes that couples who receive their mortality experience shortly after marriage are induced more than others to reproduce generously in order to compensate for the loss and safeguard against expected deaths. Such a painful experience colours their attitudes throughout the reproductive period until they are guaranteed at least the desired number of children. This actually happens when three or four children pass the hazardous period which corresponds to 10-14 years of marriage. By this time an additional one or two children are born to safeguard against the expected loss of the preceding older ones which may not occur. He also showed that fertility is most sensitive to whatever causes might bring changes in child mortality. Hassan, 1971 mentioned that rapid fertility decline can be assured by drastic control on causes of infant/child mortality through extensive as well as intensive application of medical technology rather than waiting until such a control is brought into effect by the slow and long process of socio-economic transformation which may be hard for many countries to generate. He finds that irrespective of religion or socio-economic characteristics, differences in the actual experience with, or the expectation of child deaths, whether between or among social classes, are the fundamental motivating forces that influence attitudes towards reproduction and consequently effective use of contraceptives. He also shows that Moslem and Christian women in each educational group, who were married at the same age and had the same duration of marriage, have produced at least four different cumulative fertility rates according to the number of child deaths experienced.

Several investigators have reported that lower regional death rates are correlated with lower levels of fertility or that the decline of the death rate when lagged several years has substantial negative correlation with the birth rate. Their studies have been conducted at both the macro level and the micro level. One difficulty with these macro-studies, however, is an inability to isolate the effect of mortality on fertility from other confounding variables. Correlations of these two variables between regions or communities could be attributed to the well documented reverse effects of high fertility on mortality. Therefore, it is better to focus on the micro level, studying the differential fertility of individual couples according to child mortality experience.

Commonly employing retrospective pregnancy histories, several researchers in Egypt, Turkey, India and Taiwan have detected higher fertility among women with previous child deaths in comparison with women with no child death experiences.

Sarah Loza, 1982, concludes that in Egypt the actual experience of losing infants or children or the threat of losing them often motivates families to reproduce a large number of children. Thus, it can be said that infant mortality is positively related to fertility. Women who experience no child loss have lower average number of children ever born. In Cairo, according to 1976 census, illiterate women with no child loss had smaller completed family sizes on the average than college graduates who had experienced child loss. Data from an isolated village indicated that infant and child mortality had the strongest influence on fertility.

Although in a country like Egypt of high mortality, parents will view high fertility as necessary to compensate for child deaths, eventually a reduction in child mortality may reduce the fertility required for replacement purposes. But for the present, the death of an infant will motivate parents to have another child although there is no certainty that it will survive.

The micro-level relationship between child mortality and fertility indicates that mortality affects fertility through different paths:

4.1 The physiological or biological mechanism which operates through the effect of breastfeeding on post-partum infertility which in its turn affects intervals between births.

This effect will be most pronounced in breastfeeding populations where the fate of an infant influences the length of the birth interval, either by the shortening or lengthening of lactation which inhibits conception through the prolonging of post-partum amenorrhoea. The suckling child stimulates production of the hormone prolactin, which thereby prolongs the anovulatory period. This process is related to suckling frequency and intensity, and thus it is the period of full breastfeeding unsupplemented with other liquids or with solid food, that provides the best approximation to the period of lactational amenorrhoea. A mother whose child is deceased soon after birth, will sooner give birth to another than a mother who nurses and rears her live born child. Thus, lactation inhibits conception through prolonging post-partum amenorrhoea. The death of an infant will interrupt lactation and allow ovulation to be resumed sooner and in the absence of contraception, will result in an earlier subsequent pregnancy. High levels of fertility usually mean larger and more closely spaced families, which increase the risk of mortality for both the mother and her child.

4.2 The volitional or behavioural mechanism which operates through parents' motivation to compensate or not for the deceased child. Parents wish to raise a certain number of children and therefore when they already have this number of living children they no longer so actively want to enlarge the family as when the desired number has not been reached especially when this is due to the loss of infants shortly after birth, couples continue to produce children, replacing those who die young, until they reach some number of surviving progeny they consider to be sufficient.

This type of response to child mortality takes two forms:

A. The replacement effect which is a behavioural mechanism and a sequential response resulting in additional births to make up for actual child loss. The replacement effect presumes some form of deliberate fertility control causing couples to cease childbearing after attaining the number of surviving children they consider to be sufficient. There is a difference between the replacement effect and replacement strategy, the former is defined in a broader sense which includes all fertility responses, voluntary and involuntary to child mortality while the latter refers to the deliberate replacement of children who have died. For example parents intend to have x children alive at the end of their reproductive period. They first attempt to bear x children. If any die before the end of reproduction, they attempt to have a replacement birth. If one of the replacement births die, they attempt to replace it. They practice contraception whenever they have x living children within the reproductive period. In the absence of deliberate limitation of family size there could be no replacement effect since childbearing would continue until the couple was no longer physiologically capable of production, regardless of their experience with child mortality. While child mortality may also influence the deliberate spacing of births, a replacement strategy is ultimately directed towards the final <u>number</u> of surviving children.

It can be argued that there is no complete replacement effect (i.e. one to one), since on average, an additional child death in the family leads to far less than one additional birth. Preston, 1978, mentions that replacement is said to be complete when one additional child death in the family prior to the end of the parents' reproductive life induces one

one additional birth. Families in which a child death results in an additional birth are said to have replaced the dead child. A replacement strategy is one that would attempt to secure the same number of surviving children at the end of the reproduction span regardless of the incidence of child death. If the replacement strategy is perfectly successful then the replacement measures will be unity. Thus, the replacement effect is never likely to be complete because complete replacement would imply, among other things, perfect family planning, fixed reproductive goals, no subfecundity and no other factors which may interfere with reproduction. Such conditions may be considered to be unrealistic in any society. Replacement may not be complete because there may not be a target number of surviving children; the target may be so high that fertility could not possibly be any higher; the target may be framed in terms of one sex only in which case the death of a child of the other sex is basically immaterial and it will not be replaced. The couple may have fecundity problems or if the control over fertility is imperfect; if the unwanted child died no attempt would be made to replace it; the child death may result in a downward modification of ideal family size. Parents as a result of their bad experience may recoil from the prospect of exposing themselves again to the risk; or the child death may be anticipated and protected by insurance strategies of over production.

B. The insurance (or hoarding) effect operates in anticipation of prospective high child mortality rather than a reaction to actual child mortality in the family. Hoarding is considered as an effort by a couple to bear more children because they anticipate that some children will die in the future.

For example, parents intend to have x children alive at some point in the future. They are aware that some of their children may die before that point but beyond the stage where they are physiologically able to replace them. Therefore, they attempt to bear more than x children even if none die, as a form of insurance against subsequent deaths. They practice contraception only when they are 'reasonably' sure that the target will be achieved or when falling short of target is in some sense less costly than exceeding it. These anticipated future deaths will then bring the couple's family size closer to the desired level. Swenson, 1981, concluded that the insurance effect is the setting of high family size targets as a partial assurance against the loss of children. This effect assumes that couples have some awareness of the community level of child mortality independent of their own experience and adjust their fertility with these risks in mind. Some studies conclude that a hoarding response can be defined as any extension of the period of exposure to the possibility of birth with a rise in the level of mortality. Another form of hoarding response becomes possible when contraception, sterilization or abortion can be used as birth control. These practices can be initiated as soon as the desired number of surviving children has been attained, or the couple can have additional children on the chance that some of the existing ones will not survive. If sterilization is the only means of birth control, it is impossible to replace any children who might subsequently die. On the other hand, when either contraception or abortion is the means of birth control, sequential response (replacement) to future child death is always possible up to the time of menopause or sterility from natural cause.

These studies point out that under conditions of perfectly effective birth control, at each given level of mortality, the total fertility rate and the intrinsic rate of natural increase will vary inversely with the degree of prevalence of a sequential (replacement) rather than a hoarding response to child death. Heer and Smith, 1968, Heer and Wu, 1978, showed that parents hoarded sons so they could be 95 per cent certain that at least one son would survive to the father's sixty-fifth birthday. They also emphasized the possible importance of the perceived level of child survival irrespective of prior child loss. Ben-Porath, 1980, O'Hara, 1972, point out that a hoarding response is a less efficient reaction to any given level of child survival than a sequential response, since the latter minimizes childbearing costs. Obviously if an equally satisfactory but reversible means of birth control were available, couples could do less hoarding and make more use of sequential response (replacement).

Therefore, the presence of an insurance effect could also complicate the extent of replacement behaviour since where a child death has been anticipated in advance and protected against, no effort at replacement would be made. Olsen, 1980 has pointed out, however, that an insurance strategy can be made far more efficient when combined with a replacement strategy.

In traditional societies with high mortality and large family size, the insurance demographic effect is high, since high rates of child mortality may result in deaths when the couples are not capable biologically to produce more births or they are older and less able to adjust their subsequent fertility to deaths.

In response, couples may produce additional children in anticipation of some deaths. Olsen, 1980 showed that if hoarding is the only response to higher mortality rates there will be no direct connection between an additional child death in the family and additional fertility even though replacement-type behaviour exists. While pure hoarding may be a possible response to mortality, modest direct replacement behaviour can substantially improve a couple's ability to approach or achieve its desired fertility.

4.3 Comparison Between Replacement and Insurance

The key distinction is between a passive adoptive strategy of replacement and an active anticipatory strategy of insurance. The distinction between replacement and insurance is important for at least two reasons:

1. Quantitatively, the effect on fertility of hoarding in order to achieve a given target is greater than that of replacement.

2. Replacement is a quick response, and it is natural to expect replacement to generate a close, short lagged association between fertility and child mortality.

Both are micro level fertility behaviour responses. But insurance based as it is on expectation may respond sluggishly to child mortality reduction depending on the speed at which the expected mortality is reduced as actual mortality changes. It is motivated by a perception of mortality levels that prevail in the community and family size norms which prevail in the community. Replacement is motivated by the personal experience of child mortality. In societies where mortality rates are high and family size norms are large the insurance effect will be high and its effect will decline in response to a shift to lower child mortality and lower family size norms. In modern societies, the insurance effect may be assumed to be relatively unimportant. In transitional societies where mortality is declining but family size norms are still high the demographic impact of insurance is intermediate and the physiological effect may be expected to have an important demographic impact too. The replacement effect has a demographic impact of low intensity. It only has a meaning in a contraceptive society, i.e. in a modernized society where mortality rates are low and family size norms are low too. Hoarding and replacement are substitutes. If families have learned to expect high mortality and respond to it by hoarding, fertility should not respond strongly to actual mortality. Friedlander, 1977, points out that the insurance effect is likely to be of significance mainly under conditions of high mortality and high family size norms, i.e. in the non-modernized societies. It follows that these two effects are unlikely to have a significant demographic impact simultaneously. The insurance effect is considered to be the most difficult to estimate because it requires appropriate fertility data in communities with variation in mortality levels, controlled by the number of living children, breastfeeding, family size norms, socio-economic, health and nutritional characteristics - all these to prevent other factors from affecting the insurance effect. The problem as Friedlander, 1977, points out is that data with variations in mortality levels while all other societal characteristics are kept constant may not exist at all. He concludes that the insurance effect, despite its importance may have to be considered as a theoretical concept that is impossible to measure. He argued that the physiological effect is the only effect to be measurable and demographically significant. But the replacement effect can be estimated from family reproductive and survival histories and the desired number of children too. Rutstein et al, 1978, pointed out that the relative importance of replacement versus insurance strategies will depend on the age to which parents target the survival of their children. The higher that age, the more the insurance strategies should dominate replacement. Countries where the primary functions of offspring are to support parents in their older years (especially sons) should show stronger relative insurance effects at the same level of mortality than countries where parents are more interested in children qua children. Hoarding may have its larger affect on age at marriage.

There are some other impacts of mortality on fertility such as societal responses to change in child mortality which operate indirectly through social customs to ensure that the community's fertility level is brought into some sort of balance with the community level of general mortality including child mortality. Such customs might govern age at marriage or breastfeeding practices in ways totally independent of an individual couple's fertility intentions. Indeed, there need be no general recognition among the population of the connection between these social customs and their consequences. This affect cannot be adequately examined by individual data. Unfortunately, this effect could not be studied here.

Infant/child mortality is one of the intervening variables between fertility and family planning acceptance. The decision for accepting a family planning method depends more on the number of children surviving rather than on the children born. Also, it seems logical to expect that if a child does not survive, women would go ahead and have another child to make up for the loss. The cycle is a vicious one, namely maternal neglect leading to higher levels of infant malnutrition morbidity/mortality and this in turn, leads to over-compensation for child loss. Mother's carelessness is considered by some researchers as another path for mortality to affect fertility. In a country like Egypt contraceptive use is still low and the majority of women use breastfeeding as a contraceptive method. In that case it can be said that the physiological effect dominates the relationship between mortality and fertility in Egypt. Thus, on the one hand, if a child survives and is breastfed by the mother, then during the period of lactation, the mother's fecundity is greatly reduced and her chance of conceiving a second child is low. Conversely if a child dies, the mother ceases breastfeeding and high fecundity soon returns and her chance of having an early conception is increased. Therefore, breastfeeding will affect the interval between births. A death of a child will shorten the interval between births, and short birth interval has a deleterious effect on both the mother's and the child's health. A short birth interval has a harmful effect on both the previous and the subsequent child. Moreover, it may lead to a high risk of infant mortality, because of a low weight birth, competition for limited resources and parent's care, early cessation of breastfeeding as a result of a sudden conception and expose the child to high risk of mortality.

This study will concentrate on the analysis of the physiological effect such as breastfeeding (its duration) and how infant mortality may affect breastfeeding and at the same time can be affected by it, and the effect of some socio-economic variables on this relationship (mortality and breastfeeding), birth intervals (subsequent and previous) and their effect on infant/child mortality, and how breastfeeding may affect the length of birth interval and the survival or death of the index child. Eventually, there is an attempt to study the replacement effect too. Furthermore, it will explain briefly the impact of infant/child mortality on subsequent fertility and desired number of children. A woman's desire for additional births seems to be influenced, to some extent, by the number of their living children. In an environment where infant/child mortality rates are high, couples may wish to have extra births in the expectation that some children will die and it may be shown that a preference for sons has some effect on subsequent fertility. In Egypt it may appear that couples strongly desire to have at least one son alive during their old age. This may result from a desire to carry on the family name and property, to receive economic and emotional support at old age, and to receive a helping hand on the farm as well as at home. Couples will not wish to limit their family size until they have some assurance that the children they already have will survive.

P A R T   T W O

CHAPTER FIVE

METHODOLOGY

5.1 Introduction

The relationship between infant/child mortality and fertility is a controversial issue which has aroused intense interest not only in the field of demography but also in medicine. Mortality and fertility are the two determinants of the rate of population growth (in the absence of migration). What is happening now in Egypt is that mortality is declining and fertility is still at its highest level. This situation creates a high rate of population growth amounting to 3 per cent. Child mortality and fertility can affect each other directly or indirectly through different mechanisms. Child mortality can affect fertility in two ways:

1. The biological mechanism which operates through post-partum infertility. A death of a child may interrupt lactation, which will lead to a rapid return of ovulation and this in its turn, will shorten the interval between births.

2. The behavioural mechanism which operates through the individual experience of child mortality (individual effect) or the anticipation of mortality from the level of mortality that prevails in society (the Societal effect). These effects (individual and societal) will motivate parents to compensate for the dead child by replacing

it or by producing a larger number of children than the desired family size in anticipation of expected deaths in the future. In this way the parents ensure that at least a sufficient number of children (especially sons) will survive to support them in their old age.

5.2 Plan of Analysis

In order to shed light on the relationship between infant/child mortality and fertility the analysis will deal with both behavioural and biological effects.

First: The Behavioural Effect: it is assumed that individual experience of child mortality may:

1. induce parents to increase their subsequent fertility;
2. affect the parents' desired number of children;
3. affect the mother's decision to cease childbearing.

These analyses will be carried out in two stages. First there is a descriptive analysis of the different variables and second there is a multiple classification analysis which deals with quantitative as well as qualitative variables (dummy variables). A series of regression analyses are made in all of which the dependent variable is the number of women who want no more children.

Duration of marriage, number of living children, number of deceased children and mother's level of education, are the independent variables. In the second series of regression analyses the deceased children are divided into males and females and in the third analysis the living children are divided into male and females. At the end of this analysis, a test is made to find out the affect of past mortality and fertility rates on recent mortality.

Olsen's model to test the replacement and insurance effect is used to find out whether replacement or hoarding is occurring in Egypt.

Second: <u>The Biological effect</u>: the analysis here will deal with the birth interval and breastfeeding in two separate chapters, namely:

<u>Birth Interval</u>

1. It is assumed that birth interval length, is considered as a measure of fertility, may affect the number of children a mother can have through her reproductive life.

2. Birth interval can be both a result and a cause of child death at the same time. A child dying may shorten interval between births and this, in turn, can be a cause of high infant mortality.

3. There may be a relationship between previous and subsequent birth interval and the survival or death of the index children.

The analysis is carried out in two stages:

1. descriptive analysis for the subsequent birth interval according to the fate of the previous child (whether dead or alive);

2. multiple classification analysis to test the impact of different lengths of previous and subsequent birth interval on the probabilities of the index child dying or surviving. There are three different contingencies. The first is concerned with the previous interval and its impact, i.e. if the previous child dies before conception of if it dies before the third birthday of the index child or if it survives after the third birthday of the index child. The second is concerned with the subsequent birth interval and its impact on the survival or death of the index child; it assesses the chance that the index child survives to its fifth birthday or if it dies after or before the interval is closed. The important use of multiple classification analysis (MCA) is to examine the pattern of changes in the effects of a given variable as more variables are introduced as control variables. It can be regarded as a method of displaying the results of analysis of variance especially when there are no significant interaction effects.

It is useful to use MCA, if there are two or more interrelated factors, to test the net effect of each variable when the differences in the other factors are controlled.

Lactation

The following hypotheses are tested:

1. There may be a strong adverse relationship between breastfeeding and infant mortality.

2. Breastfeeding or not and breastfeeding duration may affect child survival.

The death of a child will interrupt lactation and this will affect the post-partum amenorrhoea which will lead to a shorter birth interval. A descriptive analysis will be designed to test the effect of some variable (time since last birth, mother's age at birth, place of residence and mother's level of education on breastfeeding and breastfeeding duration). Multiple Classification Analysis is also used to discover the effect of infant mortality on breastfeeding and breastfeeding duration. This technique is selected for its ability to handle non-interval variables and non-linear relationships. Since MCA is a form of dummy variable regression, the implied model is additive rather than interactive, but interaction terms may be included as independent variables. The explanatory or background variables consist of a mixture of scaled continuous variables (such as age at birth), dichotomous variables (type of place of residence) and categorical variables (for example mother's level of education and occupation) and these variables have a complex pattern of intercorrelations.

5.3 Data Source

The Egyptian Fertility Survey (EFS) was carried out in 1980 by the Central Agency for Public Mobilisation and Statistics of Government of the Arab Republic of Egypt. It was conducted as part of the World Fertility Survey (WFS), with the collaboration of the World Bank.

The EFS was designed as a two-phase survey. The first phase survey covered all households in the sample. It was administered to Egyptian, ever-married women, under 50 years of age, who were usually resident in the sample households. The second phase survey covered a sub-sample of about one-third of the households interviewed in the first phase survey. Household schedules were successfully completed for 10,079 households out of 10,343 households in the EFS. Within the 10,079 households successfully interviewed for the household schedule, a total of 8,974 ever-married women under fifty years of age were identified as eligible for the individual interviews. The number of questionnaires successfully completed in the individual survey for ever-married women was 8,788 or 97.9 per cent. The first phase survey carefully documents levels of fertility, infant and child mortality, breastfeeding and other biological factors, attitudinal dimensions of childbearing, knowledge and use of contraception, availability and accessibility of family planning services and the sociological and background factors affecting the biological, attitudinal and behavioural determinants of fertility.

Two analyses of the EFS conclude that the data are of high quality. El Deeb, 1984, suggests that there is some displacement of birth dates of children from one period to another but that there is no evidence of omission of births, even among groups most likely to suffer omissions, i.e. females or those children who later died. Coale, 1983, in his analysis of fertility trends in Egypt argues that women 10 through 25 years of age (especially those less than 20) tend to overstate their age. Trussell, 1983, suggests in his study of the determinants of the birth interval that the only identified source of bias is that some women will be assigned to the wrong age category at the beginning of a birth interval but given a broad categorisation this bias should be negligible. Information on breastfeeding and contraceptive use was collected only for the open and the last-closed intervals. Analysis of only these intervals introduces a bias because the further back in time one goes, the less representative of all intervals are the open and last closed intervals.

In most of the analyses, the region or place of residence (either rural, urban, lower or upper Egypt) is examined, because the variations in demographic features are quite notable especially in fertility and mortality levels, desired family size and breastfeeding. In addition to these obvious demographic variations, there are geographical and socio-economic elements such as:

1. prominence of agricultural features in some regions;

2. spread of industrial activities in other regions;

3. adherence to religious and conventional values;

4. climatic conditions affecting childrens' and mothers' activities;

5. non-availability of medical services, drinking water and electricity especially in upper Egypt.

All these considerations are indicative of mothers' attitudes and behaviour towards infant/child mortality and fertility.

5.4 General Characteristics

This part starts by presenting a descriptive tabular analysis of the basic variables, and characteristics of the respondents. Table 5.1 presents a summary of statistics of the variables that are used in this study. It gives an idea of the characteristics of the sample (8,788 respondents). Table 5.1 shows that in urban areas, age at first marriage is higher than that in rural areas. Fertility, mortality, desired number of children, desired number of sons, births wanted in the future are all higher in rural areas than in urban areas. Use of any contraceptive devices or ever use of any method are lower in rural areas. Moreover when rural mothers start using contraceptives, this is not before they have had an average of 3.82 children and their average ultimate family size is 4.65 children.

Table 5.2 indicates, as expected, that child mortality increases with mother's current age which is in turn strongly related to fertility. Mortality increases also with an increase in the number of children born, and both mortality and fertility are higher in rural areas than in urban areas. The desired number of children is lower in the second and third age groups, since younger age women may prefer to have fewer number of children than their mothers when they reach the equivalent older ages and usually in these second and third age groups the desired number of children is close to the number of children already born and alive.

Tables 5.3, 5.3(a) and 5.3(b) reveal the variations in demographic characteristics between women with no child mortality experience and women with child mortality experience, in total population and in rural and in urban Egypt. It is found that women with child mortality experience have lower age at first marriage, higher fertility and mortality, a higher desired number of children and a very low level of contraceptive use. These relationships are inverted for women without child mortality experience. The same trend is found in rural and urban areas but with a higher level of mortality and fertility and all other variables than in urban areas.

TABLE 5.1

Mean and Standard Deviation of Some Characteristics of the Sample in Total Egypt, Rural and Urban Areas

VARIABLES	TOTAL POPULATION		RURAL		URBAN	
	MEAN	S.D.	MEAN	S.D.	MEAN	S.D.
Current age (years)	31.25	8.77	30.59	8.93	32.09	8.47
Age at first marriage	17.24	3.85	16.56	3.38	18.17	4.25
Children ever born	4.13	3.06	4.32	3.18	3.88	2.88
Sons ever born	2.13	1.85	2.25	1.95	2.00	1.75
Deceased children	.99	1.49	1.15	1.59	.80	1.35
Living children	3.15	2.27	3.17	2.35	3.07	2.17
Living sons	1.63	1.45	1.65	1.48	1.60	1.40
Living daughters	1.52	1.45	1.52	1.46	1.47	1.37
Desired number of children	5.75	12.68	6.77	14.05	4.33	10.44
Desired number of sons	2.46	1.99	2.88	2.17	1.89	1.55
Number of births wanted in the future	2.34	8.67	2.38	9.28	2.28	7.79
Number of births when first used contraceptives	4.13	10.51	4.65	9.45	3.88	11.02
Currently using any method	.32	.46	.16	.37	.55	.50
Ever used any method	.39	.49	.23	.42	.65	.48
Number of cases	8,788		5,083		3,705	

TABLE 5.2

Mean of Some Selected Variables for Ever Married

Women by Mother's Current Age

In Rural and Urban Egypt

AGE	RURAL				URBAN			
	CEB	TLC	CD	DNC	CEB	TLC	CD	DNC
15-19	.58	.47	.11	6.55	.75	.61	.12	5.48
20-24	1.89	1.55	.34	6.01	1.66	1.45	.25	3.95
25-29	3.37	2.67	.70	6.29	2.73	2.25	.47	3.88
30-34	5.18	3.91	1.27	6.54	3.92	3.24	.67	3.75
35-39	6.31	4.61	1.70	7.55	5.08	4.06	1.02	4.75
40-44	6.99	4.93	2.06	7.89	5.80	4.44	1.35	4.25
45-49	6.95	4.62	2.33	7.46	6.75	4.96	1.79	5.68
TOTAL	4.31	3.17	1.15	6.77	3.88	3.08	.80	4.35

CEB = Children Ever Born

TLC = Total Living Children

CD = Deceased Children

DNC = Desired Number of Children

FIGURE 5.1
MEAN NUMBER OF CHILDREN EVER BORN, TOTAL LIVING CHILDREN, DECEASED CHILDREN AND DESIRED NUMBER OF CHILDREN IN RURAL EGYPT

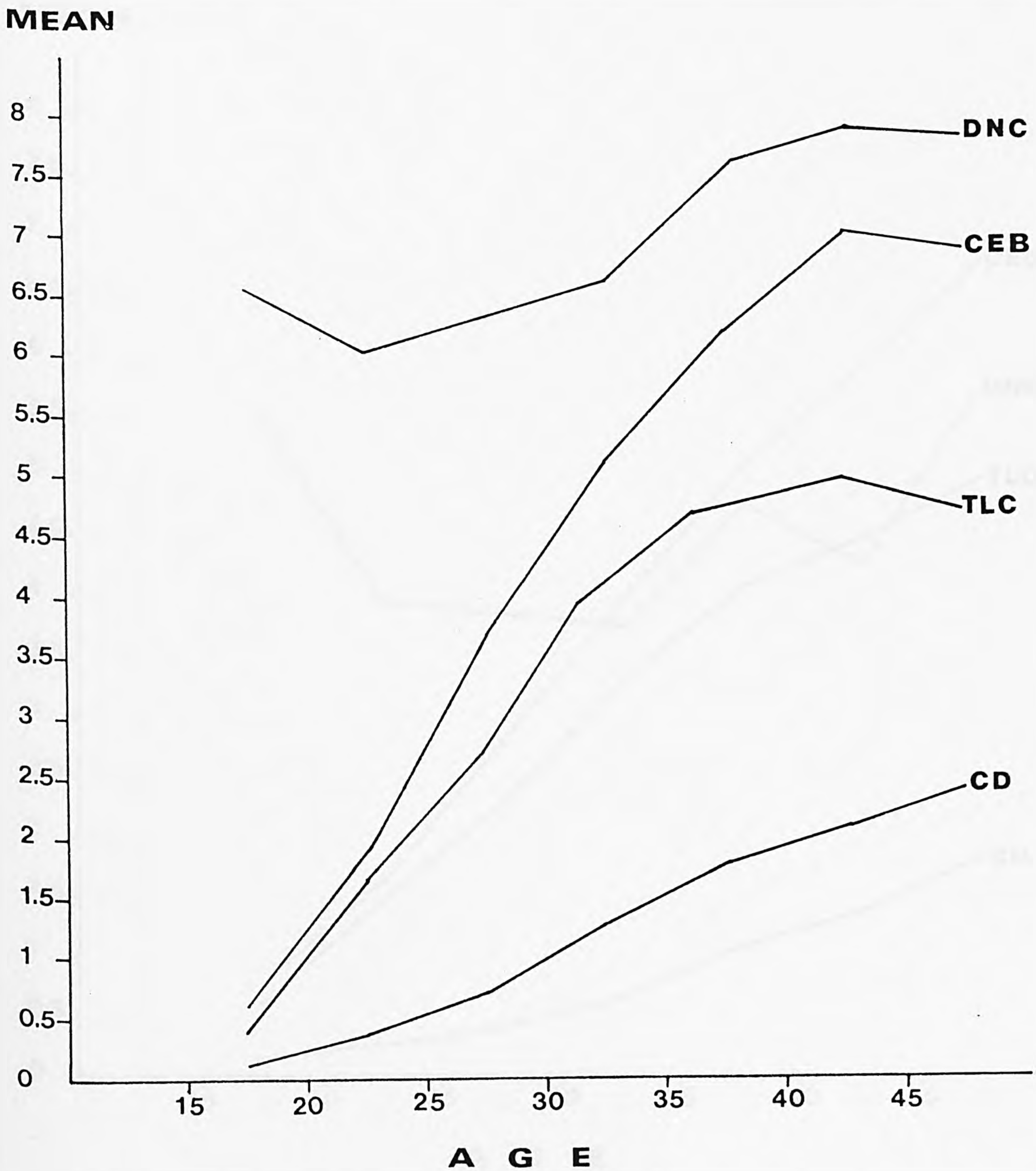


FIGURE 5.2
MEAN NUMBER OF CHILDREN EVER BORN, TOTAL LIVING CHILDREN, DECEASED CHILDREN AND DESIRED NUMBER OF CHILDREN IN URBAN EGYPT

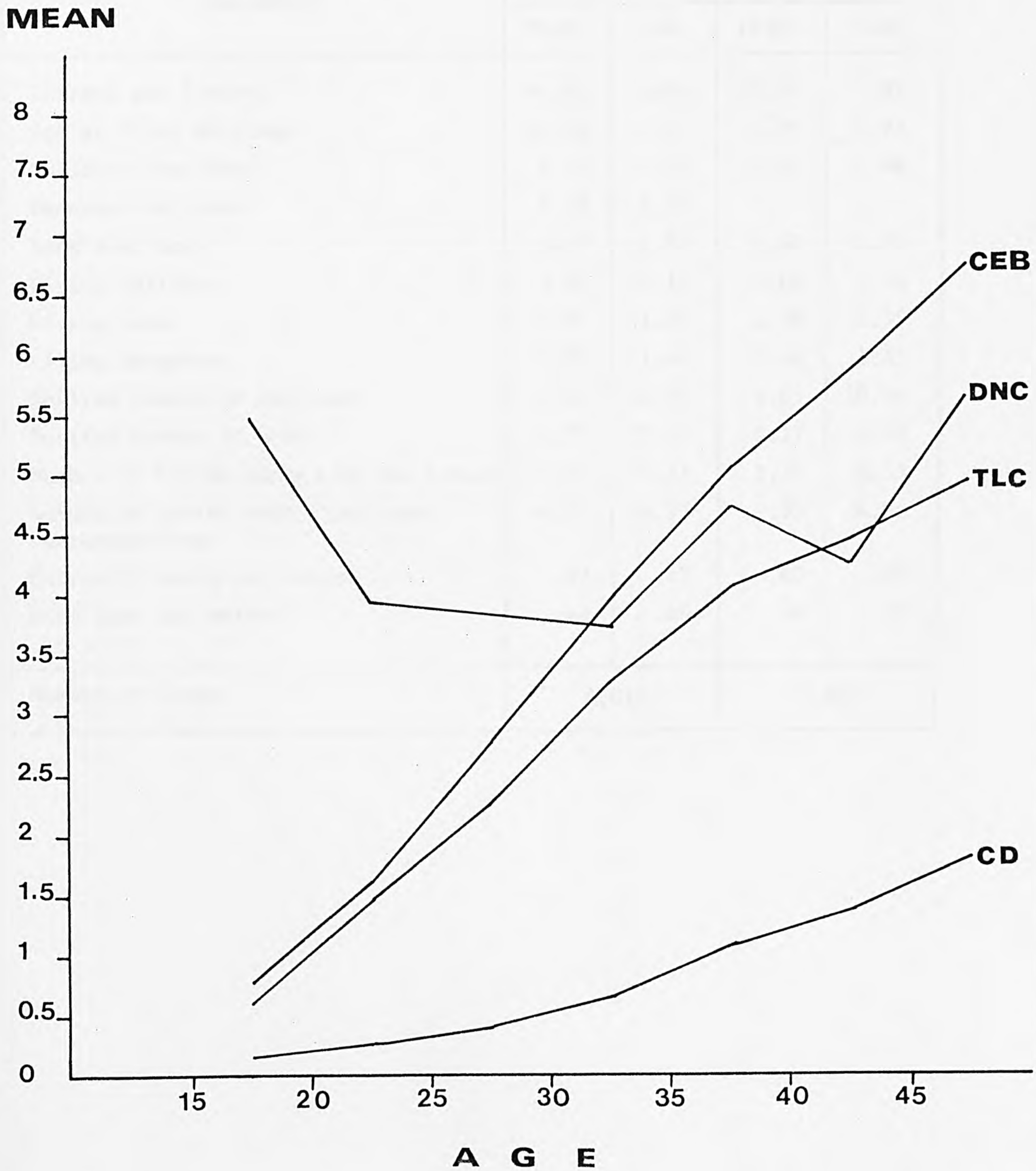


TABLE 5.3

Mean and Standard Deviation of some

Selected Variables for Fertile Women with and without

Child Mortality in Total Population

VARIABLES	WOMEN WITH CHILD MORTALITY		WOMEN WITHOUT CHILD MORTALITY	
	MEAN	S.D.	MEAN	S.D.
Current age (years)	34.85	8.06	29.35	7.82
Age at first marriage	16.16	3.17	17.99	3.93
Children ever born	6.15	2.75	3.55	1.96
Deceased children	2.18	1.52	-	-
Sons ever born	3.17	1.85	1.58	1.35
Living children	3.97	2.14	3.06	1.26
Living sons	2.07	1.47	1.58	1.35
Living daughters	1.89	1.44	1.48	1.33
Desired number of children	6.65	13.95	4.85	10.74
Desired number of sons	2.79	2.14	2.17	1.75
Number of births wanted in the future	2.56	9.33	2.35	8.53
Number of births when first used contraceptives	4.25	6.97	2.59	4.85
Currently using any method	.29	.45	.40	.49
Ever used any method	.40	.49	.49	.50
Number of Cases	4,015		3,802	

TABLE 5.3a

Mean and Standard Deviation of

Some Selected Variables for Fertile Women with and Without

Child Mortality in Rural Egypt

VARIABLES	WOMEN WITH CHILD MORTALITY		WOMEN WITHOUT CHILD MORTALITY	
	MEAN	S.D.	MEAN	S.D.
Current age (years)	34.37	8.05	28.22	7.80
Age at first marriage (years)	15.89	3.00	17.04	3.45
Children ever born	6.24	2.79	3.16	2.07
Deceased children	2.29	1.58	-	-
Sons ever born	3.25	1.86	1.63	1.37
Living children	3.95	2.17	3.16	2.07
Living sons	2.06	1.48	1.63	1.37
Living daughters	1.88	1.44	1.53	1.41
Desired number of children	7.45	14.43	5.94	12.64
Desired number of sons	3.16	2.26	2.59	1.96
Number of births wanted in the future	2.65	10.06	2.29	8.74
Number of births when first used contraceptives	5.35	10.06	3.24	4.65
Currently using any method	.16	.37	.19	.40
Ever used any method	.25	.43	.27	.44
Number of cases	2,517		1,957	

TABLE 5.3b

Mean and Standard Deviation of Some Selected Variables for Fertile Women with and Without Child Mortality in Urban Egypt

VARIABLES	WOMEN WITH CHILD MORTALITY		WOMEN WITHOUT CHILD MORTALITY	
	MEAN	S.D.	MEAN	S.D.
Current age (years)	35.65	8.05	30.55	7.68
Age at first marriage (years)	16.60	3.40	18.99	4.16
Children ever born	5.99	2.68	2.93	1.85
Deceased children	1.98	1.39	-	-
Sons ever born	3.09	1.82	1.51	1.23
Living children	4.05	2.09	2.93	1.85
Living sons	2.09	1.45	1.51	1.23
Living daughters	1.91	1.44	1.42	1.24
Desired number of children	5.36	12.97	3.65	8.10
Desired number of sons	2.18	1.75	1.75	1.34
Number of births wanted in the future	2.42	7.98	2.45	8.35
Number of births when first used contraceptives	3.46	3.58	2.32	4.87
Currently using any method	.49	.50	.59	.49
Ever used any method	.65	.47	.75	.45
Number of cases	1,498		1,845	

CHAPTER SIX

Behavioural Response to Children Deceased

6.1 Introduction

The present population pressure in Egypt is largely the result of birth rates failing to respond to the decline in death rates. Although there is a general decline in mortality in Egypt as the country develops economically, it is still high especially in rural areas where fertility as well as infant mortality is high. The balance between these two forces determines the rate of population growth which in turn has serious, perhaps grave, policy implications for social welfare preservation.

There are two kinds of mortality effects on fertility. First, the community effect where a woman's perception of the mortality level reaches her by knowledge of a child death that occurs in her own family, or among friends, neighbours and the community in general. Secondly, there is a couple's own experience of child death that affects their reproductive behaviour either by impelling them to replace the deceased child or to desire a large number of children which thus affecting the mother's subsequent fertility. The fear of a high child mortality level in the community may persuade couples to adjust their fertility level upward to ensure the ultimate survival of at least the number of children considered sufficient for them.

The relationship between infant/child mortality and fertility has been a subject of debate among demographers. A question is posed concerning the manner in which fertility can respond to infant and child mortality.

There are two kinds of responses. First the immediate biological response through lactation cessation and shortening of birth interval. This is considered one of the mechanisms explaining the relationship between mortality and fertility. This effect will be discussed in detail in the next two chapters where it will be shown that child mortality shortens birth interval length. The death of a nursed child will interrupt lactation. The interruption of lactation allows ovulation to resume sooner and if intercourse takes place this may lead to an earlier pregnancy and ultimately to high fertility. Secondly, there is the behavioural effect which can be explained by the replacement and the insurance effects. The replacement effect results from additional births to make up for actual child loss, but the insurance effect may be attributed to couples having more children in anticipation of child mortality.

The relationship between mortality and fertility is complex. Some of their interactions are direct and some are indirect involving socio-economic, cultural and demographic variables. The mother's age may be considered an important factor in her family building process, since the longer she is exposed to the risk of having additional births, the more likely she is to continue childbearing. In populations like Egypt where contraceptive use is low, it may be suspected that couples will continue child bearing until either one of them loses the physiological ability. Wives generally lose their reproductive capacity earlier, and it is their age that plays the limiting role. Thus, mothers with low child mortality will decide to cease childbearing earlier than those of high child mortality.

It seems that child mortality impedes any effort to reduce the number of children desired or to cease childbearing at early age. Moreover, children in larger families may receive less care than children in small families and hence experience higher mortality.

Singh and Chakrabarty, 1975, tested the influence of infant mortality on fertility in a rural environment in India where infant mortality has declined by a considerable amount during the last twenty years but still the rates are very high and on the other hand, fertility rates remain constant at a high level at least for the last two decades. They conclude that individual experience of child loss has some effect on fertility attributed to physiological effects. The analysis of couples' subsequent reproductive behaviour after the third birth does not show any substantial effect of infant mortality on fertility.

Iskandar and Jones, 1975, studied the effect of infant and child mortality on subsequent fertility in Indonesia using data from the Indonesian Fertility - Mortality Survey. They concluded that:

1. the proportion dying rises steadily as the number of children ever born increases;

2. women with one or more children dead are more likely to want additional children than are women who have had no children die, when parity is used as control;

3. the percentage of women wanting more children is higher for those who have experienced at

least one infant death than for those who have not.

Adlakha and Suchindran, 1984, in their paper about 'Effect of Infant Mortality on subsequent Fertility of Women in Jordan' show that in Jordan the influence of infant death on subsequent fertility is not uniform among the population and parity groups. Infant mortality is high among women at the higher birth orders and reduction of infant mortality in these women substantially reduces subsequent fertility. Occurrence of an infant death and a subsequent short birth interval are two major factors associated with the infant death of the ensuing birth. Consequently motivating women, especially those of high parity, to lengthen birth intervals will be helpful in reducing fertility.

Chowdhury, 1976, et al present an empirical analysis of the effects, behavioural and biological, of child mortality experience on subsequent fertility in Pakistan and Bangladesh. They show that at each death, women will be progressed to the next parity faster than women without such deaths. Moreover, better survivorship of infants would extend lactation and prolong the period of post-partum sterility and thus the entire birth interval and lengthening the interval is equivalent to reducing fertility. Thus reducing infant mortality would lead to a reduction in fertility and better survivorship of those infants who are born.

Balakrishnan, 1978, shows in his study about child mortality effects on subsequent fertility of women in Latin American countries that where there has been child loss, subsequent fertility is higher at all parity levels in all areas when he measures the influence of mother's age, duration of marriage and some socio-economic variables such as, mother's education, standard of living and husband's occupation, he finds that the observed increase in subsequent fertility can be attributed to differences in age, elapsed duration and the socio-economic variables. Moreover, he shows that perception of child mortality seems to have at least as much influence as personal experience itself.

Park et al, 1979, studies the effect of infant death on subsequent fertility in Korea, examining spacing of children and additional births following the survival of death of the preceeding infant. The data was provided by the 1971 National Fertility Survey of Korea covering 6,285 women. The findings suggest that prior to the introduction of a national family planning programme, the influence of infant death was limited to the biological effect resulting from a shortened lactational period. Since fertility regulation methods have been made available throughout the country, motivational effects to replace the lost child appeared to emerge. The proportion of excess births attributable to infant deaths has increased in recent years. However, because of the lowered infant mortality, the overall impact of infant death on the national fertility level appears to be small.

In 1975 CICRED (Committee for International Co-ordination for National Research in Demography) held a seminar on Infant Mortality in Relation to the Level of Fertility and reviewed relevant evidence and delineated a typology of these possible mechanisms. The seminar concluded that:

1. There is a biological effect in that where breastfeeding is curtailed by infant death, duration of post-partum sterility is shortened and the birth interval tends to be shorter thus increasing fertility.

2. There is a replacement effect in that specific experience of child loss may lead to direct attempts to replace the lost child. Declines in mortality should lead to a direct decline in fertility (assuming adequate fertility control mechanisms are accessible) because replacement births would not be necessary. There is also an insurance effect in that parents' anxiety about mortality as a result of personal experience with death in the family and/or community may promote high fertility as an assurance against risk of loss. This attitude would change after a decline in mortality became apparent and parents developed confidence in the chances of their childrens' survival.

Trussell and Olsen, 1983, uses a new technique for estimating the fertility response to child mortality.

They conclude that efforts to reduce child mortality would induce fertility decline since parents in developing societies currently produce many children in order to ensure that at least some would survive to adulthood. Once it is recognized that a large fraction of children no longer die, couples would adjust fertility accordingly.

Hassan, 1971, studied the effect of religion and child mortality on fertility in Egypt. The study is based on data obtained from a fertility survey conducted in 1963, in Cairo, Egypt. He concluded that the longer the duration of marriage in which couples suffer from child deaths, the higher tends to be their birth rate which reveals explicitly the dominant effect of these events on attitudes and behaviour responsible for human manifestation of reproductive capacity. In his paper, he also mentions that if it is true that child deaths are an effect rather than a cause, one would expect couples to experience the loss of children of higher parity after an elapse of a considerable period subsequent to marriage. In this case, there is no reason to believe that higher fertility is induced by the incidence of child mortality. Conversely, if couples experience child deaths among lower parity and shortly after marriage, both time and motive permit a high rate of reproduction to make up for the actual or expected losses. Such a rate varies in magnitude according to the intensity of the emerging fear of being childless. He reveals that actual experience with the death of a child, or the fear of its expected death as generated in the ecological setting due to the prevalence of unhealthy social environment and lack of medical facilities creates a pessimistic feeling that motivates couples to 'stockpile' children early in the reproductive period in order to compensate for actual loss and as a safeguard against anticipated events.

Hassan, 1966, indicated in a paper about the influence of child mortality on population growth, that fertility is most sensitive to whatever causes might bring changes in child mortality. It seems surprising that a slight change in the age at which children die account for significant differences in cumulative fertility. Therefore, the younger the age of the deceased child the greater the tendency of couples to make up for the loss. He concludes that the most effective combination of socio-economic variables is the one which produces the lowest child mortality as well as the lowest proportion of couples that experience it.

Kelley, Khalifa and El-Khorazaty, 1982, in their study about fertility and mortality in Egypt using data from Rural Fertility Survey conducted by the Population and Family Planning Board in 1979 show that the replacement effect is of plausible magnitude, but it is on the low side for rural Egypt and that for parts of this society (upper Egypt) replacement may be unimportant as a motivating behaviour.

Callum, Farid and Moussa reveal in their paper about child loss and its impact on fertility depending upon data from Egyptian Fertility Survey conducted in Egypt in 1980, that a woman's fertility is moulded by her experience of infant or childhood death. There is a pronounced attitudinal replacement response to the number of child deaths within each domain of residence. They find that the total fertility rate will be affected by the level of childhood mortality which inflates the total fertility by one live birth per woman.

Evidence demonstrates that parents' reproductive behaviour can change according to number of deaths they experience among their births.

Increasing deaths among their children may threaten the chances of survival of a certain number of children they consider satisfactory.

It is assumed here that individual experience of infant or child death may:

1. induce parents to increase their subsequent fertility;

2. speed up reproduction;

3. affect the desired number of children.

6.2 Analytical Procedure

In order to shed light on the effect of individual experience of child mortality on subsequent fertility, a couple's subsequent fertility according to the survival of earlier children is calculated. For this the method is confined to women with at least three births who have experienced infant deaths among the first three births. Then the average number of subsequent births after the third for these females are calculated as well as the average number of infant deaths after the third birth for the same women.

The same method is used for urban, rural regions and in lower and upper Egypt.

Secondly, the percentage of women who proceed to the next birth is estimated taking into account the parity and number of living children and controlling for mother's age at index child birth and it is estimated also for urban, rural, lower and upper Egypt.

Thirdly, in order to detect the speed of reproduction, the percentage of women who proceed to have another conception according to the survival or death of the previous child is estimated taking into account the period of time which elapsed between two births, (grouped as 16, 24, 32, 40 months) and the number of children born. The same method is used for urban, rural, lower and upper Egypt.

Fourthly, multiple classification analysis is applied on women who want no more children as an attempt to show the extent to which:

1. age at first marriage, years since first in union and number of living children and deceased children and mother's level of education can affect mother's decision to curtail childbearing;

2. in the second run the sex of the deceased child is considered to find out if sex preference has an effect or not on the mother's decision;

3. in the third run the living number of children is substituted separately by living daughters and living sons, with the number of children deceased.

4. in the fourth run the last occupation since marriage enters the model and years since first union is excluded to examine the effect of some socio-economic variables in addition to the number of children born and the number of deceased children on women who want no more children.

These models are applied for lower and upper Egypt.

Fifthly, an attempt is made to test the effect of the number of children ever born, living children including the current pregnancy and duration of marriage on a woman's desired number of children. Furthermore, the relation between deceased children and the desired number is tested by calculation of the mean desired number of children by number of deceased children. The same tables are used for rural and urban areas in Egypt.

The last model here is to test the effect of fertility and mortality five years ago on the recent fertility and mortality. First, a descriptive analysis is used to find out the effect of fertility five years ago on recent fertility. Secondly, the effect of fertility and mortality five years ago on recent fertility. Thirdly, multiple classification analysis will be used to test the effect of fertility rate and mortality rate five years ago, mother's age and exposure to mortality risk in the recent five years. All these models are applied for urban, rural, lower and upper Egypt.

The mortality and fertility model is confined to women first in union 5 years ago and currently married. Children born five years ago are calculated as the difference between children ever born and children born in the last five years. Children deceased five years ago are the difference between children ever born, children born in the last five years and living children five years ago. Children deceased in the last five years (1975-80) are calculated as living children five years ago plus children born in the last five years minus living children. Three levels of fertility and mortality five years ago are considered here for fertility:

Low	= 0 - 0.2
Average	= 0.2 - 0.4
High	= 0.4 - 0.6

For mortality:

Low	= 0 - .05
Average	= .05 - .2
High	= .2 and over

In this model, the proportion of deaths will be taken into account when this model is tested it does not show reliable results especially in connection with the mortality rate.

Some changes in the model are made concerning mortality. Exposure to death in the last five years (1975-1980) is substituted for the proportion of deaths and is computed as:

(5 * living children 5 years ago + 2.5 * children born in last 5 years -1.5 * child death last five years) and four levels of exposure are computed:

1. no births,

2. low exposure,

3. medium exposure

4. high exposure.

The fertility rate five years ago is computed as:

(children born five years ago/number of months since marriage - 59 months) * 12.

Mortality rate five years ago is calculated as:

(children deceased five years ago/number of months since marriage - 59 months) * 12. Fertility levels are:

1. low (0 - .2)

2. average (.2 - .4)

3. high (.4+)

Mortality levels are:

1. low (0 - .05)

2. average (.05 - .10)

3. high (.10+)

4. less than 5 years exposure.

Five years of age, i.e. the period between 1970-1975. The purpose of choosing this period is to be as near as possible to the date of survey because before this period the fertility rate declines as a result of the 1967 war. Demographers in Egypt interpreted this phenomenon as a consequence of Egypt's defeat in the 1967 war, which led to a reduction of marriages because of the conscription of a large number of youths who were of marriage age. This condition lasted for seven years, and was accompanied by an economic recession, because almost all resources were directed to preparation for the next war of 1973. After the 1973 war and the adoption by the government of the economic open policy, fertility returned to its normal level because of a rise in marriage levels in Egypt. The source of data is a national sample of women surveyed by the government of Egypt in 1980 as a part of the World Fertility Survey programme (Egyptian Fertility Survey). Observations in this analysis are derived from 6,176 respondents.

6.3 Mortality and Subsequent Fertility

Tables 6.1 and 6.1 a) show the mean number of subsequent births and deaths after the third birth for women with at least three births, by number of deaths among the first three births in total population, urban, rural, lower and upper Egypt. It is presumed that couples with child mortality experience are expected to try to compensate for the loss by having more children. The individual's experience of child loss among the first three births may be an important predictor of subsequent fertility. Table 6.1 indicates that if the mother does not have any mortality experience among her first three children, she will have only 3.08 children on average after her first three children. This will increase with the increase in number of deceased children. This means that women who experience one or more deceased children end up with more births. It reveals also that if all the first three children are deceased, a mother will have an average of 5.36 children with a difference of 2.28 if she does not lose any of her children. This Table can be used to examine the replacement effect. If it is assumed that the event of an infant death at any parity is independent of previous infant deaths to the couple, then the differences in average number of births after the third birth may be attributed to the replacement effect. But if there is any dependency between death incidents which is difficult to arrive at a definite conclusion, because usually women who are having a greater number of infant deaths among first three births have experienced more infant deaths later on and consequently they will have a greater number of subsequent births. This can be seen from the average number of deaths after the third birth. A woman who loses all the first three children is likely to suffer high mortality risks among her subsequent births; an average of 1.20 instead of .39 in the case where all the first three children survived. The same indications can be seen in urban and rural areas with higher fertility and higher mortality after the third birth if the parents experience child mortality. It can be noticed too that upper Egypt figures are very similar to that of rural areas in Egypt.

Thus, individual child loss may have some effect on subsequent fertility. Moreover, the infant deaths at different parities may be affected by the experience of previous deaths.

Tables 6.2, 6.2a, 6.2b, 6.2c, and 6.2d show the proportion of women who proceed to next birth according to their numbers of children ever born and numbers of living children according to their age at birth. Women in age group <25, 90 per cent of them proceed to have another child if they lose their first born child. This percentage increases with the increase in number of children born who do not survive. The percentage of women who proceed to another conception will decrease with the increasing number of surviving children. Moreover, it has been noticed that the percentage of women who proceed to have their subsequent birth decreases with increasing age. But in both age groups of 25-34, 35+ the same trend is noticed in urban, rural, lower and upper Egypt. The analysis reveals that both the number of living children and mother's age at birth may affect their subsequent reproduction behaviour. The younger a woman is at a given point in the family building process, the longer she will be exposed to the risk of additional births and the more likely she is to continue childbearing.

Moreover, fertility in general decreases with mother's age, and this may explain why at age <25 the trend is more obvious and the percentage of women proceeding to a further birth is higher than in other age groups. Moreover, a woman's fertility reaches its maximum at ages between <25 and 25 years. It may seem then that increased child survival would tend to reduce a couples' fertility.

Tables 6.3 and 6.3a show the percentage of women who proceed to have another conception according to the time which elapsed between the index child and the next conception, whether the last previous child died or survived. It seems that the percentage of women who proceed to have another conception is smaller if the child is alive than if it dies and the percentage increases with the prolongation of period between births. It is found that in the case of a child death both rural and urban regions seem to have nearly the same percentage of procedure to conception especially in the first parity. It may be obvious that a mother whose child dies will give birth sooner to another than a mother whose child is alive. Furthermore, each parental couple wishes to raise a certain number of children and when they already have this number of living children, they will not be so anxious to enlarge the family as when the desired number has not been reached, due to the loss of infants. This may explain the higher percentage of women proceeding to conception in the lower parities than in the higher parities. Usually, mothers in the early years of marriage, will like to achieve their desired number of children as soon as possible. If they experience a death between the siblings, they will continue to have more than their desired number because they are afraid that more deaths may occur in the future by which time they may have lost their reproductive capacity.

The higher percentage of new conceptions after a child death may be due to the physiological effect that relates the length of birth interval to the fate of the infant born at the beginning of that interval. Thus it may appear that fertility behaviour arises from couples own direct experience with child mortality.

Balakrishnan, 1978, finds that direct personal experience of a child loss can affect a woman's subsequent reproductive behaviour and the early death may also have biological effects on later reproductive capacity. Fear of losing subsequent children may affect her behaviour and if a woman's perception of mortality level is high, she may have a larger number of births to ensure against future losses.

It is presumed that some factors may influence a mother to have no more children. These factors include her age when she first married, duration of marriage, her number of surviving children, her number of deceased children and her level of education. Multiple classification analysis designed for this purpose contained 7,288 cases. The F-ratios and R^2 for this analysis is shown in Tables 6.4 and 6.5 for the total population, lower and upper Egypt.

The overall value of F is 225.2 ($P < .001$) and is highly significant. The values of F for each coefficient are all significant. In lower and upper Egypt the overall values of F (114.3, 57.3) ($P < .001$) respectively are highly significant. But the values of F for individual coefficients do not show any significance for duration of marriage, number of deceased children, or age at first marriage in upper Egypt.

The interpretation of this result is that it may be due to the large number of children women have so that the death of one of them does not affect her decision not to have more children. Rutstein and Medica mention that parents who have fewer children than desired are likely to have another child no matter what their experience with child mortality is. Equally, parents who have many more children than actually desired are not likely to want to have another birth unless child mortality reduces the number of their surviving children below the actual desired family size. Another explanation is given by Preston, 1978, which is that if family size targets are framed for one sex only, the death of a child of the other sex would induce no fertility response. Furthermore, if the child who died is an unwanted child no attempt would be made to replace it. Any of these reasons may explain why the death of a child does not show a significant effect on a mother's decision to want no more children. In upper Egypt, women usually marry at a young age sometimes under the legal age which is 18. Traditions that prevail in this environment enforce women to start having children the day they begin their married life, since children in such communities give their mothers a sort of social recognition and prestige in the community. This part of Egypt is characterized by high fertility and high mortality because women start childbearing at a younger age putting their children under high mortality risk as a result of biological immaturity and their ignorance of fostering children and they continue childbearing until they lose their capacity to reproduce. That is why neither duration of marriage nor age at first marriage may have an effect on a mother's decision to have further children. There are also other factors which may play different roles, such as religion, low use of contraception, traditional values of an agrarian community and high level of illiteracy. All these factors may show that a woman's essential function in such a community is that of reproduction.

Table 6.5 reveals that R^2, the coefficient of multiple determination, which measures the proportionate reduction of total variations between the dependent and independent variables are: (.42, .45, .36) and R (coefficients of multiple correlation) are: (.65, .67, .60) in the total population and in lower and upper Egypt respectively. These results appear to support the assumption that the number of surviving children has an effect on a mother's reproductive behaviour. It shows that the proportion of women who want no more children increases with an increase in the number of living children, age at first marriage, duration of marriage and with the mother's level of education. It decreases with the increasing number of deceased children from .64 with no mortality to .46 with 5+ children dead. The proportion of women who want no more children rises from .04 for those with no living children to .89 with 8 living children. The same trend may be found in both lower and upper Egypt.

In Table 6.6 number of living children is excluded and number of deceased children is divided into male and female, to test the effect of sex preference on a mother's decision to have no more children. Table 6.6. shows that the overall values for F are (118.6, 59.7, 36.2) ($P < .05$) and that it is highly significant in the total population, lower and upper Egypt respectively. The values of F for age at first marriage, duration of marriage, male deceased child and mother's level of education are significant.

As for female deceased children it is insignificant in the total population. It is noticed that in lower and upper Egypt, age at first marriage and both male and female deceased children do not show a significant effect on a mother's decision to want no more children. It seems difficult to decide whether the sex of the deceased child may affect a mother's subsequent fertility or not. The apparent indifference to sex of deceased children may be explained by using living males and females instead to see their effect on a mother's decision of wanting no more children. It seems that couples care more for their living children especially for the number of living sons.

Comparing the results in Table 6.8 with those of Table 6.6 shows that the number of living sons and daughters is highly significant. The F values are ($P < .05$) for male and female living children in total population; in lower Egypt and in upper Egypt. These results may strengthen the evidence that the sex of surviving children has a greater effect on the subsequent fertility than the sex of the deceased children. It seems that women prefer a balanced sex composition of living children, i.e. one or two of each sex. Women may be satisfied when at a certain family size, the number of sons is more than that of girls. This can be shown by the fact that the F values for the effect of living sons are higher than those for the effect of living daughters. The results generally indicate that a woman's motivation to cease childbearing is influenced by the achievement of a satisfyingly balanced sex composition. Table 6.9 shows that the proportion of women who want no more children increases more with an increasing number of sons than with an increasing number of daughters; it decreases with the increasing number of deceased children.

Table 6.10 shows the effect of age at first marriage, number of children ever born (CEB), mother's level of education, mother's last occupation and number of deceased children. The overall values of F are highly significant (199.5, 104.1, 52.5) ($P < .05$) for total population, lower and upper Egypt respectively. The values of F for the individual coefficients for mother's occupation and age at first marriage are not significant. But they are highly significant for the number of children ever born and the number of deceased children, in all parts of Egypt. Table 6.11 shows that the proportion of women who want no more children increases with the increasing number of children ever born and it declines with the increasing number of deaths. Hence, it seems that the occurrence of death among children affects the mother's desire to compensate by having more children in future. It can also be noticed that women who want no more children are in general lower in upper Egypt than in lower Egypt. The decline in number of women desiring no more children with the number of deceased children is greater in upper Egypt than in lower Egypt. This may be due to the high level of infant and child mortality in upper than in lower Egypt.

Eventually, it seems that a mother's desire to cease childbearing at a certain number of living children varies with mortality experience, the achievement of a satisfying balanced sex composition of her living children and with her level of education.

6.4 Mortality and Desired number of Children

The Egyptian Fertility Survey furnishes information on desired number of children (DNC) in an attempt to provide data on family size aspirations as distinct from family size outcome. The objective of this analysis is to detect any possible impact of mortality on desired number of children.

The analysis starts with Table 6.14 which shows the general relationship between desired number of children and living children by duration of marriage by region. It is found that the total mean desired number of children is 3.9 which increases to 4.5 in rural areas and decreases to 3.2 in urban areas. It ranges from 3.5 to 4.5 according to duration of marriage and it increases with the increasing number of children ever born and living children. The high mean desired number of children in rural areas may be due to the high level of mortality in a rural society which gives importance to children as a source of income, security in old age or social status. Furthermore, a woman's desired number of children is usually related to the number of living children. Women who already have a certain number of living children will be unwilling to express a desired number which is less than they already have, because according to tradition this would mean that they wish their last children to be dead. Table 6.15 displays the relationship between the number of children deceased and desired number of children by region. It shows that the desired number of children increases with increasing number of deceased children and that it is higher in rural areas than in urban areas. As already stated the desired number of children may be expected to be higher in rural areas due to the high level of mortality in these areas and because of the children's economic role in the agrarian society and that they are a guarantee for social security at old age.

In sum, infant and child mortality may affect fertility through family size preference.

6.5 The effect of past Fertility and Child Mortality on Recent level of Fertility and Child Mortality

Past fertility and mortality means, in the present context births and deaths between (1970-1975) and the recent level of fertility and child mortality refers to the last five years immediately preceding the date of interview. Recent fertility has practical importance since it reflects the level of fertility which has, prevailed and may be still prevailing in Egypt. The analysis is confined to women who have been continuously in the married state for the past five years. Thus, all births to women who were divorced, widowed or died during that period are excluded. The analysis is carried out in two stages. First, a descriptive analysis for the dependent variable (recent mortality rate) and the independent variables (past fertility and mortality rates, mother's age and mortality exposure in the last five years (1975-1980) and second the use of these variables in a Multiple Classification Analysis (MCA) in the second stage.

Tables 6.16, 6.16a, 6.16b, 6.16c and 6.16d reflect the mean number of children born (recent fertility) by children born five years ago (past fertility) and mother's age. Table 6.16 shows that the mean number of children born in the recent five years is 1.57 for women with no births five years ago and that it increases to 1.66 for mothers with one birth and then starts to decrease with the increasing number of children (row total). It shows also that recent fertility reaches its highest at age group 20-24 and then starts to decrease with age. Comparing the results in Tables 6.16a, 6.16b, 6.16c, 6.16d indicates that variation in recent fertility by regions is quite substantial.

A clustering of the regions puts rural areas and upper Egypt with the highest fertility. Urban areas and lower areas belong to an intermediate group.

Tables 6.17 to 6.17d show the mean number of children born in the last five years (recent fertility) by past fertility and mortality. The results display the expected trend in general which is that women with no mortality in the past will have low fertility in the future or recently and women's fertility starts to increase with the number of deceased children. This means that if a woman has mortality experience in her past family life, she will increase her fertility in the future to protect herself against the past mortality and the expected future mortality. At the same time she will try to make certain that at the end of her reproductive span, she has achieved the desired living number of children. This trend is clear in Tables 6.17 to 6.17d, if the deceased children after the third one are ignored and also the number of children ever born after the fifth child because the number of cases are small and fluctuate with sample errors.

The results of the second stage analysis (Multiple Classification Analysis) appear in Tables 6.18 and 6.19. This analysis indicate the effects of past fertility and mortality rates on recent child mortality rates by regions. It contains 6,176, 2,728, 1986 observations with number of missing cases due to empty cells or a singular matrix (268, 97, 104) for total population, lower and upper Egypt respectively. The overall values of F are 47.15, 20.68, 17.41 ($P < 0.05$) and are highly significant in total population, lower and upper Egypt respectively. The values of F for each coefficient are significant only for the past mortality rate and mother's age, for total population and lower Egypt. As for upper Egypt, it appears that the past mortality rate is the only variable that has a significant effect on recent mortality. This result supports the hypothesis that child mortality incidents in the family are not independent, i.e. that a mother who experiences mortality in an earlier period of her family building process is more likely to have further child mortality during her subsequent fertility. Table 6.19 shows the unadjusted and adjusted recent mortality. This shows that if a woman has had low fertility in the past her recent fertility will also be low. But for those with average or high fertility there is no difference between past fertility and recent fertility. It seems that women do not change their level of fertility with time. The mortality rate shows the same trend if the family has a certain level of mortality rate, this same level of mortality will continue in the family. But it may be noticed that there is a decline in the mortality rate for those children who are exposed to the risk of mortality for less than five years. It shows also that mortality declines with mother's age from .11 at age 15-19 to .01 at age 35-39 and over. But variation in past exposure to the risk of mortality does not show any effect on recent child mortality.

Summary and Conclusion

In this study, the relationship between child mortality and subsequent fertility is analysed. The findings of this analysis in relation to the hypotheses can be summarized as follows:

1. Individual child loss affects a woman's subsequent reproductive behaviour. She may want to replace the lost child. Moreover, there may be clear evidence that those who

experience child mortality among their first children are more likely to experience it at higher parities.

2. Couples usually try to attain a certain number of surviving children, the death of a child may lead its parents to try to offset this disturbance to their plans. Thus, the number of surviving children may appear to influence parents' reproductive behaviour, since the percentage of women who proceed to have another birth decreases with the increasing number of surviving children. So, increasing child survival would tend to reduce a couple's fertility.

3. Testing the effect of death or survival of the previous child on the percentage of women who proceed to have another birth according to certain periods, reveals that the percentage of women who proceed to have another birth is lower after a child's survival than after a child's decease.

4. Women may like to cease childbearing only when they achieve a certain number of living children (which varies with mortality experience) and when they reach a satisfying balanced sex

composition of her living children. It is also found that child mortality in some cases does not affect a mother's decision to cease childbearing. When fertility is very high as in rural and upper Egypt, or when couples find themselves with more surviving children than they want they will fail to replace a child who dies.

5. The desired number of children increases with the increased number of deceased children.

6. Testing the effect of past mortality rates and fertility rates on recent mortality and fertility shows slight relationship. Recent fertility reaches the same level as that which prevailed in the past and it increases with mortality experience.

TABLE 6.1

Mean Number of Subsequent Births and Infant Deaths after Third Birth for Women with at least Three Births by Number of Deaths among First Three Births

NUMBER OF INFANT DEATHS AMONG FIRST THREE BIRTHS	NUMBER OF WOMEN	MEAN NUMBER OF BIRTH AFTER THIRD BIRTH	MEAN NUMBER OF DEATHS AFTER THIRD BIRTH
0	1,893	3.08	.53
1	1,462	3.88	.99
2	660	4.37	1.28
3	186	5.36	1.79
TOTAL	4,201	3.66	.86

NOTE:

It is confined to children at age less than 5 years old.

TABLE 6.1a

*Mean Number of Subsequent Births and Infant Deaths after Third Birth for Women with at least three Births by Number of Deaths among First Three Births according to Place of Residence

URBAN				RURAL			
NUMBER OF DEATHS AMONG FIRST THREE CHILDREN	NUMBER OF WOMEN	MEAN NUMBER OF BIRTHS AFTER THIRD BIRTH	MEAN NUMBER OF DEATHS AFTER THIRD BIRTH	NUMBER OF DEATHS AMONG FIRST THREE CHILDREN	NUMBER OF WOMEN	MEAN NUMBER OF BIRTHS AFTER THIRD BIRTH	MEAN NUMBER OF DEATHS AFTER THIRD BIRTH
0	852	2.67	.40	0	1,041	3.43	.64
1	597	3.56	.75	1	865	4.10	1.15
2	231	4.28	1.14	2	429	4.42	1.36
3	51	5.45	1.69	3	135	5.33	1.83
TOTAL	1,731	3.27	.66	TOTAL	2,470	3.94	1.01

LOWER				UPPER			
NUMBER OF DEATHS AMONG FIRST THREE CHILDREN	NUMBER OF WOMEN	MEAN NUMBER OF BIRTHS AFTER THIRD BIRTH	MEAN NUMBER OF DEATHS AFTER THIRD BIRTH	NUMBER OF DEATHS AMONG FIRST THREE CHILDREN	NUMBER OF WOMEN	MEAN NUMBER OF BIRTHS AFTER THIRD BIRTH	MEAN NUMBER OF DEATHS AFTER THIRD BIRTH
0	925	3.26	.54	0	472	3.46	.74
1	638	3.94	.95	1	492	4.10	1.23
2	265	4.48	1.16	2	278	4.43	1.49
3	48	5.77	1.77	3	112	5.27	1.82
TOTAL	1,876	3.72	.80	TOTAL	1,354	4.04	1.16

* It is confined to children at age less than 5 years old

TABLE 6.2

Percentage of Women who Proceed to the next Birth

According to the Survival or Death of the Child by Mother's Age at Birth

PARITY AND AGE	NUMBER OF LIVING CHILDREN									TOTAL ROW
	0	4	2	3	4	5	6	7	8+	
<25										
1	90									7,118
2	91	88								5,638
3	94	91	87							3,970
4	95	89	89	89						2,383
5	96	93	93	91	89					1,132
6	100	90	88	94	88	*				462
7+	*	*	97	93	86	*	*			176
25-34										
1	78									665
2	79.6	76								1,047
3	86.2	77.9	74.4							1,549
4	87.8	83.7	77.2	71.1						2,015
5	88.2	86.8	79.1	75.9	68.3					2,209
6	*	85.5	80.9	76.3	75.0	66.2				1,975
7	*	85.9	84.2	77.5	76.8	72.9	64.6			1,419
8+	*	*	85.0	78.3	77.0	72.3	68.3	63.8	*	831
35+										
1	48.2									34
2	*	46.3								50
3	*	46.9	45.8							99
4	*	*	50.2	45.5						151
5	*	*	51.11	46.0	43.1					260
6	*	*	52.5	48.3	45.8	41.5				335
7	*	*	56.6	50.7	47.0	42.7	40.0			417
8	*	*	*	55.3	48.1	44.1	42.0	39.7		469
9	*	*	57.0	56.0	53.3	45.6	*	41.5	38.6	378
10	*	*	*	*	53.9	47.1	43.4	42.8	40.3	295
11	*	*	*	*	*	49.5	45.5	43.0	42.5	152
12+	*	*	*	*	*	*	*	44.2	*	101

* number of cases in the cell <20

TABLE 6.2a

Percentage of Women who Proceed to the Next Birth According to Survival or Death of the Child by Mother's Age at Birth in Urban Egypt

PARITY AND AGE	NUMBER OF LIVING CHILDREN									TOTAL ROW
	0	1	2	3	4	5	6	7	8+	
<25										
1	89.8									2,920
2	90.0	86.8								2,259
3	96.2	89.1	84.4							1,522
4	96.4	95.3	88.9	81.8						896
5	*	95.3	93.1	87.6	78.7					428
6	*	*	94.0	92.4	87.1	75.9				185
7+	*	*	*	92.9	90.3	*				75
25-34										
1	76.8									409
2	82.6	75.3								564
3	83.2	80.3	75.3							711
4	*	81.0	77.2	73.3						818
5	*	86.0	78.9	75.5	72.8					822
6	*	*	82.9	76.3	72.9	70.6				716
7	*	*	83.5	81.7	74.1	71.2	68.2			497
8	*	*	90.9	81.8	74.9	71.8	70.2	66		278
9+	*	*	*	82.9	76.9	72.0	70.2	*		143
35+										
1	*									14
2	*	54								27
3	*	*	46.6							56
4	*	*	*	40.5						68
5	*	*	*	42.6	34.6					106
6	*	*	*	*	37.8	26.5				114
7	*	*	*	*	39.0	30.4	20.0			134
8	*	*	*	*	39.0	32.8	29.3	14.6		153
9+	*	*	*	*	*	32.9	30.0	28.2		122

NOTE:

* number of cases <20

Table 6.2b

Percentage of Women who Proceed to the Next Birth

According to Survival or Death of the Child by Mother's Age

At Death in Rural Egypt

PARITY AND AGE	NUMBER OF LIVING CHILDREN									TOTAL ROW
	0	1	2	3	4	5	6	7	8+	
< 25										
1	90.3									4,198
2	91.9	88.7								3,379
3	93.3	89.7	87.2							2,448
4	94.2	91.9	88.8	84.4						1,487
5	95.2	92.9	89.2	85.4	82.6					700
6	100	93.5	90.0	88.5	87.7	79.1				277
7+	*	*	92.2	89.5	*	*				101
25-34										
1	80.1									256
2	83.5	80.0								483
3	89.4	83.2	78.2							838
4	90.0	87.7	80	76.9						1,197
5	*	86.9	85.3	77.4	75.6					1,387
6	*	87.4	86.5	81.4	77.4	73.9				1,259
7	*	87.8	86.7	84.2	77.5	77.4	68.6			922
8	*	*	86.8	85.4	77.9	75.4	75.8	60.0		553
9	*	*	86.9	85.4	78.1	76.6	76.6	75.0		307
10+	*	*	*	*	79.0	77.8	76.6	*		123
35+										
1	70.0									20
2	*	65.5								23
3	*	*	59.5							43
4	*	*	60.6	57.1						83
5	*	*	61.7	57.5	50.33					154
6	*	*	62.7	58.1	58.9	45.0				221
7	*	*	*	59.5	57.4	46.7	38.7			283
8	*	*	*	60.7	58.3	46.7	46.3	34.7		316
9	*	*	*	*	58.5	52.8	51.6	39.1	30.0	256
10	*	*	*	*	58.5	52.9	52.5	46.7	35	217
11+							71.43	50.0		111

NOTE:

* number of cases < 20

TABLE 6.2c

Percentage of Women who Proceed to the Next Birth

According to the Survival or Death of the Child by

Mother's Age at Birth in Lower Egypt

PARITY AND AGE	NUMBER OF LIVING CHILDREN									TOTAL ROW
	0	1	2	3	4	5	6	7	8+	
<25										
1	90.8									3,169
2	93.3	89.3								2,537
3	95.0	92.0	87							1,801
4	96.6	93.6	89.2	86.5						1,064
5		94.9	91.7	87.7	84.4					485
6+			92.9	89.7	85.0	83.0				185
25-34										
1	79.1									277
2	80.4	72.9								460
3	85.9	79.4	72.6							712
4	87.5	84.0	76.8	72.6						956
5	*	85.7	81.9	76.6	72.5					1,067
6	*	86.4	83.1	79.1	74.8	72.4				930
7	*	*	86.1	81.3	75.8	71.4	66.4			652
8	*	*	86.5	82.5	79.1	69.2	70.7	66.4		369
9+	*	*	*	83.2	79.5	63.0	62.5	68.0	*	207
35+										
1	*									11
2	*	*								15
3	*	*	51.2							36
4		*	*	47.5						62
5	*	*	*	48.3	44.3					114
6		*	*	49.9	45.8	41.4				151
7		*	*	62.5	49.4	42.5	40.4			201
8		*	*	*	50.4	47.14	41.8	38.3		234
9		*	*	*	52.0	48.5	43.0	32.6	33.0	183
10+		*	*	*	*	50.0	45.7	35.5	22.7	144

NOTE:

* number of cases <20

TABLE 6.2d

Percentage of Women who Proceed to the Next Birth

According to Survival or Death of the Child

by Mother's Age at Birth in Upper Egypt

PARITY AND AGE	NUMBER OF LIVING CHILDREN									TOTAL ROW
	0	1	2	3	4	5	6	7	8+	
≤ 25										
1	89.6									2,327
2	91.7	88.1								1,877
3	92.0	89.1	87.3							1,355
4	93.2	91.6	89.1	85.7						861
5	94.4	91.7	90.2	88.6	84.7					434
6+	100	92.8	90.4	89.9	89.7	*				187
25-34										
1	86.8									148
2	88.4	84.4								244
3	92.6	85.3	80.2							425
4	92.6	89.0	84.8	76.7						600
5	*	90.8	86.9	80.4	74.6					693
6	*	91.6	87.4	82.4	78.5	72.8				684
7	*	92.5	88.5	83.3	79.2	75.7	68.8			519
8	*		88.6	85.6	79.6	76.6	72.0	65.6		336
9+	*	*	*	86.9	80.7	76.6	73.0			178
35+										
1	*									15
2	*	*								19
3	*	*	56.9							35
4		*	*	55.0						45
5		*	*	55.5	51.4					88
6		*	*	56.7	52.4	48.0				120
7		*	*	58.6	53.2	52.4	46.4			148
8			*	*	53.2	52.6	46.9	44.4		155
9			*	*	54.2	52.9	51.3	45.0	*	138
10+			*	*	*	53.9	52.4	46.0	*	115

NOTE:

* number of cases < 20

TABLE 6.3

Percentage of Women who Proceed to have another Conception according to Different Time Elapsed since last Birth whether a child dies or survives in Urban and Rural Egypt

NUMBER OF CHILDREN AND TIME ELAPSED (IN MONTHS)		URBAN			RURAL		
		ALIVE	DEAD	TOTAL	ALIVE	DEAD	TOTAL
1.							
	T 16	52.4	69.3	54.9	46.4	69.3	50.9
	24	71.9	82.8	73.8	70.9	82.3	73.4
	32	82.6	87.7	83.6	83.4	88.8	84.8
	40	87.9	91.7	88.6	89.3	92.0	90.0
2.							
	T 16	39.7	66.1	43.7	41.4	65.8	45.8
	24	61.4	81.1	64.9	65.0	80.8	68.3
	32	74.2	87.7	76.9	80.9	87.3	82.5
	40	81.3	93.0	83.7	88.2	91.2	89.0
3.							
	T 16	37.6	66.3	41.7	38.8	63.5	43.3
	24	58.9	80.6	62.6	63.1	78.1	66.3
	32	72.0	87.6	75.0	77.8	86.3	79.8
	40	78.4	90.2	80.8	87.1	89.3	87.6
4.	T 16	32.8	58.3	36.3	38.1	60.3	42.5
	24	55.1	77.2	58.5	61.5	76.2	64.8
	32	66.3	85.1	69.7	75.6	83.8	77.7
	40	73.5	89.3	76.6	84.1	88.4	85.3
5.	T 16	33.7	57.7	37.5	33.2	61.3	38.6
	24	54.1	73.4	57.5	55.4	76.7	60.0
	32	65.3	81.9	68.5	70.7	83.0	73.7
	40	72.3	86.6	75.2	79.1	86.1	81.0

TABLE 6.3 (continued)

NUMBER OF CHILDREN AND TIME ELAPSED (IN MONTHS)	URBAN			RURAL		
	ALIVE	DEAD	TOTAL	ALIVE	DEAD	TOTAL
6.						
T 16	27.4	58.8	32.9	30.3	56.7	37.4
24	46.6	70.6	50.6	55.6	73.2	59.5
32	58.8	77.9	63.1	70.6	81.5	73.4
40	66.8	81.3	70.2	79.1	83.7	80.3
7.						
T 16	24.7	55.9	29.3	30.3	56.7	35.1
24	41.5	64.4	45.4	51.2	71.4	55.3
32	52.5	69.6	55.8	65.0	76.3	67.6
40	61.2	79.2	64.9	73.1	79.6	74.7
8.						
T 16	22.3	56.7	27.4	28.5	52.2	33.3
24	38.7	60.3	42.5	47.7	69.6	52.6
32	52.3	67.1	55.1	59.3	74.2	63.1
40	59.0	73.7	62.0	67.6	79.7	71.0
9. T 16	26.5	46.3	30.8	24.8	46.5	29.1
24	39.5	58.5	43.6	46.0	59.8	49.3
32	48.9	67.3	53.2	57.8	62.7	59.1
40	54.9	71.2	59.1	67.9	67.7	67.8
10. T 16	18.3	44.4	23.2	23.1	47.9	29.1
24	32.7	55.2	37.4	38.7	64.8	45.3
32	41.1	70.0	47.5	49.0	66.7	53.7
40	51.0	70.0	55.2	56.7	70.7	60.9

TABLE 6.3a

Proportion of Women who Proceed to have their next Conception according to Different Time Elapsed since last Birth whether a Child dies or survives in Lower and Upper Egypt

NUMBER OF CHILDREN AND TIME ELAPSED (IN MONTHS)		LOWER			UPPER		
		ALIVE	DEAD	TOTAL	ALIVE	DEAD	TOTAL
1.							
	T 16	48.7	67.9	51.3	46.7	70.8	52.9
	24	73.2	83.0	74.8	68.5	83.1	72.6
	32	84.8	88.2	85.4	81.3	90.0	84.0
	40	89.9	92.5	90.4	88.2	92.4	89.5
2.	T 16	42.1	67.1	45.6	41.2	64.4	46.6
	24	65.9	80.3	68.2	63.2	81.0	68.0
	32	80.7	86.6	81.8	79.7	87.9	82.1
	40	88.1	91.5	88.8	86.9	91.7	88.4
3.	T 16	38.5	64.2	42.2	39.8	64.4	45.11
	24	63.4	80.8	66.4	62.3	78.1	66.2
	32	77.3	88.3	79.41	77.5	86.1	79.9
	40	85.8	90.4	86.8	86.7	89.4	87.5
4.							
	T 16	35.8	58.9	39.3	38.7	63.7	44.5
	24	60.2	77.5	63.2	60.9	76.5	65.1
	32	73.9	85.3	76.2	75.0	84.0	77.6
	40	82.4	91.0	84.2	83.2	87.7	84.6
5.	T 16	32.1	60.3	36.4	36.6	62.9	42.4
	24	56.4	75.2	59.6	55.3	77.4	60.9
	32	70.3	80.6	72.3	70.3	85.8	74.7
	40	77.2	86.6	79.2	80.0	87.3	82.2

TABLE 6.3a (continued)

NUMBER OF CHILDREN AND TIME ELAPSED (IN MONTHS)	LOWER			UPPER		
	ALIVE	DEAD	TOTAL	ALIVE	DEAD	TOTAL
6.						
T 16	30.1	55.6	34.1	33.3	60.8	39.6
24	53.2	71.1	56.5	54.5	76.8	60.4
32	66.6	79.3	69.3	70.7	83.4	74.5
40	74.7	82.1	76.3	79.1	85.4	81.0
7.						
T 16	27.2	54.3	31.4	32.3	58.5	37.4
24	46.9	70.5	51.1	53.1	72.5	57.3
32	61.8	72.2	63.9	65.2	80.7	69.0
40	70.2	78.1	71.8	73.3	83.1	75.9
8.						
T 16	26.6	47.4	30.3	28.7	57.5	34.7
24	46.1	64.1	49.6	45.7	70.5	51.7
32	57.6	72.4	60.9	60.1	73.7	63.9
40	67.6	77.5	70.0	66.4	79.5	70.3
9.						
T 16	26.1	42.6	28.7	24.2	49.3	30.5
24	41.0	58.8	44.6	47.6	62.7	51.6
32	52.5	60.00	54.1	59.2	66.3	61.3
40	59.3	63.0	60.1	72.5	70.8	72.0
10.						
T 16	16.31	47.9	24.3	26.7	50.0	31.5
24	31.8	63.8	40.2	43.0	64.1	47.7
32	39.7	68.8	47.7	53.5	69.2	57.1
40	46.2	73.0	54.0	64.4	71.4	66.3

TABLE 6.4

*The Impact of Some Demographic Variables and Mother's levels of Education on Women who want no more Children in Egypt

SOURCE OF VARIATIONS	TOTAL POPULATION		LOWER		UPPER	
	F	SIGNIFICANCE OF F	F	SIGNIFICANCE OF F	F	SIGNIFICANCE OF F
Main Effects	225.2	0.000	114.3	.000	57.3	.000
AFM	9.5	.000	2.2	.066	.86	.487
YSFU	25.3	.000	12.1	.000	5.84	.001
LC	248.8	.000	122.8	.000	55.72	.000
CD	6.7	.000	.29	.920	.91	.472
LEDU	105.1	.000	18.4	.000	40.79	.000
NUMBER OF CASES	7,288		3,243		2,329	

NOTE:

AFM = Age at First Union (5 year groups)
YSFU = Years Since First in Union (10 year groups)
LC = Living Children (9+)
CD = Deceased Children (5+)
LEDU = Mother's Levels of Education

* It is confined to women in union and fecund

TABLE 6.5

Unadjusted and Adjusted Women who want no more

Children by Demographic Variables

Mother's Level of Education in Egypt

VARIABLE AND CATEGORY	TOTAL POPULATION			LOWER			UPPER		
	N	UNAD-JUSTED	AD-JUSTED	N	UNAD-JUSTED	AD-JUSTED	N	UNAD-JUSTED	AD-JUSTED
AFM									
<15	1,549	.58	.49	640	.71	.57	667	.39	.33
15-19	4,022	.52	.52	1,848	.58	.59	1,335	.34	.35
20-24	1,345	.52	.58	611	.53	.62	265	.32	.38
25-29	319	.47	.59	131	.46	.65	49	.39	.38
30+	53	.36	.61	13	.15	.56	13	.15	.35
YSFU									
<10	3,354	.29	.47	1,534	.33	.53	1,061	.13	.31
10-19	2,414	.70	.56	1,076	.78	.63	737	.46	.35
20-29	1,340	.80	.62	555	.89	.68	474	.62	.43
30+	180	.82	.65	78	.85	.67	57	.68	.45
LC									
0	907	.02	.04	393	.02	.06	331	.01	.02
1	1,147	.16	.17	461	.18	.22	410	.06	.09
2	1,223	.45	.46	492	.50	.53	399	.22	.23
3	1,157	.65	.64	518	.70	.71	314	.37	.37
4	978	.76	.75	450	.80	.78	300	.56	.54
5	770	.82	.81	367	.89	.85	237	.63	.61
6	540	.90	.88	278	.93	.88	152	.78	.75
7	309	.89	.87	153	.93	.88	100	.78	.75
8	157	.92	.89	75	.86	.90	56	.85	.81
9+	100	.91	.87	56	.86	.90	30	.76	.70
CD									
0	4,154	.46	.55	1,944	.49	.59	1,118	.26	.37
1	1,478	.59	.53	645	.68	.59	488	.35	.33
2	803	.65	.50	339	.77	.60	303	.46	.32
3	419	.66	.47	164	.71	.57	186	.49	.32
4	212	.68	.45	76	.86	.59	112	.51	.32
5+	222	.64	.46	75	.78	.56	122	.51	.31
LEDU									
1	4,221	.49	.48	1,936	.58	.56	1,619	.31	.31
2	2,050	.58	.57	915	.63	.62	572	.44	.43
3	1,017	.58	.67	392	.55	.68	136	.46	.57
	R^2 = .42 R = .65 Grand Mean = .53			R^2 = .45 R = .67 Grand Mean = .59			R^2 = .36 R = .60 Grand Mean = .35		

NOTE: AFM = Age at First Marriage. YSFU = Years Since First In Union. LC = Living Children. LEDU = Mother's Level of Education: (1) illiterate, no school; (2) illiterate, some school, can read and write; (3) Primary or more school.

TABLE 6.6

*The Impact of Some Demographic Variables and Mother's level of Education on Women who want no more Children in Egypt By Sex of the Deceased Children

SOURCE OF VARIATIONS	TOTAL POPULATION		LOWER		UPPER	
	F	SIGNIFICANCE OF F	F	SIGNIFICANCE OF F	F	SIGNIFICANCE OF F
Main Effects	118.63	.000	59.66	.000	36.22	.000
AFM	5.32	.000	1.85	.116	.87	.481
YSFU	613.14	.000	270.54	.000	162.74	.000
CDF	1.32	.251	.76	.581	1.87	.097
CDM	5.31	.000	2.05	.069	1.72	.127
LEDU	72.28	.000	10.17	.000	38.61	.000
NUMBER OF CASES	7,288		3,243**		2,329	

NOTE:

AFM = Age at First Marriage (5 year groups)

YSFU = Years Since First in Union (10 year groups)

CDF = Female Deceased Children

CDM = Male Deceased Children

LEDU = Mother's Level of Education

* Confined to Women in Union and Fecund

** Cairo and Alexandria are not considered

TABLE 6.7

Unadjusted and Adjusted Women who want no more Children by Male and Female Deceased, Age since first Marriage, Years since first in Union and Mother's Level of Education confined to Women in Union and Fecundity in Egypt

VARIABLE AND CATEGORY	TOTAL POPULATION			LOWER			UPPER		
	N	UNAD-JUSTED	AD-JUSTED	N	UNAD-JUSTED	AD-JUSTED	N	UNAD-JUSTED	AD-JUSTED
AFM									
< 15	1,549	.58	.49	640	.71	.58	667	.39	.32
15-19	4,022	.52	.53	1,848	.58	.59	1,335	.34	.36
20-24	1,345	.52	.57	611	.53	.61	265	.32	.36
25-29	319	.47	.53	131	.46	.58	49	.39	.37
30+	53	.36	.49	13	.15	.30	13	.15	.31
YSFU									
10	3,354	.29	.26	1,534	.33	.33	1,061	.13	.11
10-19	2,414	.70	.71	1,076	.78	.78	737	.46	.47
20-29	1,340	.80	.84	555	.89	.89	474	.62	.66
30+	180	.82	.88	78	.85	.85	57	.68	.71
CDF									
0	5,143	.49	.53	2,397	.53	.58	1,445	.29	.35
1	1,409	.61	.53	562	.73	.62	542	.41	.34
2	507	.67	.50	202	.82	.61	222	.48	.33
3	144	.66	.47	53	.84	.62	73	.48	.30
CDM									
0	5,198	.49	.54	2,379	.53	.59	1,497	.30	.34
1	1,333	.62	.54	576	.72	.62	474	.41	.35
2	493	.67	.51	196	.79	.60	219	.50	.35
3	170	.60	.39	57	.75	.49	87	.43	.23
LEDU									
1	4,221	.49	.48	1,936	.58	.56	1,619	.31	.30
2	2,050	.58	.58	915	.63	.62	572	.44	.44
3	1,017	.58	.65	392	.55	.66	138	.46	.55
R^2 R	R^2 = .24 R = .49 Grand Mean = .53			R^2 = .26 R = .51 Grand Mean = .59			R^2 = .23 R = .48 Grand Mean = .35		

NOTE: AFM = Age at First Marriage. YSFU = Years Since First in Union. CDF = Female Deceased Children. CDM = Male Deceased Children. LEDU = Mother's Level of Education: (1) illiterate, no school; (2) illiterate, some school, can read and write; (3) Primary or more school.

TABLE 6.8

*The Impact of Some Demographic Variables on Women who want no more Children in Egypt by Sex of the Living Children

SOURCE OF VARIATION	TOTAL POPULATION		LOWER		UPPER	
	F	SIGNIFI-CANCE OF F	F	SIGNIFI-CANCE OF F	F	SIGNIFI-CANCE OF F
Main Effects	219.37	.000	118.08	.000	55.95	.000
AFM	32.41	.000	5.89	.000	3.32	.010
YSFU	30.37	.000	11.79	.000	4.90	.002
LD	148.46	.000	69.38	.000	28.24	.000
LS	279.23	.000	144.98	.000	78.38	.000
CD	9.59	.000	.16	.978	1.71	.129
NUMBER OF CASES	7,288		3,243		2,329	

NOTE:

AFM = Age at First Marriage (5 year groups)
YSFU = Years Since First in Union (10 year groups)
LD = Living Daughters (5+)
LS = Living Sons (5+)
CD = Deceased Children

* Confined to women in union and fecund

TABLE 6.9

Unadjusted and Adjusted Women who want no more

Children, by some Demographic Variables

VARIABLE AND CATEGORY	TOTAL POPULATION			LOWER			UPPER		
	N	UNAD-JUSTED	AD-JUSTED	N	UNAD-JUSTED	AD-JUSTED	N	UNAD-JUSTED	AD-JUSTED
AFM									
<15	1,549	.58	.47	640	.71	.56	667	.39	.32
15-19	4,022	.52	.51	1,848	.58	.58	1,335	.34	.35
20-24	1,345	.52	.61	611	.53	.63	265	.32	.41
25-29	319	.47	.66	131	.46	.69	49	.39	.48
30+	53	.36	.63	13	.15	.49	13	.15	.35
YSFU									
10	3,354	.29	.46	1,534	.33	.53	1,061	.13	.30
10-19	2,414	.70	.57	1,076	.78	.64	737	.46	.36
20-29	1,340	.80	.61	555	.89	.66	474	.60	.42
30+	180	.82	.65	78	.85	.66	57	.65	.44
LD									
0	2,132	.22	.32	905	.24	.37	749	.13	.22
1	2,153	.54	.54	922	.61	.61	673	.31	.32
2	1,476	.72	.66	647	.77	.70	442	.52	.45
3	865	.75	.66	430	.81	.71	270	.57	.47
4	418	.81	.70	214	.86	.72	122	.66	.55
5+	244	.83	.74	125	.87	.79	73	.71	.61
LS									
0	1,867	.15	.23	787	.15	.26	651	.06	.13
1	2,061	.46	.47	893	.53	.54	656	.23	.25
2	1,610	.71	.67	709	.77	.73	498	.50	.47
3	975	.83	.76	485	.87	.79	273	.67	.60
4	471	.89	.82	221	.96	.87	138	.72	.65
5+	304	.90	.81	148	.95	.84	113	.81	.73
CD									
0	4,154	.46	.56	1,944	.49	.59	1,118	.26	.37
1	1,478	.59	.52	645	.68	.59	488	.35	.32
2	803	.65	.49	339	.77	.60	303	.46	.33
3	419	.66	.46	164	.81	.59	186	.49	.31
4	212	.68	.43	76	.86	.60	112	.51	.32
5+	222	.64	.46	75	.78	.57	122	.51	.38
R^2	R^2 = .40			R^2 = .45			R^2 = .35		
R	R = .63			R = .67			R = .59		
	Grand Mean = .53			Grand Mean = .59			Grand Mean = .35		

NOTE: AFM = Age at First Marriage (5 year groups). YSFU = Years since First Union (10 year groups). LD = Living Daughters (5+). LS = Living Sons (5+). CD = Children Deceased (5+).

TABLE 6.10

The Impact of Some Demographic Variables and Some Socio-economic Variables on Women who want no more Children in Egypt

SOURCE OF VARIATION	TOTAL POPULATION		LOWER		UPPER	
	F	SIGNIFICANCE OF F	F	SIGNIFICANCE OF F	F	SIGNIFICANCE OF F
Main Effects	199.50	.000	104.1	.000	52.5	.000
AFM	6.22	.000	1.3	.255	0.33	.860
CEB	467.98	.000	226.6	.000	113.3	.000
LEDU	95.54	.000	14.8	.000	31.9	.000
WSTAT	1.16	.325	1.1	.344	2.7	.028
CD	110.95	.000	21.8	.000	39.2	.000
NUMBER OF CASES	7,288		3,243		2,329	

NOTE:

AFM = Age at First Marriage (5 year groups)

CEB = Children Ever Born (9+)

LEDU = Women's Level of Education

WSTAT = Last Occupation Since Marriage

CD = Children Deceased

* Confined to Women in Union and Fecund

TABLE 6.11

Unadjusted and Adjusted Women who want no more Children

By Some Demographic and Socio-economic Variables in Egypt

VARIABLE AND CATEGORY	TOTAL POPULATION			LOWER			UPPER		
	N	UNAD-JUSTED	AD-JUSTED	N	UNAD-JUSTED	AD-JUSTED	N	UNAD-JUSTED	AD-JUSTED
AFM									
<15	1,549	.58	.50	640	.71	.58	667	.39	.34
15-19	4,021	.52	.52	1,848	.58	.53	1,334	.34	.35
20-24	1,345	.52	.57	611	.53	.61	265	.32	.38
25-29	319	.47	.58	131	.46	.64	49	.39	.34
30+	53	.36	.60	13	.15	.48	13	.15	.35
CEB									
0	779	.02	.00	357	.02	.00	266	.00	.00
1	945	.15	.02	386	.17	.09	310	.05	.00
2	991	.41	.30	419	.40	.34	284	.18	.08
3	956	.48	.51	422	.67	.63	273	.26	.20
4	816	.65	.65	366	.71	.71	242	.39	.37
5	678	.75	.79	335	.83	.85	173	.46	.49
6	628	.77	.85	290	.84	.89	205	.57	.63
7	500	.82	.96	223	.92	.99	179	.63	.76
8	400	.81	.91	175	.89	100	154	.67	.85
9+	594	.84	100	270	.93	100	242	.69	.95
LEDU									
1	4,220	.49	.47	1,936	.58	.56	1,618	.31	.31
2	2,050	.58	.57	915	.63	.62	572	.44	.42
3	1,017	.58	.68	392	.55	.67	138	.46	.56
WSTAT									
1	5,959	.53	.53	2,514	.59	.59	2,023	.35	.34
2	225	.59	.57	84	.58	.65	33	.25	.32
3	162	.45	.53	65	.37	.59	16	.37	.32
4	797	.54	.51	507	.62	.57	222	.30	.43
5	144	.59	.57	73	.57	.65	34	.53	.45
CD									
0	4,153	.46	.65	1,944	.49	.66	1,117	.26	.50
1	1,478	.59	.48	645	.68	.53	488	.35	.34
2	803	.65	.36	339	.77	.48	303	.46	.23
3	419	.66	.27	164	.81	.42	186	.49	.12
4	212	.68	.21	76	.86	.42	112	.51	.06
5	222	.64	.13	75	.78	.32	122	.51	.00
	R^2 = .40 R = .63 Grand Mean = .53			R^2 = .44 R = .66 Grand Mean = .59			R^2 = .35 R = .60 Grand Mean = .35		

NOTE: AFM = Age at First Marriage (5 year groups). CEB = Children ever born (9+) LEDU = Mother's Level of Education: (1) illiterate, no school; (2) illiterate, some school, can read and write; (3) Primary or more school. WSTAT = Last Occupation since marriage. CD = Children Deceased: (1) Did not work; (2) Professional; (3) Clerical; (4) sales, agric. self-employed; (5) skilled, unskilled.

TABLE 6.12

The Impact of Age at First Marriage Children ever born, Mother's level of Education, Children Deceased and Place of Residence on Women who want no more Children

SOURCE OF VARIATION	TOTAL POPULATION	
	F	SIGNIFICANCE OF F
Main Effects	245.88	.000
AFM	3.63	.006
CEB	466.14	.000
LEDU	59.59	.000
CD	108.46	.000
Rural/Urban	228.35	.000
NUMBER OF CASES	7,288	

NOTE:

AFM = Age at First Marriage (5 year groups)

CEB = Children Ever Born

LEDU = Mother's Level of Education

CD = Children Deceased

TABLE 6.13

Unadjusted and Adjusted Women who want no more Children by Age at First Marriage, Children Ever Born Mother's Level of Education, Children Deceased and Place of Residence

VARIABLE AND CATEGORY	TOTAL POPULATION		
	N	UNADJUSTED	ADJUSTED
AFM			
< 15	1,549	.58	.51
15-19	4,022	.52	.52
20-24	1,345	.52	.56
25-29	319	.47	.56
30+	53	.36	.58
CEB			
0	780	.02	.00
1	945	.15	.03
2	991	.41	.30
3	956	.58	.51
4	816	.65	.64
5	678	.75	.78
6	628	.77	.84
7	500	.82	.95
8	400	.81	100
9+	594	.84	100
LEDU			
1	4,221	.49	.49
2	2,050	.58	.57
3	1,017	.58	.64
CD			
0	4,154	.46	.64
1	1,478	.59	.48
2	803	.65	.37
3	419	.66	.27
4	212	.68	.22
5	222	.64	.14
Urban	3,116	.63	.61
Rural	4,172	.45	.47

R^2 = .42
R = .65
Grand Mean = .53

NOTE: AFM: Age at First Marriage. CEB: Children Ever Born. LEDU: Mother's level of education; (1) illiterate, no school (2) illiterate, some school (3) primary or more school. CD: Children Deceased.

TABLE 6.14

Mean Desired Number of Children according to Children ever Born and Living Children by duration of Marriage and Place of Residence

VARIABLE DURATION OF MARRIAGE	TOTAL POPULATION				RURAL		URBAN		TOTAL
	<10	10-19	20-29	30+	MEAN	N	MEAN	N	
CEB									
0	3.5	3.2	2.6	2.7	3.9	591	2.7	359	
1	3.2	3.2	3.3	2.4	3.9	579	2.6	490	
2	3.3	2.9	3.4	3.5	3.8	548	2.7	556	
3	3.7	3.4	3.1	2.7	4.1	551	2.9	504	
4	4.1	3.7	3.8	3.8	4.4	514	3.2	420	
5	4.2	3.9	4.3	3.9	4.6	477	3.3	336	
6		4.4	4.1	4.0	4.8	440	3.6	305	
7		4.5	4.5	5.1	5.1	390	3.8	247	
8		4.8	4.9	4.7	5.3	326	4.1	176	
9+		5.3	5.1	5.0	5.5	555	4.3	268	
TOTAL	3.5	3.9	4.4	4.5	4.5		3.2		3.9
N	3,522	2,657	1,946	507	4,971		3,661		8,632
LC & CP*									
0	3.6	3.3	2.9	2.6	3.9	528	2.7	290	
1	3.3	3.4	3.8	**	3.9	763	2.6	583	
2	3.5	3.2	3.9	3.7	4.2	772	2.8	685	
3	3.7	3.4	3.8	4.9	4.3	716	3.1	639	
4	3.9	3.9	4.3	4.9	4.7	684	3.3	530	
5		4.3	4.4	4.8	4.9	586	3.6	381	
6		4.5	4.5	4.8	5.0	417	3.8	268	
7		5.1	5.2	4.4	5.4	260	4.1	164	
8			5.0	4.9	5.3	149	4.9	73	
9+				4.9	5.1	69	4.2	33	
TOTAL	3.5	3.9	4.4	4.5	4.5		3.1		3.9
N	3,522	2,655	1,922	491	4,944		3,646		8,590

NOTE:
CEB: Number of Children Ever Born
LC: Living Children
CP Current Pregnancy
* Confined to Living Children and Current Pregnancy
** Number of Cases less than 20

TABLE 6.15

Mean Desired Number of Children by

Children Deceased and Place of Residence

CHILDREN DECEASED	TOTAL		URBAN		RURAL	
	DNC	N	DNC	N	DNC	N
0	3.5	4,704	2.9	2,191	4.1	2,513
1	4.0	1,737	3.2	743	4.6	994
2	4.5	1,011	3.7	351	4.9	660
3	4.6	563	3.8	202	5.1	361
4	5.0	294	4.0	80	5.4	214
5	5.2	323	4.4	94	5.5	229
TOTAL	3.9	8,632	3.2	3,661	4.5	4,971

NOTE: DNC - Desired Number of Children

TABLE 6.16

*Mean Number of Children Born in the last Five Years** by Fertility Five Years Ago and Mother's Age in Egypt

CHILDREN BORN FIVE YEARS AGO	MOTHER'S AGE IN YEARS							ROW TOTAL
	15-19	20-24	25-29	30-34	35-39	40-44	45-49	
0	1.63	1.93	1.75	1.21	1.50	.07	0.0	1.57 815
1	1.90	2.05	1.81	1.38	.78	.54	.13	1.66 788
2	1.00	1.85	1.76	1.38	.84	.25	.05	1.44 824
3		1.28	1.81	1.44	.94	.43	.08	1.33 707
4		***	1.87	1.46	1.01	.57	.16	1.22 670
5		***	1.78	1.44	1.16	.40	.13	1.05 608
6		***	***	1.64	1.19	.58	.24	.99 514
7			***	1.57	.90	.60	.17	.72 442
8				1.25	1.08	.66	.25	.69 293
9				1.29	1.11	.63	.23	.62 238
10				***	.82	.61	.29	.49 147
TOTAL N	1.69 35	1.94 723	1.79 1,264	1.43 1,366	1.00 1,159	.53 865	.19 634	1.23 6,046

NOTE:

* Confined to women in union five years ago and still in union

** Last five years, i.e. between 1975-80 (five years prior to the Survey date)

*** Number of cases less than 10

TABLE 6.16a

*Mean Number of Children Born in the last

Five Years (1975-80) by Fertility

Five Years ago and Mother's Age in Urban Egypt

CHILDREN BORN FIVE YEARS AGO	MOTHER'S AGE IN YEARS							ROW TOTAL
	15-19	20-24	25-29	30-34	35-39	40-44	45-49	
0	**	1.94	1.93	1.15	.64	-	-	1.56 328
1	**	2.06	1.79	1.35	.81	.31	-	1.55 350
2		1.57	1.57	1.03	.77	.29	**	1.14 369
3		**	1.49	1.17	.76	.20	-	.99 343
4		**	1.65	1.14	.82	.43	.14	.98 301
5		**	**	1.34	.89	.32	.17	.84 249
6			**	1.28	1.08	.31	.05	.65 213
7			**	1.37	.87	.37	.14	.58 172
8				**	1.00	.47	.16	.47 106
9				**	.53	.50	.18	.42 84
10				**	**	.29	.16	.36 45
TOTAL N	1.91 11	1.93 209	1.70 530	1.19 609	.85 512	.34 398	.12 291	1.04 2,560

NOTE:

* Confined to women in union five years ago and still in union

** Number of cases less than 10

TABLE 6.16b

*Mean Number of Children Born in the last Five Years (1975-80) by Fertility Five Years ago and Mother's age in Rural Egypt

CHILDREN BORN FIVE YEARS AGO	MOTHER'S AGE IN YEARS							ROW TOTAL
	15-19	20-24	25-29	30-34	35-39	40-44	45-49	
0	1.44	1.92	1.63	1.32	.35	.13	-	1.58 487
1	**	2.04	1.84	1.44	.75	.77	.27	1.76 438
2	**	1.93	1.88	1.73	.97	.10	.07	1.68 455
3	-	1.36	2.01	1.69	1.23	.74	.33	1.65 364
4	-	**	2.03	1.70	1.18	.72	.18	1.41 369
5	-	-	1.68	1.49	1.34	.50	.09	1.20 359
6	-	**	**	1.77	1.25	.87	.48	1.23 301
7	-	-	**	1.69	.91	.73	.20	.80 270
8	-	-	-	1.30	1.10	.77	.33	.81 187
9	-	-	-	**	1.32	.69	.27	.73 154
10	-	-	-	-	.69	.79	.33	.55 102
TOTAL N	1.58 24	1.95 514	1.85 734	1.62 757	1.12 647	.70 467	.25 343	1.37 3,486

NOTE:

* Confined to women in union five years ago and still in union

** Number of cases less than 10

TABLE 6.16c

*Mean Number of Children Born in the last Five Years (1975-80) by Fertility Five Years ago and Mother's age in Lower Egypt

CHILDREN BORN FIVE YEARS AGO	MOTHER'S AGE IN YEARS							TOTAL ROW
	15-19	20-24	25-29	30-34	35-39	40-44	45-49	
0	**	1.97	1.99	1.29	.45			1.68 346
1	**	2.03	1.83	1.38	.67	**	**	1.69 331
2	-	1.96	1.91	1.56	1.18	.20	**	1.66 372
3	-	**	1.87	1.58	.94	.57	**	1.50 321
4	-	**	1.78	1.65	.86	.73	.20	1.29 278
5	-	**	1.87	1.22	1.20	.28	.13	1.00 263
6	-	-	**	1.62	1.15	.65	.21	.98 242
7	-	-	**	1.50	.85	.67	.15	.70 200
8	-	-	-	**	.92	.71	.32	.68 136
9	-	-	-	**	.96	.57	.20	.51 117
10	-	-	-	-	**	.50	.24	.37 65
TOTAL	**	1.98	1.88	1.48	.98	.58	.18	1.28
N		322	581	622	485	376	276	2,671

NOTE:

* Confined to women in union five years ago and still in union

** Number of cases less than 10

TABLE 6.16d

*Mean Number of Children Born in the Last

Five Years (1975-80) By Fertility

Five Years ago and Mother's Age in Upper Egypt

CHILDREN BORN FIVE YEARS AGO	MOTHER'S AGE IN YEARS							TOTAL ROW
	15-19	20-24	25-29	30-34	35-39	40-44	45-49	
0	1.29	1.89	1.43	1.15	.58	**	-	1.53 285
1	**	2.06	1.81	1.50	.77	**	.30	1.75 265
2	**	1.86	1.75	1.61	.95	**	**	1.58 235
3	-	**	1.88	1.65	1.25	.67	**	1.54 181
4	-	**	2.26	1.67	1.32	.50	.14	1.44 204
5	-	-	1.69	1.77	1.30	.66	.24	1.33 203
6	-	**	**	1.86	1.41	.74	.53	1.27 166
7	-	-	**	1.64	1.00	.71	.18	.85 150
8	-	-	-	**	1.23	.69	.17	.79 107
9	-	-	-	**	1.44	.74	.35	.87 76
10	-	-	-	**	1.00	1.06	.38	.71 66
TOTAL N	1.35 20	1.94 306	1.76 400	1.66 389	1.20 371	.69 255	.27 197	1.37 1,938

NOTE:

* Confined to women in union five years ago and still in union

** Number of cases less than 10

TABLE 6.17

*Mean Number of Children Born in the Last Five Years (1975-1980) by Fertility and Mortality Five Years Ago in Egypt

CHILDREN BORN FIVE YEARS AGO 1970-1975	CHILDREN DIED FIVE YEARS AGO 1970-1975						TOTAL ROW
	0	1	2	3	4	5+	
0	1.57						1.57
							815
1	1.67	1.65					1.66
		107					788
2	1.35	1.72	1.54				1.44
	607	182	35				824
3	1.20	1.52	1.71	.90			1.33
	429	223	45	10			707
4	1.12	1.28	1.36	1.26	**		1.22
	324	200	112	31	-		670
5	.92	.98	1.17	1.27	1.80	**	1.05
	210	196	124	55	.20	-	608
6	.74	.88	1.08	1.40	1.26	.90	.99
	136	145	123	81	19	10	514
7	.67	.64	.70	.82	.81	.75	.72
	93	115	108	74	36	16	442
8	.60	.83	.68	.67	.79	.65	.69
	42	46	63	75	42	25	293
9	.53	.60	.47	.54	.79	.60	.62
	15	25	55	50	47	46	238
10	**	.38	.52	.40	.54	.58	.49
	-	16	25	30	24	44	147
TOTAL	1.34	1.22	1.04	.94	.92	.56	1.23
N	3,360	1,255	690	406	191	144	6,046

NOTE:

* Confined to women in union five years ago and still in union

** Number of cases less than 10.

TABLE 6.17a

*Mean Number of Children Born in the last Five Years (1975-1980) by Fertility and Mortality Five Years Ago in Urban Egypt

CHILDREN BORN FIVE YEARS AGO 1970-1975	CHILDREN DIED FIVE YEARS AGO 1970-1975						TOTAL ROW
	0	1	2	3	4	5+	
0	1.56						1.56 328
1	1.52	1.76					1.55 350
2	1.00	1.68	1.90				1.14 369
3	.89	1.14	1.82				.99 343
4	.83	1.03	1.24	1.55			.98 301
5	.71	.71	.94	1.61	1.75		.84 249
6	.45	.60	.77	.93	1.20	**	.65 213
7	.35	.47	.55	.80	1.07	**	.58 172
8	.50	.50	.56	.80	**	**	.47 106
9	**	.45	.38	.38	**	**	.42 84
10	**	**	**	.23	**	**	.36 45
TOTAL N	1.13 1,543	.97 524	.88 259	.76 145	.88 49	.90 40	1.04 2,560

NOTE:

* Confined to women in union five years ago and still in union

** Number of cases less than 10

TABLE 6.17b

*Mean Number of Children Born in the Last Five Years (1975-1980) by Fertility and Mortality Five Years Ago in Rural Egypt

CHILDREN BORN FIVE YEARS AGO 1970-1975	CHILDREN DIED FIVE YEARS AGO 1970-1975						TOTAL ROW
	0	1	2	3	4	5+	
0	1.58						1.58 487
1	1.79	1.60					1.76 438
2	1.69	1.74	1.40				1.68 455
3	1.57	1.77	1.64	**			1.65 364
4	1.37	1.53	1.43	1.10	**		1.41 369
5	1.07	1.21	1.31	1.11	1.81	**	1.20 359
6	1.04	1.10	1.25	1.64	1.29	**	1.23 301
7	.82	.82	.80	.84	.64	.83	.80 270
8	.67	.97	.78	.91	.90	.58	.81 187
9	**	.71	.55	.62	.90	.82	.73 154
10	**	.33	.68	.53	.33	.73	.55 102
TOTAL N	1.52 1,817	1.41 731	1.14 431	1.04 261	.93 142	.65 104	1.37 3,486

NOTE:

* Confined to women in union five years ago and still in union

** Number of cases less than 10.

TABLE 6.17c

*Mean Number of Children Born in the Last Five Years (1975-1980) by Fertility and Mortality Five Years Ago in Lower and Upper Egypt

CHILDREN BORN FIVE YEARS AGO	LOWER					UPPER				
	CHILDREN DIED 5 YEARS AGO				TOTAL ROW	CHILDREN DIED 5 YEARS AGO				TOTAL ROW
	0	1	2	3+		0	1	2	3+	
0	1.68				1.68 346	1.53				1.53 285
1	1.70	1.65			1.69 331	1.78	1.64			1.75 265
2	1.61	1.79	1.85		1.66 372	1.51	1.72	1.41		1.58 235
3	1.39	1.65	1.71	**	1.50 321	1.45	1.64	1.65	**	1.54 181
4	1.25	1.33	1.38	**	1.29 278	1.32	1.66	1.41	1.32	1.44 204
5	.80	1.07	1.13	1.75	1.00 263	1.39	1.16	1.47	1.32	1.33 203
6	.77	1.00	1.16	1.11	.98 242	.97	1.11	1.24	1.27	1.27 166
7	.60	.63	.65	.99	.70 200	1.04	.85	.91	.69	.85 150
8	.62	.78	.63	.57	.68 136	**	.94	.76	.78	.79 107
9	**	.60	.37	.59	.51 117	**	**	.75	.76	.87 76
10	**	**	.45	.36	.37 65	**	**	**	.73	.71 66
TOTAL N	1.42 1,553	1.27 547	1.01 303	.64 268	1.28 2,671	1.51 908	1.44 414	1.24 246	.82 370	1.37 1,938

NOTE:

* Confined to women in union five years ago and still in union

** Number of cases less than 10.

TABLE 6.18

*The Effects of (Fertility Rate and Mortality Rate Five Years Ago [1975-1980], Mother's Current Age and Mortality Exposure in Last Five Years) on Recent Mortality in Total Population, Lower and Upper Egypt

SOURCE OF VARIATION	TOTAL POPULATION		LOWER		UPPER	
	F	SIGNIFI-CANCE OF F	F	SIGNIFI-CANCE OF F	F	SIGNIFI-CANCE OF F
Main Effects	47.15	.000	20.68	.000	17.41	.000
FERTR5A	4.54	.011	3.49	.031	.40	.672
MORTR5A	22.58	.000	12.30	.000	5.30	.001
Mother's Age	27.67	.000	15.27	.000	7.16	.000
EXPGRP	.81	.444	.46	.633	.36	.699
Number of Cases = 6,176 Missing cases = 268			N = 2,728 Missing = 97		N = 1,986 Missing = 104	

NOTE:

* Confined to women in union five years ago and still in union

FERTR5A = Fertility Rate Five Years Ago = Calculated by (children born five years ago/(Duration of Marriage - 59) x 12)

MORTR5A = Mortality Rate Five Years Ago = Calculated by (children died five years ago/exposure to risk)

EXPGRP = Mortality Exposure in Last Five Years

TABLE 6.19

Unadjusted and Adjusted Mortality in the Last Five Years by Fertility and Mortality Five Years Ago, Mother's Age and Mortality Exposure in the Last Five Years, in Total Population, Lower and Upper Egypt

VARIABLE AND CATEGORY	TOTAL POPULATION			LOWER			UPPER		
	N	UNAD-JUSTED	AD-JUSTED	N	UNAD-JUSTED	AD-JUSTED	N	UNAD-JUSTED	AD-JUSTED
FERTR5A									
Low	1,131	.04	.03	459	.03	.03	370	.05	.03
Average	2,717	.01	.02	1,195	.01	.02	825	.02	.03
High	2,060	.02	.02	977	.02	.02	687	.03	.03
MORTR5A									
Low	3,284	.01	.01	1,543	.01	.02	871	.01	.02
Average	663	.02	.02	237	.02	.02	312	.02	.03
High	334	.05	.05	132	.05	.05	148	.01	.01
Less than 5 yrs exposure	1,624	.04	.03	719	.04	.02	551	.00	.02
Mother's Age									
15-19	26	.12	.11	8	.18	.18	13	.10	.08
20-24	673	.06	.05	300	.04	.03	287	.08	.07
25-29	1,214	.03	.03	569	.03	.03	374	.04	.03
30-34	1,317	.02	.02	606	.02	.02	370	.03	.03
35-39	1,136	.01	.01	475	.01	.01	368	.01	.02
40-44	865	.00	.01	377	.01	.01	260	.01	.01
45-49	677	.00	.01	296	.01	.01	210	.00	.01
EXPGRP									
Low	1,791	.00	.02	724	.00	.02	636	.06	.03
Medium	2,915	.01	.02	1,299	.02	.02	882	.02	.03
High	1,202	.01	.02	608	.01	.02	364	.01	.03
	R^2 = .09 R = .31 Grand Mean = .02			R^2 = .09 R = .31 Grand Mean = .02			R^2 = .11 R = .33 Grand Mean = .03		

CHAPTER SEVEN

INFANT AND CHILD MORTALITY AND BIRTH INTERVAL

7.1 Introduction

This study is an attempt to evaluate the strength of the impact of birth interval duration on infant and child survival chances in the low contraceptive using population of Egypt, where at least 94% of children are breastfed up to at least 18 months. Studying the interval between births reveals considerable information about the family growth and fertility level of the Egyptian society. Furthermore, it identifies the variables that affect the principal components of spacing of births.

Previous studies about this relationship has revealed the deleterious effects of rapid or closely spaced childbearing on the increasing risks of infant and child mortality.

Sweemer, 1984, studied 'The Influence of Child Spacing on Child Survival' using data from a pregnancy history survey which was conducted in 25 Punjabi villages in India (1969). The data included the pregnancy history of 5,745 currently married women aged between 15-45 years. In his study he analysed the relationship between the length of the preceding and subsequent birth intervals and the survival chances of the index child according to his age at death. He found that:

1. the preceding and subsequent intervals are correlated significantly, but the coefficient of determination is low. Thus, he indicated that analysing the influence of both intervals

(subsequent and preceding) should be separated;

2. the death or survival of a preceding child influences the length of the preceding interval and the survival chances of the index child;

3. Depletion of maternal reserves, competition for mother's care, particularly where resources are very scarce and the mother grieves for the death of a preceding child, are caused by short preceding interval.

4. Subsequent birth interval affects the risks of mortality of the index child through an early cessation of breastfeeding.

Irene Figa, 1984, in her study of infant and child mortality in rural areas of the developing world found that a third variable contributing to infant mortality was the spacing of births. For both developing and developed countries there was an association between short birth intervals and infant mortality. Furthermore, short birth intervals as well as high parity and teenage pregnancy were all linked with higher mortality primarily due to prematurity and low birth weight.

Hobcraft, Macdonald and Rutsteing, 1983, in their study of 'Child Spacing Effects on Infant and Early Child Mortality', using data from the

World Fertility Survey, adopted a new approach i.e. to form counts of births in segments of time before and after the index child. They used three 2 years "windows" of observation immediately prior to the birth of the index child, forming counts of births 0-2, 2-4 and 4-6 years before. These counts permit indirect estimation of the length of the immediately preceding interval but also preserve details about the overall incidence of childbearing during the 6 years before the index child was born. They revealed that:

1. Raised mortality risks from a closely spaced earlier birth are universal.

2. A great deal of the excess mortality associated with rapid later births is due to premature and more abrupt weaning when a mother discovers pregnancy and, perhaps, reduces care and attention.

3. There is no doubt of a very powerful association between child spacing and infant and child mortality.

4. They showed that there was considerable reason to believe that a mother with repeated pregnancies and especially with short birth intervals does not have sufficient time for recovery, both physically and nutritionally, from pregnancy and child birth and rearing and is thus more likely to have

pregnancy losses and lower birth weight babies which lead to poorer survival chances.

5. A mechanism likely to cause poorer survival chances for children in large families or closely spaced families is often called competition. 'Competition' means that larger numbers require feeding and older siblings may take precedence in access to the limited available food supplies, or all may be at higher risk as a result of sharing too meagre resources. Both deterioration in maternal health and 'competition' act in almost all societies.

Bothaina El-Deed, 1983, who studied 'The Dynamics of Birth Spacing and Marital Fertility in Egypt' using the Egyptian Fertility Survey (EFS) data, 1980, revealed that lower marital fertility rates in rural upper Egypt were due to long birth intervals, since women in this area breastfed their children for 20 months. In contrast, urban upper Egypt reflected the highest fertility rate due to the shortest birth intervals.

Eid and Casterline, 1983, studied 'Differentials in Infant and Child Mortality in Egypt', using the Egyptian Fertility Survey (EFS) data, 1980, and concluded that the probability of survival was strongly associated with the length of interval from the previous birth. Furthermore, they showed that the infant mortality rate in Egypt could be reduced by as much as one-third, if all births were to follow previous births by at least two years.

Callum and Cleland, 1983, in their paper about 'The Effect of Birth Spacing on Infant and Child Mortality' drawing their data from the Egyptian Fertility Survey, 1980 revealed that the length of the preceding interval was strongly associated with the survivorship of the index child, regardless of whether the preceding child died before the conception of the index child or not. In other words, children who were born after long intervals of four or more years were much less likely to die in infancy and childhood than children born after shorter intervals. The shorter the preceding interval the greater becomes the risk of dying. They also found that if the length of interval following the birth of a child was less than 18 months, the risk of dying between age one and two was doubled and that of dying between age two and five was raised by 38 per cent. Their results suggested that the risks of dying in infancy fell by about 10 per 1,000 with each monthly increment in the length of the preceding interval.

Ingrid Swenson's research, 1982, considered the 'Relationship between Pregnancy Spacing, Sex of Infants, Maternal Age and Birth Order and Neo-natal and Post-neo-natal Mortality in Bangladesh' using data from the vital registration system consisted of 5,158 women having second or higher births. It revealed that the increased risk of mortality from closely spaced pregnancies was not as great for neo-natal mortality as for post-neo-natal mortality. Post-neo-natal mortality due to short intervals seemed to be most apparent in those instances where the infant followed in close succession to another child who was still being breastfed. Davanzo and Butz in their study about 'Influences on Fertility and Infant Mortality in Developing Countries' 1978, used the Family Life Survey in Malaysia; retrospective data were collected on a national probability sample of more than

1200 families. It revealed that:

1. Birth spacing affected the rate of population growth because, for a given completed family size, closer birth spacing would result in higher fertility rates.

2. An infant's chance of dying was influenced by the length of the birth interval preceding its birth. In other words a baby born at the close of a short birth interval has a significantly lower chance of surviving its first year than one born after a longer interval.

Rodriguez, Hobcraft, McDonald, et al, 1984, in 'A Comparative Analysis of Determinants of Birth Intervals' depending upon data from countries which participated in the World Fertility Survey (WFS) concluded that a short previous birth interval had been well documented as being closely linked with higher infant mortality for the child born at the end of that interval.

Cleland and Sathar, 1984, studied 'The Effect of Birth Spacing on Childhood Mortality in Pakistan' using data from the World Fertility Survey. This showed that:

1. The length of the preceding birth interval emerged as a major determinant of childhood mortality. In the neo-natal period there appeared to be a threshold of about three years, above which no further advantage was conferred on the index child by increasing the interval.

2. The probability of dying for post-neo-natal and early childhood mortality declined with the lengthening of the preceding interval. Children born after an interval of 2 years or less since the last birth were twice as likely to perish at these ages as those born after four or more years. After the age of two years, the relationship was less strong but nevertheless appreciable.

3. The level of mortality in early childhood for mothers who conceived their next child within twelve months was twice as high as for children whose next sibling was born after a longer interval.

The World Fertility Survey book entitled, 'The Major Findings and Implications 1984', showed the harmful effects of rapid childbearing on the survival of children. Children born less than two years after the preceding birth were much less likely to live until their fifth birthday than those born within two or three years. Equally, children born after long intervals (four or more years) had a better chance of surviving to their fifth birthday. In some countries babies born after short intervals were two and a half times more likely to die within the first five years of life than those born after four year intervals. The harmful nature of closely spaced births affected both the younger and older children.

Brass and Barrett, 1978, pointed out that closer birth spacing leads to higher child mortality; women experiencing child mortality would tend to be characterized by higher fecundability and/or shorter periods of post-partum non-susceptibility to conception.

Boerma and Vanen, in their paper tried to analyse the 'Impact of the length of birth interval on mortality and growth of young children', using longitudinal data from rural areas in Kenya with a relatively favourable level of health. It was shown that children with short retrospective or short prospective birth intervals did not suffer a higher risk of mortality or growth retardation than children with longer intervals, neither during the perinatal period nor during the first two years of life. It has often been observed that early childhood mortality shortens the interval between births. Shortened interval can sometimes be the result rather than the cause of child mortality.

Santow and Bracher, 1984, mentioned that a new birth occurred sooner when the previous child died than when it survived. The death of an infant might promote the return of ovulation through the abrupt cessation of breastfeeding. Also the birth of the younger sibling might hasten the death of the older child as a result of premature weaning. They also found that, infant mortality rates rose dramatically when the interval between two successive births were shorter than two years. In their study they depended upon data collected in central Java in 1976.

Winikoff, 1983, concluded in his paper that a short interbirth interval could be either the cause or the result of a child death. Consequently it was important in studying the effects of the preceding interval to know about the survival status of the first child in order to understand the association between interval and health outcome for the second child. Early death of the first child resulted in a shortened birth interval, either through a replacement effect or cessation of lactation which led to early return of ovulation.

He also mentioned that short intervals had a detrimental effect on child survival and had the largest effect in the post-neo-natal period. Moreover, he showed, that societies with traditional lactation practices adopted birth spacing patterns, that for most children, avoided the hazards of short intervals, If lactations patterns were abandoned in these countries, children would be subjected to the double jeopardy of greater likelihood of birth within a short interval and the nutritional/immunological detriment of lack of mother's milk.

Birth interval can be defined as the time elapsed between two successive live births for one woman. It is part of the pattern of family building and is shortened by child mortality. Consequently, improved survivorship, long breastfeeding, post-partum-amenorrhoea and contraceptive use extends the length of the birth interval.

Different bio-medical studies prove that birth intervals may increase the risk of infant and child mortality. A child born after a short interval has a smaller chance of surviving than the one born after a longer interval. Short birth intervals with repeated pregnancies do not give sufficient time for a mother to regain health, and will decrease the chances of infant survival and create a motivation to increase subsequent fertility for mothers suffering bad child mortality experience.

There are two kinds of birth intervals: an open birth interval is the time elapsed since the most recent live birth until the date of the interview. A closed birth interval is the time elapsed between two successive births or between a birth and the next pregnancy.

The birth interval is a compound of four components, the period of post-partum infecundability the menstruating interval (the period of ovulatory exposure after menstruation has resumed) and the duration of gestation. Post-partum infecundability can shorten or lengthen the birth interval according to the breastfeeding duration. Consequently, the duration of post-partum infecundability is considered as one of the major determinants of birth interval in Egypt, since about 94% of women breastfeed their children and the use of contraception is still low especially in rural areas where the fertility rate is still high.

It is generally recognized that certain factors can affect the length of the birth interval directly or indirectly. Infant and child mortality shortens the length of the interval directly and indirectly through breastfeeding cessation and the shortening of the post-partum infecundability period and the rapid return to ovulation. Consequently, the nature and duration of breastfeeding affects the length of the birth interval and is considered one of the major determinants of its length. Other factors that have some effect on birth interval length are mother's age, order of birth, the outcome of the previous pregnancy and its sex and some of the socio-economic variables. These factors do not, however, act independently of one another but jointly in a relatively complex manner.

Furthermore, the birth interval can be used as an indicator of the individual level of fertility, since a short birth interval is related to large families and a long birth interval is related to small families.

These previous studies of the relationships between infant and child mortality and birth interval show that it is important to study the length of both the immediate preceding and the subsequent birth intervals and their impact on the death and survival of the index child.

The literature reviewed here helps in determining the hypotheses of this chapter:

1. Birth interval length, considered as a measure of individual fertility, may reduce the number of children a mother will have during her reproductive life (family size) and its growth.

2. The birth interval can be a result and a cause of child mortality at the same time.

3. There is a relationship between previous and subsequent birth intervals and both may affect the survival or death of index children according to the fate of the previous birth and the length of the subsequent birth interval.

7.2 Plan of Analysis

First: the length of subsequent birth interval is calculated without any control except for the order of birth.

Second: the mean length of subsequent birth interval is measured in relation to the fate of the previous child. If he lives it is expected that the length of the interval is longer than if he had died.

Third: since the length of the birth interval has an impact on the number of children born to a woman and the number of living children, different lengths (<2, 2-4 and 4+ years) are chosen to see the effect of birth interval length on the number of children ever born and the number of deaths.

Fourth: different lengths of previous birth interval and subsequent birth interval, are studied to find their effects on the probabilities of dying of the index child according to its age at death.

Three different risks are observed:

1. <u>Previous birth interval on the death of the index child</u>

   (a) <u>If the previous child dies before conception of the index child</u>, this will shorten the previous interval and will increase the risk of death of the index child. The interval will be shortened either because of the role of lactation or because the parents will consciously want to replace the deceased child. It is also expected from this pattern that mortality of the index children will decline as the interval length increases.

   (b) <u>If the previous child survives after the third birthday of the index child</u> or is still alive. This may decrease the risk of death for the index child, since a long birth interval will give the mother a chance to recover and to regain her health and her ability to care for both children.

   (c) <u>If the previous child dies before the third birthday of the index child</u>. This may explain some causes of death such as inadequate nutritional reserves among mothers, poor parental attention and care, high environmental contamination or disease incidence. All this will place the index child at excess risk of death.

2. <u>Subsequent birth interval impact on the survival or death of the index child</u>

(a) If the index child survived to its fifth birthday.

(b) If the index child died after an interval closed by the next conception.

(c) If the index child died before the interval is closed.

The impact of subsequent birth intervals on the death or survival of the index child may be due to a rapid conception. Rapid conception will lead to early disruption and cessation of breastfeeding. Mother's milk is known to be the most nutritious and protective food an infant can have. It is more sanitary and it contains antibodies that help to protect a baby against infection for several months after birth. The death of the index child before the birth interval is closed (i.e. before the next conception) may be due to other causes of death in the family itself. Actual current diseases, a generally unhealthy environment, poor food, especially if the family has suffered a previous child death are all factors which are known to be related to infant and child mortality.

The technique of analysis of variance (ANOVA) is used to isolate the effects of:

1. Previous interval;

2. Subsequent birth intervals.

Infant and child mortality according to age at death is used as a dependent variable [Neo-natal (< 1 month) and post-neo-natal (< 12 months), dead 23 (< 24 months) and dead 35 (< 36 months)] and each age group is excluded from the rest of the groups. Length of previous birth interval is used as an independent variable (0-11, 12-17, 18-23, 24-35, 36+ months) and child survival to age 36+ months.

ANOVA provides an analysis of variance table which contains one-way and two-way analysis and F ratios. F ratios and accompanying statistics is used for tests of statistical significance.

A table of multiple classification analysis (MCA) is also produced. The important use of MCA is to examine the pattern of changes in the effects of a given variable as more variables are introduced as controls. It can be viewed as a method of displaying the results of analysis of variance especially when there are no significant interaction effects. MCA is particularly useful if there are two or more interrelated factors, in indicating the net effect of each variable when the differences in the other factors are controlled.

The table shows the adjusted mean values for each category (expressed as deviations from the grand mean) when the other variables are controlled. The multiple R at the bottom of the table indicates the overall relationship between the dependent variable and the independent variables. R^2 (coefficient of multiple determination) represents the proportion of variation in the dependent variable explained by the additive effects of independent variables.

The analysis of subsequent birth interval (1, 2, 3, 4, 5+ years) uses the same kind of tables and analysis as for the previous birth interval.

The last type of analysis deals with the probability of dying at age 35 months if the mother becomes pregnant within two years from the birth date of the previous child.

The data for this chapter is taken from The Egyptian Fertility Survey 1980. It includes all children born 3-8 years prior to the survey data. Choosing this period of 5 years provides the advantage of concentrating on children who are exposed to risk of dying or living up to age five years. It avoids the high level of mortality that was prevailing in Egypt ten years ago and also memory errors. The analysis separates rural and urban areas and lower and upper Egypt.

The index child is defined as the child whose survival or death is considered and who initiates or closes the birth interval.

The previous child is the child who immediately precedes the index child.

The subsequent pregnancy is the next pregnancy that occurs after the index child.

Previous birth interval is the duration of time between the birth of the preceding child and the birth of the index child.

Subsequent birth interval is the duration of time between the birth of the index child and the birth of the subsequent child.

The data also allows a detailed analysis of sequence of births and deaths and identifies for each child individually such characteristics as the length of previous and subsequent birth interval as well as its sex, and age at death and the death or survival of the previous child.

Tables 7.1, and 7.1a indicates the differences between urban, rural and upper, lower areas in Egypt. The birth interval is shorter in urban areas than in rural areas and also shorter in lower Egypt than in upper Egypt. These differences may be due to variation in the fecundity of the couple, breastfeeding duration, contraceptive use, mother's age at first marriage, incidence of abortion, infant mortality, desired number of children, maternal parity and some other socio-economic variables like mother and father's level of education, their occupations and their level of living. Previous studies about Egyptian fertility found that urban experience, breastfeeding duration, contraceptive use affected birth interval length. Tables 7.1 and 7.1a suggest that longer birth intervals appear with increasing parity. The increase is from 27.04 months (for interval 1-2) [interval 1-2 = interval between 1st and 2nd births] to 29.96 months (for interval 6-7). These increases in length of birth interval may be due to the implied increase in mother's age which affects her reproductive ability; she may be nearing the end of her reproductive age span when reproductive efficiency is lower and the probability of a live birth for any given pregnancy is decreased or she may have already achieved her desired number of children. The unusually long interval might be caused by social or family disruption, illness of mother or predisposition to foetal loss, all of which may be associated with increased risk to other children born in that family. Tables 7.2 and 7.2a show the effect of survival or death of previous child on the duration of closed birth interval (defined as the interval between an immediately previous birth and the subsequent pregnancy) according to place of residence. It can be seen from these tables that birth interval length is shorter after the death of a previous child than after survival. They show also that the mean duration of birth interval is decreasing more and more with the increasing parity in the case of a previous child death. In other words, infant mortality may shorten the birth interval length and this in turn may increase the risk of subsequent infant and child mortality.

Brass and Barrett point out that closer birth spacing leads to higher child mortality because short birth intervals have a detrimental effect on both the babies' and the mother's health. Armagnac and Laurentin conclude that infant mortality reduces intervals between births when the first born child dies at an early age.

It can be said that the occurrence of a short interval after an earlier child death has occurred indicates that short spacing can be a result rather than a cuase of child death. It may be expected that the birth interval length after a child death will be shorter in rural areas and shorter in upper Egypt than in lower Egypt.

Tables 7.3, 7.3a and 7.3b reveal the effect of birth interval duration on the number of children born to a woman, the number of surviving children and the number of child deaths according to different lengths of successive birth intervals (<2, 2-4, 4+ years). Figures in these tables indicate that the number of children ever born and the number of children dying decrease with increasing length of interval for all parities. At the same time child deaths increase with increasing number of births and the number surviving decreases. These results suggest that on the one hand there may be an association between mortality and fertility and on the other hand that higher fertility is associated with shorter birth interval as well as higher mortality. Children born after a short period (less than two years) are less likely to survive than the children born after a long interval (4 years and over). The mean number of living children increases with birth interval from 3.95 for birth order 1-2 to 5.94 for birth order 6-7 but there is not a straight trend with increasing length of birth interval. This may be due to the effect of both high mortality and high fertility which conceals the effect of length of interval on the survival of children. The same trend is found in all regions of Egypt (urban, rural, lower and upper) but for both numbers of children born and numbers dying they are higher in both rural and upper regions in Egypt. The excess mortality which is associated with short birth intervals may be due to premature and abrupt weaning when the mother discovers a new pregnancy, and perhaps reduces care and attention to the existing child. So the interrelationship between infant mortality, fertility and birth interval is of a complex nature. The early decease of a child may create a desire for another child. Furthermore physiological factors may also play a role, because the death of a nursed infant will end breastfeeding and this will shorten the length of post-partum amenorrhoea. It seems that a mother with repeated pregnancies does not have enough time for recovery, both physically and nutritionally, and is then more likely to suffer both pregnancy losses and lower birth weight babies and this will lead to poorer chances of survival. Rutstein 1973 concluded that the range of infant mortality levels associated with differing previous intervals was considerably greater than that associated with mother's age or parity. Hobcraft et al concluded that there was no doubt of a very powerful association between child spacing and infant and child mortality. Vallin and Lery revealed that an infant death tended to reduce the average interval between births by about 20% or 25%. Preston mentioned that the length of an average birth interval was important because it was a direct measure of fertility. Birth interval lengths are inversely related to fertility, long intervals are associated with low fertility.

7.3 The influence of the previous birth interval length on the survival of the index child

The analysis of the impact of the previous birth interval is shown in Tables 7.4-7.9. Birth interval length is subdivided as 0-11, 12-17, 18-23, 24-35, 36+ months, age at death of index child is grouped as <1, 1-5, 6-11, 12-23, 24-35 months and the surviving age is 36+ months. The tables are all constructed on the same principle, the rows represent different age groups of the index children, the columns relate to different preceding birth intervals. Each cell represents the average deaths for a given preceding birth interval for a specific age group. The rows permit a comparison of the age specific probability of dying among children born after different intervals between their birth and the previous birth. Table 7.4 shows the probability of deaths among the index children distributed according to their age at death. It shows that the probability of deaths at age <1 month ranges from .21 at birth interval length 0-11 months to .03 when the previous interval is more than 36 months. For other age groups the average probability of deaths decreases monotonically with the length of the previous interval. It finds that the probability of index children surviving to age 36 months ranges from a low of .60 when the previous birth interval is 0-11 months to a high of .91 when the previous birth interval is over 36 months. It seems that the two age groups < 1 month and 6-11 months with a previous birth interval 0-11 months suffer an excess risk of mortality. Table 7.4 explains also that for previous birth intervals of 12 months and over the risk of dying decreases for all ages up to 24 months, as the length of the previous interval increases.

These results conform with those obtained by Cleland and Callum which suggest that the risks of dying in infancy fall by about 10 per 1,000 with each monthly increment in the length of the previous interval.

The same trends can be seen in Table 7.4a for both urban and rural areas in Egypt. Moreover, it shows that in rural areas the probability of dying is higher than in urban areas. Conversely, the chance of the index child surviving up to age 36+ is higher in urban areas than in rural areas.

Tables 7.5, 7.5a reveal the impact of the length of the previous birth interval on the index child's survival where the previous child dies before the conception of the index child. A comparison between Tables 7.4 and 7.5 shows that the probability for children whose previous child dies before their conception is higher for all previous interval, (.43, .16, .12, .07, .05) comparing with (.21, .10, .08, .05, .03) respectively for the whole population. In addition, the chance of survival up to age 36+ for the index child is lower; .75 (where the previous child dies before conception of the index child) compared with .81 in Table 7.4. The lower chance of surviving where the preceding child has died may be due to either, high mortality during the neo-natal period or to the short previous birth interval. It is likely that pre-maturity or low birth weight are related to shortness of the previous birth interval. It appears that reconceiving within a short period of the death of a child at an early age does not give the mother an opportunity to recover and she will be in a depressed nutritional and health state, which in turn leads to high infant mortality.

The next Tables 7.6 and 7.6a are an attempt to find out how a previous short birth interval may lead to competition between children for care and attention and scarce resources, where the previous child survived beyond the third birthday of the index child. There is a clear decrease in mortality with the increasing length of the previous birth interval and the survival chance of the index child up to age 36+ is greater (.83).

Comparison of the results of Tables 7.6 and 7.4 reveals that the probability of deaths among index children according to their age at death do not differ much from that found in the population as a whole (Table 7.4) but the survival chance of the index child is much better (.83) where the previous child survives, than that in Table 7.4, .81. But if the results of Table 7.6 are compared with those of Table 7.5 it appears that the risk of dying < 1 decreases from .10 to .05 if the previous child survived. Similar results are found for age < 6 months; the probability of deaths decrease from .07 to .04 in the case of previous child surviving. The survival chance of the index child up to age 36+ is raised from .75 to .83 in the case of the previous child surviving. The same trend of results can be noticed in Tables 7.5a, 7.6a, where place of residence (urban and rural) is considered. It seems that the probability of dying is always higher in rural areas than in urban areas for all previous birth intervals. But the age specific probability of deaths is less when the previous child has survived than when the previous child died before the conception of the index child. The chances of the index child surviving to its third birthday is less in rural areas than in urban areas and it is higher when the previous child survived than when it had died.

Tables 7.7 and 7.7a show the impact of the previous child's death on the index child if that death occurred before the third birthday of the index child. The same trends are found, i.e. that the probability of dying at all ages decreases with the length of the previous birth interval and the survival chances of the index child up to age 36 months increases also with the birth interval length.

Comparing Table 7.7 with Table 7.5 shows that the age specific probability of death is higher in Table 7.7 than in Table 7.5 (total rows) after age 12 months for all previous birth intervals. It shows also that the overall surviving chance of the index child up to age 36 months is less (.64) than if the previous child dies before conception of the index child (.75).

It seems that the death of the previous child whether the death occurs before the conception of the index child or after his birth exposes the index child to the risk of mortality especially if the previous birth interval is less than 18 months. This may be due to different causes, biological or environmental. When the previous child dies at less than 6 months of age, the birth interval is shortened by cessation of breastfeeding especially in a society like Egypt where 94% of women breastfeed their children. This may lead to a rapid succession of pregnancies. Rapid succession of pregnancies may lead to a lowering of the physical and nutritional state of the mother. Consequently, this will result in low birth weight and high infant mortality. Another factor playing a part when the previous child dies before the index child reaches its third birthday is the lack of parents care or bad nutritional practice or prevalence of communicable disease. All these factors separately or in combination may be responsible for the excess risk of mortality if the death of the previous child is associated with a very short birth interval.

Tables 7.8, 7.8a, 7.9, and 7.9a show the influence of previous birth interval on the survival to the third birthday of male and female index children. Table 7.8 and 7.9 show that the probability of dying at age less than one month for all previous birth intervals is higher for males than for females (.07, .06). After the neo-natal and post-neo-natal period the probability of dying is higher for females than males (.05, .06), (.04, .04) but at age 24-35 the probability of dying for males and females are equal (.02, .02 respectively). The chances of survival up to the third birthday are about the same for both sexes, when the birth intervals are more than 24 months but when the birth interval is less than 24 months the survival chance of males is higher than for females. But for both sexes the survival chances increase with increasing length of the previous birth interval. The same trends are found in Tables 7.8a, 7.9a in urban and rural areas, but, as before, the probability of dying is higher in rural areas than in urban areas.

Table 7.10 examines the number of deaths at age 35 months if the mother becomes pregnant within two years from the date of birth of previous child, according to place of residence. It shows that if the mother becomes pregnant within two years the mean number of deaths is 2.02 and if she does not become pregnant it is 1.40, a difference of about .62. This high level of mortality seems to be due to two factors:

1. maternal health deterioration from a rapid subsequent pregnancy, and,

2. short periods of breastfeeding as a result of abrupt weaning.

Cleland and Sather conclude that the length of preceding birth interval emerges as a major determinant of childhood mortality. Children born after an interval of two years or less since last birth are twice as likely to perish at earlier ages as those born after four or more years. Short inter-pregnancy interval may lead to short breastfeeding duration which considered to be one of the major determinants of birth interval and an important factor for infant health. Breastfeeding is considered to be an inexpensive and appropriate source of nutrients and to stimulate strong emotional relationships between mother and child. Consequently, early termination of breastfeeding because of a new pregnancy may lead to high infant mortality as a result of malnutrition and infection.

The foregoing analysis indicates that excess mortality is related to short previous birth intervals especially if the previous child dies, either before the conception of the index child or after. The chances of survival of the index child is greater after the length of previous interval reaches 24 months and over whether or not the previous child dies or survives. The average mortality is very high during the first year and more pronounced during the first month of life of the index child. This may be caused by short birth interval and the death of previous child. The same trend can be noticed too when the place of residence is taken into account, but with higher general mortality levels in rural areas than in urban areas in Egypt.

7.4 The impact of the subsequent birth interval on Survival of the index child

Table 7.11 shows the impact of the subsequent birth interval on the survival of the index child, i.e. whether this child:

1. survives up to the fifth birthday;

2. dies after this interval has closed
   (i.e. after mother has conceived the next child);

3. dies before the interval has closed (i.e. before the
   mother's next conception).

This table shows that the longer the subsequent birth interval is the smaller the risk of the index child dying whether before or after the conception of the next child. It means that the risk of dying decreases with the prolongation of the subsequent birth interval. But the average mortality before the interval has closed is much higher (14.0) than after the interval has closed (7.7). At the same time, it seems that if the subsequent interval is short (one year) the average mortality before the interval is closed is lower (39.7) than if the index child dies after the interval has closed (74.2). It would not be expected that a new conception could lead to higher mortality of the older child than arises from the birth of newborn child when the index child will then have to compete with the newborn for a share of mother's attention and care. This high mortality also may be due to the abrupt weaning which resulted from the new conception because the duration and quality of breastfeeding is considered to be an important determinant of infant and child mortality. [See breastfeeding and Infant Mortality in next Chapter.] This early weaning with associated dangers of malnutrition may lead to a high risk of infant and child mortality. Moreover, the mortality of index children may shorten the subsequent birth interval and this will affect the next conception too. Winikoff concluded that there was a deleterious effect of the short intervals in those conceived less than a year from the birth of the index child.

De Sweemer found also some indication that there might be an increase in mortality to age 24 months if the second conception took place when the index child was between 1-11 months of age. It can be concluded that the index child death may lead to a short subsequent interval either because of the effect of the short breastfeeding period or because the death of a child may persuade parents to replace the dead child as soon as possible. Table 7.11 shows also that the chance of survival increases from 26.9 to 39.5 when the subsequent period increased from one year to two years. But this chance decreases after that point. Some studies in traditional non-contracepting societies have shown that very long intervals were associated with women near the end of their reproductive lives when their reproductive efficiency was lower and the probability of live births for any given pregnancy was decreased. Unusually long intervals also might be caused by social or family disruption, illness of the mother or predisposition to foetal loss, all of which may be associated with increased risk to other children born in the same family, independently of the effect on birth intervals.

Multiple classification analysis is designed to measure the individual contributions of both the previous and subsequent intervals separately according to age at death of the index child on his death or survival. The analysis is carried out firstly with the previous interval if the previous child dies before conception of index child, if he dies before third birthday of the index child and if he survives beyond his third birthday or is still alive. The dependent variable is the death of the index children according to age at death.

DEADO = Neo-natal death (if the child dies before age one month.

PNNDEAD = Post-neo-natal death (if the child dies before age one year)

DEAD 23 = (if the child dies before age two years) and,

DEAD 35 = (if the child dies before age three years).

The independent variables are previous birth intervals (0-11, 12-17, 18-23, 24-35, 36+ months) death of previous child or survival and the place of residence (rural/urban).

The analysis indicates the strength of the previous birth interval as a predictor of mortality at different age periods. It shows that the risk of mortality at all ages decreases with the increasing length of the previous interval (Table 7.12). Tables 7.13 and 7.14 provide the F ratios for each coefficient and the R^2 for each age group. For neo-natal mortality the overall value of F is 20.07, which is significant [$P < .03$]. Table 7.13 show also that F is highly significant for the types of previous child death (i.e. if he dies before his mother next conceives or dies after or is still alive). It seems that the previous birth interval is an important factor in determining neo-natal mortality for the index child whose next older sibling dies; whether the sibling dies before the mother's conception or after the third birthday of index child. It can be noticed too that the place of residence has no significant effect in any of these cases.

For post-neo-natal mortality it is found that the overall F ratio is significant but the effect varies with the timing of the death of the previous child. It appears that the previous birth interval has an impact on the death of the index child but between the interval and the three types of previous child death (2-way interaction) the effect is not significant.

Table 7.13 indicates that if the index child dies at less than two years of age, the overall F ratio is significant. Compairing these results with that for neo-natal or post-neo-natal death, it seems that the previous birth interval length is important for predicting neo-natal mortality and mortality during the second year of life of the index child whether the previous child dies before conception or after his third birthday or is still surviving. For child mortality at age three years, it appears that if the previous birth interval does not have a strong effect on the death or survival of the index child. In other words the survival status of the preceding child loses its predictive value for mortality during the index child's second and third years of life.

Finally, it can be mentioned that the effect of the death of the previous child, as an independent variable affecting the different age specific mortality rates of index children changes where there has not been a subsequent conception. During the index child's neo-natal period, mortality is significantly increased if the previous child dies before the index child's conception, but it is not significantly affected by the survival of the previous child after the index child reaches its third birthday. But if the previous child survives until the index child reaches its third birthday or is still alive, the mortality of the index child will be reduced.

Secondly, for the subsequent birth interval, the analyses are carried out for three variants if the index child survives to its fifth birthday or if he dies after or before the interval is closed.

Table 7.15 reveals the impact of the subsequent birth interval on the age specific mortality rates for the index child (one-way analysis).

It seems that risk of mortality decreases with the increasing length of the subsequent birth interval. It shows that after a long birth interval the risk of neo-natal mortality increases again. It may be due to biological or environmental causes, mother's age, and fecundity, illness in the family, a low standard of living and/or a large family. All or some of these factors may cause the high risk of mortality after a long period.

Multiple classification analysis here deals with age specific mortality rates of index children as dependent variables and subsequent birth intervals, survival or death of the index child before or after the interval is closed and place of residence as independent variables. Table 7.16 shows that the overall F ratio is highly significant [$P < .03$] and the F ratios for the subsequent intervals at all age groups are significant and also for the relationship between the interval and the death of the index child or his survival (2 way interactions). When the place of residence is introduced the effect is reduced but not significantly. These results may explain why the interval between the index child's birth and subsequent interval is a significant predictor of its mortality whether or not a subsequent conception has taken place. Table 7.16 shows also that the subsequent interval has no significant effect on age group 35 mortality. It seems that the subsequent interval does not have a predictive value on the risk of dying at age three years. In other words the subsequent interval has more impact on the neo-natal and post-neo-natal mortality.

Finally, it seems that previous birth interval is related to the survival of the index children in total and to the survival of index children whose previous siblings survive for at least 36 months. It is found that the previous birth interval is highly significant as a factor affecting the mortality of index child in the neo-natal and post-neo-natal period. A causal relationship seems to exist between the death or survival of the previous child and the length of the previous interval and both have an impact on the survival of the index child. A short interval whether previous or subsequent has a detrimental impact on maternal resources and competition for mother's care especially if the resources are limited. It appears that, the duration of birth interval affects the number of children born and the number of dead children and conversely it (the duration) is affected by them too. A short birth interval may therefore, be related to both high mortality and high fertility because the death of a child may persuade his parents to replace it as soon as possible and this will lead to high fertility through this replacement effect. The analysis also shows that the duration of birth interval is longer after a previous child which survives (19.75 months) and shorter (9.40 months) after a previous child dies. The survival chances seem to increase with the prolongation of the birth interval. Conversely the risk of mortality will decrease with the increasing length of birth interval.

ABBREVIATIONS

DEAD0 = Child died before age one month (neo-natal)

PNNDEAD = Post-neo-natal death (child died before one year)

DEAD23 = A child died before age 2 years

DEAD35 = A child died before age 3 years

NEXTINT = Subsequent interval (between the date of birth of index child and the date of conception of subsequent child

PREVINT = Previous birth interval

V702 = Place of Residence (urban - rural)

CHSURV = Children Survived

1 = Child survived to fifth birthday

2 = Child died after interval closed

3 = Child died before interval closed

PFPDTH = Death of Previous Child

1 = Died before conception of index child

2 = Died before third birthday of index child

3 = Died after third birthday of index child

TABLE 7.1

The Mean Duration of Subsequent Birth Intervals for Ever Married Women according to type of Place of Residence and Birth Order

INTERVAL BETWEEN BIRTH ORDERS	MEAN DURATION		
	TOTAL	URBAN	RURAL
1-2	27.04	26.69	27.29
N	6737	2851	3886
2-3	28.28	28.77	27.94
N	5618	2289	3329
3-4	29.00	29.74	28.53
N	2549	1782	2767
4-5	29.65	31.44	28.57
N	3601	1356	2245
5-6	29.49	30.15	29.11
N	2772	1015	1757
6-7	29.96	31.78	28.98
N	2012	706	1306
Total Observations	8788	3705	5083

TABLE 7.1(a)

The Mean Duration of Subsequent Birth Intervals for Ever Married Women according to Region of Residence (Lower and Upper Egypt) and Birth Order

INTERVAL	MEAN DURATION		
	TOTAL	LOWER	UPPER
Births:			
1-2	27.04	27.12	26.83
N	6737	3013	2141
2-3	28.28	28.24	27.70
N	5618	2549	1815
3-4	29.00	28.82	28.25
N	4549	2082	1506
4-5	29.65	29.45	28.15
N	3601	1666	1215
5-6	29.47	29.33	28.98
N	2772	1266	991
6-7	29.96	29.72	28.67
N	2012	912	745

NOTE: The smaller number of observations is ascribed to the fact that Cairo and Alexandria are not considered in this Table.

TABLE 7.2

Mean Duration of Closed Birth Interval Considering the Fate of the Previous Child (Dead or Alive) according to Place of Residence

INTERVAL	MEAN DURATION	N	URBAN	N	RURAL	N
Births						
1-2						
Alive	19.75	1,001	20.49	354	19.35	647
Dead	9.40	720	8.63	257	9.83	463
TOTAL	15.42	1,721	15.50	611	15.37	1,100
2-3						
Alive	20.65	801	20.00	291	21.02	510
Dead	9.11	688	8.46	260	9.51	428
TOTAL	15.32	1,489	14.56	551	15.77	938
3-4						
Alive	21.32	654	21.19	221	21.38	433
Dead	9.74	563	8.64	209	10.38	354
TOTAL	15.96	1,217	15.09	430	16.43	787
4-5						
Alive	22.02	547	23.24	166	21.49	381
Dead	8.55	457	8.26	144	8.68	313
Total	15.89	1,004	16.28	310	15.71	694
5-6						
Alive	21.23	426	28.89	133	21.38	293
Dead	7.34	328	7.42	107	7.31	221
TOTAL	15.19	754	14.88	240	15.33	514

NOTE: Closed birth interval is defined as duration between the first birth and the subsequent pregnancy

TABLE 7.2a

Mean Duration of Closed Birth Interval

Considering the Fate of the Previous Child (dead or alive)

According to Region of Residence

INTERVAL	MEAN DURATION BY MONTHS			
	LOWER EGYPT		UPPER EGYPT	
	M.D.	N	M.D.	N
Births				
1-2				
Alive	20.16	369	18.20	452
Dead	10.70	284	8.80	311
TOTAL	16.05	653	14.37	763
2-3				
Alive	23.14	289	18.65	346
Dead	9.57	283	8.99	267
TOTAL	16.53	581	14.44	613
3-4				
Alive	20.85	257	21.00	282
Dead	9.66	242	10.13	220
TOTAL	15.42	499	16.24	502
4-5				
Alive	21.50	220	21.19	240
Dead	9.65	192	7.46	195
TOTAL	15.98	412	15.03	435
5-6				
Alive	20.80	169	20.76	190
Dead	8.30	142	6.82	132
TOTAL	15.09	311	15.05	322

NOTE: Closed birth interval is defined as duration between the first birth and the subsequent pregnancy.

TABLE 7.3

Birth Interval Duration Effect on Mean

Number of Children Ever Born,

Living Children and Dead Children, In Egypt

INTERVAL LENGTH BY YEARS	CEB	LC	CD	N
Births: 1-2				
< 2	5.50	4.00	1.50	3,470
2-4	5.06	3.98	1.08	2,699
4+	4.35	3.44	.90	568
TOTAL	5.23	3.95	1.28	6,737
2-3				
< 2	6.37	4.48	1.89	2,536
2-4	5.63	4.42	1.21	2,557
4+	4.65	3.77	.88	525
TOTAL	5.87	4.38	1.49	5,618
3-4				
< 2	7.01	4.83	2.18	1,987
2-4	6.36	4.90	1.46	2,070
4+	5.44	4,36	1.08	492
TOTAL	6.55	4.81	1.73	4,549
4-5				
< 2	7.77	5.22	2.55	1,504
2-4	6.98	5.33	1.65	1,665
4+	6.21	4.84	1.37	432
TOTAL	7.21	5.22	1.99	3,601
5-6				
< 2	8.36	5.49	2.87	1,163
2-4	7.69	5.75	1.94	1,271
4+	6.97	5.33	1.64	338
TOTAL	7.88	5.59	2.29	2,772
6-7				
< 2	9.12	5.89	3.23	833
2-4	8.35	6.03	2.32	916
4+	7.77	5.81	1.96	263
TOTAL	8.59	5.94	2.65	2,012

NOTE: CEB: Children Ever Born. LC: Living Children.
CD: Dead Children.

TABLE 7.3a

Birth Interval Duration Effect on Mean Number of Children Ever Born, Living Children and Number of Deaths According to Place of Residence

INTERVAL LENGTH BY YEARS	URBAN			RURAL			N URBAN	N RURAL
	CEB	LC	CD	CEB	LC	CD		
Births								
1-2								
2	5.12	3.93	1.19	5.82	4.06	1.76	1,567	1,903
2-4	4.73	3.86	.87	5.27	4.05	1.22	1,034	1,665
4+	3.98	3.27	.71	4.63	3.58	1.05	250	318
TOTAL	4.88	3.85	1.03	5.49	4.02	1.47	2,851	3,886
2-3								
2	6.18	4.55	1.63	6.50	4.43	2.07	1,033	1,503
2-4	5.31	4.32	.99	5.84	4.48	1.36	1,008	1,549
4+	4.21	3.60	.61	5.04	3.93	1.11	248	277
TOTAL	5.58	4.35	1.23	6.07	4.41	1.66	2,289	3,329
3-4								
2	6.89	4.91	1.98	7.09	4.78	2.31	785	1,202
2-4	6.11	4.91	1.20	6.52	4.90	1.62	777	1,293
4+	5.01	4.22	.79	5.80	4.47	1.33	220	272
TOTAL	6.32	4.82	1.50	6.70	4.81	1.89	1,782	2,767
4-5								
2	7.70	5.33	2.37	7.81	5.16	2.65	523	981
2-4	6.88	5.38	1.50	7.04	5.30	1.74	628	1,037
4+	5.88	4.78	1.10	6.51	4.89	1.62	205	227
TOTAL	7.05	5.27	1.78	7.32	5.20	2.12	1,356	2,245
5-6								
2	8.17	5.62	2.55	8.46	5.43	3.03	430	733
2-4	7.59	5.78	1.81	7.74	5.74	2.00	451	820
4+	6.78	5.48	1.30	7.09	5.23	1.86	134	204
TOTAL	7.73	5.67	2.06	7.97	5.55	2.42	1,015	1,757
6-7								
2	9.15	6.01	3.14	9.09	5.82	3.27	283	550
2-4	8.15	6.10	2.05	8.45	5.99	2.46	315	601
4+	7.75	6.04	1.71	7.79	5.65	2.14	108	155
TOTAL	8.49	6.06	2.43	8.65	5.88	2.77	706	1,306

NOTE: CEB: Children Ever Born
LC: Living Children
CD: Dead Children

TABLE 7.3b

Birth Interval Duration Effect on Mean Number of Children Ever Born, Living Children and Dead Children by Regions

INTERVAL LENGTH BY YEARS AND BIRTHS	LOWER			UPPER			N LOWER	N UPPER
	CEB	LC	CD	CEB	LC	CD		
Births								
1-2								
< 2	5.46	4.16	1.30	5.99	3.91	2.08	1,479	1,124
2-4	5.23	4.21	1.02	5.09	3.71	1.38	1,300	836
4+	4.56	3.59	.97	4.55	3.46	1.09	234	181
TOTAL	5.29	4.14	1.15	5.52	3.79	1.73	3,013	2,141
2-3								
< 2	6.32	4.69	1.63	6.67	4.20	2.47	1,130	855
2-4	5.69	4.59	1.10	5.82	4.25	1.57	1,199	803
4+	4.75	3.92	.83	5.08	3.82	1.26	220	157
TOTAL	5.88	4.57	1.31	6.16	4.19	1.97	2,549	1,815
3-4								
< 2	6.95	5.04	1.91	7.30	4.54	2.76	886	686
2-4	6.39	5.08	1.31	6.54	4.68	1.86	978	675
4+	5.51	4.48	1.03	5.68	4.33	1.35	218	145
TOTAL	6.54	5.00	1.54	6.80	4.58	2.22	2,082	1,506
4-5								
< 2	7.67	5.49	2.18	8.00	4.85	3.15	677	563
2-4	6.94	5.41	1.53	7.11	5.15	1.96	811	523
4+	6.33	5.06	1.27	6.61	4.73	1.88	178	129
TOTAL	7.17	5.41	1.76	7.48	4.96	2.52	1,666	1,215
5-6								
< 2	8.26	5.71	2.55	8.59	5.18	3.41	505	447
2-4	7.75	5.98	1.77	7.70	5.37	2.33	615	426
4+	6.92	5.50	1.42	7.13	5.11	2.02	146	118
TOTAL	7.85	5.82	2.04	8.04	5.25	2.79	1,266	991
6-7								
< 2	9.03	6.19	2.84	9.22	5.47	3.75	366	327
2-4	8.41	6.31	2.10	8.39	5.66	2.73	425	336
4+	7.78	5.93	1.85	7.94	5.55	2.39	121	82
TOTAL	8.58	6.21	2.37	8.71	5.56	3.15	912	745

NOTE: CEB: Number of children ever born. LC: Living Children.
CD: Dead children

TABLE 7.4

Probability of dying by age at Death and Survival Rates to Third Birthday of Index Child by Duration of Previous Birth Interval, In Egypt

AGE AT DEATH OF INDEX CHILDREN (MONTHS)	DURATION OF PREVIOUS INTERVAL					TOTAL ROW
	0-11	12-17	18-23	24-35	36+	
< 1	.21	.10	.08	.05	.03	.06
N	305	1,114	1,311	2,162	2,123	7,015
1- 5	.08	.08	.05	.03	.02	.04
N	241	1,001	1,208	2,063	2,063	6,576
6-11	.10	.08	.05	.04	.02	.04
N	220	918	1,150	1,994	2,023	6,305
12-23	.06	.08	.05	.05	.02	.05
N	197	836	1,094	1,919	1,989	6,035
24-35	.03	.02	.03	.02	.01	.02
	184	766	1,036	1,829	1,946	5,761
Surviving 36+	.60	.64	.78	.83	.91	.81
(N)	305	1,114	1,311	2,162	2,123	7,015

NOTE:

$$\text{Probability of dying} = \frac{\text{Number of deaths between age x and x + n}}{\text{Number of living at age x}}$$

TABLE 7.4a

Probability of Dying by Age at Death and Survival to Third Birthday of Index Child by Duration of Previous Interval According to Place of Residence

AGE AT DEATH OF INDEX CHILD (MONTHS)	DURATION OF PREVIOUS INTERVAL					TOTAL
	0-11	12-17	18-23	24-35	36+	
URBAN						
< 1	.14	.05	.05	.03	.03	.04
N	97	407	424	686	851	2,465
1- 5	.07	.09	.05	.03	.02	.04
N	83	385	402	666	827	2,363
6-11	.14	.08	.05	.05	.02	.05
N	77	351	381	648	809	2,266
12-23	.03	.07	.04	.03	.02	.04
N	66	323	361	619	796	2,165
24-35	.02	.02	.03	.01	.01	.02
N	64	300	346	600	778	2,088
Surviving 36+	.65	.73	.79	.86	.90	.83
N	97	407	424	686	851	2,465
Rural						
< 1	.24	.13	.09	.05	.03	.07
N	208	707	887	1,476	1,272	4,550
1-5	.10	.08	.05	.04	.02	.04
N	158	616	806	1,397	1,236	4,213
6-11	.08	.10	.05	.03	.02	.04
N	143	567	769	1,346	1,214	4,039
12-23	.08	.09	.06	.06	.02	.05
N	131	513	733	1,300	1,193	3,870
24-35	.05	.03	.03	.02	.01	.02
N	120	466	690	1,229	1,168	3,673
Surviving 36+	.55	.64	.76	.81	.91	.79
N	208	707	887	1,476	1,272	4,550

Table 7.5

Probability of dying by age at Death and Survival to third Birthday of Index Child by Duration of Previous Birth Interval where the Previous Child died before Conception of Index Child, in Egypt

AGE AT DEATH OF INDEX CHILDREN (MONTHS)	DURATION OF PREVIOUS INTERVAL					TOTAL ROW
	0-11	12-17	18-23	24-35	36+	
<1	.43	.16	.12	.07	.05	.10
N	37	223	198	303	309	1,070
1-5	.10	.14	.09	.06	.01	.07
N	21	188	174	283	295	961
6-11	-	.07	.06	.05	.02	.05
N	19	161	159	267	292	898
12-23	-	.07	.05	.04	.03	.04
N	19	150	149	254	286	858
24-35	.05	.03	.02	.03	.01	.02
N	19	140	142	243	277	821
Surviving 36+	.49	.61	.70	.78	.89	.75
N	37	223	198	303	309	1,070

TABLE 7.5a

Probability of Dying by Age at Death and Survival to Third Birthday of Index Child and by Duration of Previous Birth Interval where the Previous Child died before Conception of Index Child by Place of Residence

AGE AT DEATH OF INDEX CHILD (MONTHS)	DURATION OF PREVIOUS INTERVAL					TOTAL
	0-11	12-17	18-23	24-35	36+	
URBAN						
< 1	.33	.10	.08	.06	.06	.08
N	9	62	63	85	102	321
1- 5	.17	.16	.07	.04	.01	.07
N	6	56	58	80	96	296
6-11	-	.04	.07	.07	.01	.04
N	5	47	54	77	95	278
12-23	-	.09	.08	.01	.01	.04
N	5	45	50	72	94	266
24-35	-	-	.04	.01	.01	.02
N	5	41	46	71	93	256
Surviving 36+	.54	.66	.70	.82	.90	.79
N	9	62	63	85	102	321
RURAL						
< 1	.46	.18	.14	.07	.04	.11
N	28	161	135	218	207	749
1- 5	.07	.14	.10	.06	.01	.07
N	15	132	116	203	199	665
6-11	-	.08	.06	.04	.03	.05
N	14	114	105	190	197	620
12-23	-	.06	.03	.06	.04	.05
N	14	105	99	182	192	592
24-35	.07	.04	.01	.04	.01	.03
N	14	99	96	172	184	565
Surviving 36+	.46	.59	.70	.76	.88	.73
N	28	161	135	218	207	749

TABLE 7.6

Probability of Dying by Age at Death and Survival to Third Birthday of Index Child and by Duration of Previous Birth Interval where the Previous Child survived after the Third Birthday of the Index Child or is still alive in Egypt

AGE AT DEATH OF INDEX CHILDREN (MONTHS)	DURATION OF PREVIOUS INTERVAL					TOTAL ROW
	0-11	12-17	18-23	24-35	36+	
< 1	.19	.08	.07	.04	.03	.05
N	176	710	988	1,778	1,783	5,435
1- 5	.07	.07	.04	.03	.02	.04
N	142	655	919	1,704	1,738	5,158
6-11	.11	.08	.05	.04	.02	.04
N	132	611	879	1,654	1,704	4,980
12-23	.08	.08	.05	.05	.02	.04
N	118	562	839	1,593	1,677	4,789
24-35	.05	.02	.02	.02	.01	.02
N	109	519	800	1,521	1,647	4,596
Surviving to Age 36	.59	.72	.80	.84	.91	.83
N	176	710	988	1,778	1,783	5,435

TABLE 7.6a

Probability of Dying by Age at Death and Survival up to Third Birthday of Index Child and by Duration of Previous Birth Interval where the Previous Child Survived after the Third Birthday of the Index Child or is still Alive according to Place of Residence

AGE AT DEATH OF INDEX CHILD (MONTHS)	DURATION OF PREVIOUS INTERVAL					TOTAL
	0-11	12-17	18-23	24-35	36+	
URBAN						
<1	.14	.03	.04	.02	.02	.03
N	59	279	328	587	740	1,993
1- 5	.08	.07	.05	.03	.02	.04
N	51	270	314	573	722	1,930
6-11	.15	.09	.05	.04	.02	.04
N	47	251	298	558	706	1,860
12-23	.03	.05	.03	.03	.02	.03
N	40	229	284	534	694	1,781
24-35	.03	.02	.03	.01	.01	.02
N	39	218	275	516	680	1,728
Surviving 36+	.64	.77	.82	.87	.91	.85
N	59	279	328	587	740	1,993
RURAL						
<1	.22	.11	.08	.05	.03	.06
N	117	431	660	1,191	1,043	3,442
1- 5	.07	.07	.04	.03	.02	.03
N	91	385	605	1,131	1,016	3,228
6-11	.08	.08	.05	.03	.02	.04
N	85	360	581	1,096	998	3,120
12-23	.10	.10	.05	.05	.02	.05
N	78	333	555	1,059	983	3,008
24-35	.06	.02	.01	.02	.01	.02
N	70	301	525	1,005	967	2,868
Surviving 36+	.56	.69	.79	.83	.92	.82
N	117	431	660	1,191	1,043	3,442

TABLE 7.7

Probability of dying by age at Death and Survival up to third Birthday of Index child and by Duration of Previous Interval where the Previous Child Died before the Third Birthday of Index Child in Egypt

AGE AT DEATH OF INDEX CHILDREN (MONTHS)	DURATION OF PREVIOUS INTERVAL					TOTAL ROW
	0-11	12-17	18-23	24-35	36+	
<1	.15	.13	.08	.06	.03	.10
N	92	180	125	81	31	509
1- 5	.12	.07	.03	.04	.10	.06
N	78	157	115	76	30	456
6-11	.13	.15	.05	.01	.04	.09
N	69	146	112	73	27	427
12-23	.07	.14	.11	.10	.15	.11
N	60	124	106	72	26	388
24-35	.02	.04	.11	.05	.05	.06
N	56	107	94	65	22	344
Surviving 36+	.60	.57	.67	.77	.68	.64
N	92	180	125	81	31	509

TABLE 7.7a

Probability of Dying by Age at Death and Survival up to Third Birthday of Index Child and by Duration of Previous Interval where the Previous Child Died before the Third Birthday of the Index Child According to Place of Residence

AGE AT DEATH OF INDEX CHILD (MONTHS)	DURATION OF PREVIOUS INTERVAL					TOTAL ROW
	0-11	12-17	18-23	24-35	36+	
URBAN						
<1	.10	.11	.09	–	–	.09
N	29	66	33	14	9	151
1- 5	.04	.10	.03	–	–	.07
N	26	59	30	13	9	137
6-11	.16	.08	.07	–	–	.08
N	25	53	29	13	8	128
12-23	.06	.16	.07	–	–	.11
N	21	49	27	13	8	118
24-35	–	.02	.07	–	–	.02
N	20	41	25	13	5	104
Surviving 36+	.69	.61	.73	–	–	.68
N	29	66	33	14	9	151
RURAL						
<1	.18	.14	.08	.07	.05	.11
N	63	114	92	67	22	358
1- 5	.15	.05	.02	.05	.09	.06
N	52	98	85	63	21	319
6-11	.11	.19	.05	.02	.05	.09
N	44	93	83	60	19	299
12-23	.08	.12	.13	.12	.06	.11
N	39	75	79	59	18	270
24-35	.03	.05	.13	.06	.06	.07
N	36	66	69	52	17	240
Surviving 36+	.56	.55	.65	.73	.73	.62
N	63	114	92	67	22	358

TABLE 7.8

Probability of Dying by Age at Death and Survival up to Third Birthday of Male Index Child, by Duration of Previous Birth Interval in Egypt

AGE AT DEATH OF INDEX CHILDREN (MONTHS)	DURATION OF PREVIOUS INTERVAL					TOTAL ROW
	0-11	12-17	18-23	24-35	36+	
<1	.26	.12	.09	.05	.03	.07
N	169	578	675	1,103	1,097	3,622
1- 5	.07	.08	.05	.04	.02	.04
N	125	509	617	1,051	1,067	3,369
6-11	.07	.09	.05	.03	.02	.04
N	116	467	587	1,009	1,042	3,221
12-23	.07	.08	.03	.05	.01	.04
N	108	427	558	980	1,025	3,098
24-35	.02	.02	.03	.02	.01	.02
N	101	394	542	936	1,011	2,984
Surviving 36+	.59	.67	.78	.83	.91	.81
N	169	578	675	1,103	1,097	3,622

TABLE 7.8a

Probability of Dying by Age at Death and Survival up to Third Birthday of Male Index Child by Duration of Previous Birth Interval according to Place of Residence

AGE AT DEATH OF INDEX CHILD (MONTHS)	DURATION OF PREVIOUS INTERVAL					TOTAL ROW
	0-11	12-17	18-23	24-35	36+	
URBAN						
<1	.20	.06	.07	.04	.02	.05
N	51	203	211	345	434	1,244
1- 5	.05	.10	.05	.03	.03	.05
N	41	190	197	332	425	1,185
6-11	.10	.05	.06	.03	.02	.04
N	39	171	187	322	411	1,130
12-23	.03	.06	.02	.03	.01	.03
N	35	162	176	315	403	1,091
24-35	-	.01	.04	.01	.01	.01
N	34	153	172	306	398	1,063
Surviving 36+	.67	.74	.79	.88	.91	.84
N	51	203	211	345	434	1,244
RURAL						
<1	.29	.15	.10	.06	.03	.08
N	118	375	464	758	663	2,378
1- 5	.08	.07	.05	.04	.02	.04
N	84	319	420	719	642	2,184
6-11	.05	.11	.05	.03	.01	.04
N	77	296	400	687	631	2,091
12-23	.08	.09	.03	.05	.02	.04
N	73	265	382	665	622	2,007
24-35	.03	.03	.02	.03	.02	.04
N	67	241	370	630	613	1,921
Surviving 36+	.55	.62	.78	.81	.91	.79
N	118	375	464	758	663	2,378

TABLE 7.9

Probability of Dying by Age at Death and Survival up to Third Birthday of Female Index Child, by Duration of Previous Birth Interval in Egypt

AGE AT DEATH OF INDEX CHILDREN (MONTHS)	DURATION OF PREVIOUS INTERVAL					TOTAL ROW
	0-11	12-17	18-23	24-35	36+	
<1	.15	.08	.07	.04	.03	.06
N	136	536	636	1,059	1,026	3,393
1- 5	.10	.08	.05	.03	.02	.04
N	116	492	591	1,012	996	3,207
6-11	.14	.09	.05	.05	.02	.05
N	104	451	563	985	981	3,084
12-23	.07	.09	.08	.05	.03	.06
N	89	409	536	939	964	2,937
24-35	.06	.02	.02	.02	.02	.02
N	83	372	494	893	935	2,777
Surviving 36+	.57	.68	.76	.83	.91	.80
N	136	536	636	1,059	1,026	3,393

TABLE 7.9a

Probability of Dying by Age at Death and Survival up to Third Birthday of Female Index Child, by Duration of Previous Birth Interval according to Place of Residence

AGE AT DEATH OF INDEX CHILD (MONTHS)	DURATION OF PREVIOUS INTERVAL					TOTAL ROW
	0-11	12-17	18-23	24-35	36+	
URBAN						
<1	.09	.04	.04	.02	.04	.04
N	46	204	213	341	417	1,221
1- 5	.10	.08	.05	.02	.01	.04
N	42	195	205	334	402	1,178
6-11	.18	.11	.05	.07	.01	.05
N	38	180	194	326	398	1,136
12-23	.03	.09	.06	.03	.03	.05
N	31	161	185	304	393	1,074
24-35	.03	.02	.02	.02	.02	.02
N	30	147	174	294	380	1,025
Surviving 36+	.63	.71	.80	.85	.90	.82
N	46	204	213	341	417	1,221
RURAL						
<1	.18	.11	.09	.06	.03	.07
N	90	332	423	718	609	2,172
1- 5	.11	.09	.04	.03	.02	.04
N	74	297	386	678	594	2,029
6-11	.12	.09	.05	.04	.02	.04
N	66	271	369	659	583	1,948
12-23	.09	.09	.09	.06	.03	.06
N	58	248	351	635	571	1,863
24-35	.08	.03	.03	.02	.01	.02
N	53	225	320	599	555	1,752
Surviving 36+	.54	.66	.74	.82	.90	.79
N	90	332	423	718	609	2,172

TABLE 7.10

The Death Rates at Age 35 Months

When the Mother becomes Pregnant within

Two Years from the Date of Birth of the Previous Child

According to Place of Residence

CONCEIVE WITHIN TWO YEARS	URBAN	RURAL	TOTAL
Yes	1.56	2.25	2.02
N	2,485	1,284	3,769
No	1.22	1.50	1.40
N	738	1,269	2,007
Difference	0.34	0.75	0.62

TABLE 7.11

The Impact of Subsequent Birth Interval*

On the Survival or Death of the Index Children

According to Place of Residence

VARIABLE		LENGTH OF INTERVAL TO NEXT CONCEPTION (YEARS)					TOTAL
		1	2	3	4	5+	
Child survived to fifth birthday		26.9	39.5	19.4	7.0	7.2	78.3
	N	837	1,228	605	218	224	3,112
Child died after interval closed		74.2	20.6	4.6	0.7	-	7.7
	N	227	63	14	2	0	306
Child died before interval closed		39.7	31.4	14.7	7.7	6.5	14.0
	N	221	175	82	43	36	557
TOTAL		1,285	1,466	701	263	260	3,975
		32.3	36.9	17.6	6.6	6.5	100
URBAN							
Child survived to fifth birthday		27.9	35.5	19.1	8.6	8.9	80.4
	N	312	397	214	96	100	1,119
Child died after interval closed		76.3	17.5	5.2	1.0	-	7.0
	N	74	17	5	1	0	97
Child died before interval closed		38.1	34.1	14.8	8.5	4.5	12.6
	N	67	60	26	15	8	176
TOTAL		453	474	245	112	108	1,392
		32.5	34.2	17.6	8.0	7.8	100
RURAL							
Child survived to fifth birthday		26.3	41.7	19.6	6.1	6.2	77.2
	N	525	831	391	122	124	1,993
Child died after interval closed		73.2	22.0	4.3	0.5	-	8.1
	N	153	46	9	1	0	209
Child died before interval closed		40.4	30.2	14.7	7.3	7.3	14.8
	N	154	115	56	28	28	381
TOTAL		832	992	456	151	152	2,583
		32.2	38.4	17.7	5.8	5.9	100

* Subsequent Birth Interval = Interval to next conception = Date of following pregnancy - pregnancy length (9) - date of event.

TABLE 7.12

The Impact of Previous Interval on the

Death of the Index Child

DEPENDENT VARIABLES	DURATION OF PREVIOUS INTERVAL					GRAND MEAN
	0-11	12-17	18-23	24-35	36+	
DEAD0	20.98	10.15	7.86	4.58	2.83	6.26
N	305	1,113	1,311	2,162	2,123	7,014
PNNDEAD	18.26	16.40	9.44	6.98	3.50	8.21
N	241	1,000	1,208	2,063	2,063	6,575
DEAD23	6.60	8.37	5.30	4.69	2.16	4.54
	197	836	1,094	1,919	1,989	6,035
DEAD35	3.80	2.35	2.61	2.08	1.28	2.00
N	184	766	1,036	1,829	1,946	5,761

NOTE:

DEAD0 = Neonatal Mortality (before age one month)

PNNDEAD = Post-neo-natal Mortality (before reaching 12 months)

DEAD23 = Infant died before its second birthday

DEAD35 = Children died before reaching 3 years old

TABLE 7.13

F Statistics for Previous Birth Interval and Death of Previous Child and Type of Place of Residence

VARIABLE	MAIN EFFECTS	PREVINT	PFPDTH	V702	TWO-WAY INTER-ACTION	PREVINT AND PFPDTH	PREVINT AND V702	PFPDTH AND V702	N
DEADO									
N									8,718
F	40.14	45.77	16.47		5.012	5.012			
Signif of F	0.000	0.000	0.000		0.000	0.000			
F	37.94	45.44	15.11	23.39	4.44	4.61	5.56	1.05	
Signif of F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.48	
Missing cases									1,704
PNNDEAD									
N									8,718
F	34.294	40.39	6.70		2.52	2.52			
Signif of F	0.000	0.000	0.001		0.010	0.010			
F	29.47	40.38	6.84	.57	1.79	2.66	0.45	2.07	
Signif of F	0.000	0.000	0.001	.449	.034	.006	.775	.127	
Missing cases									2,143

TABLE 7.13 (continued)

VARIABLE	MAIN EFFECTS	PREVINT	PFPDTH	V702	TWO-WAY INTER-ACTION	PREVINT AND PFPDTH	PREVINT AND V702	PFPDTH AND V702	N
DEAD23									
N									8,718
F	14.43	10.40	13.99		1.31	1.31			
Signif of F	0.000	0.000	0.000		0.234	0.234			
F	13.23	10.25	13.64	5.91	1.31	1.37	1.79	1.00	
Signif of F	0.000	0.000	0.000	0.15	.192	.206	.127	.370	
Missing cases									2,683
DEAD35									
N									8,718
F	5.03	1.32	9.74		3.05	3.05	3.90		
Signif of F	0.000	0.259	0.000		0.002	0.002	0.000		
F	4.52	1.25	9.52	1.42	2.57	2.86	0.94	3.40	
Signif of F	0.000	0.286	0.000	0.234	0.001	0.004	0.438	0.034	
Missing Cases									2,957

TABLE 7.14

Adjusted and Unadjusted Infant and Child Mortality by Previous Birth Interval, Death of Previous Child and Place of Residence

VARIABLE AND PLACE OF RESIDENCE	DEAD0			PNNDEAD			DEAD23			DEAD35		
	N	UNAD-JUSTED	AD-JUSTED FOR INDE-PENDENT	N	UNAD-JUSTED	AD-JUSTED FOR INDE-PENDENT	N	UNAD-JUSTED	AD-JUSTED FOR INDE-PENDENT	N	UNAD-JUSTED	AD-JUSTED FOR INDE-PENDENT
PREVINT												
0-11	305	20.98	20.88	241	18.25	17.6	197	6.6	5.17	184	3.81	2.97
12-17	1,113	10.15	9.84	1,000	16.4	15.99	836	8.37	7.87	766	2.35	2.05
18-23	1,311	7.86	7.84	1,208	9.43	9.36	1,094	5.3	5.11	1,036	2.61	2.50
24-35	2,162	4.58	4.68	2,063	6.98	7.11	1,919	4.69	4.85	1,829	2.08	2.17
36+	2,123	2.92	2.92	2,063	3.56	3.77	1,989	2.16	2.47	1,946	1.29	1.46
PFPDTH												
1	1,070	10.19	10.06	961	10.72	10.74	858	4.31	4.22	821	2.32	2.33
2	509	10.41	6.57	456	14.91	10.81	388	11.34	10.1	344	5.53	5.22
3	5,435	5.1	5.48	5,158	7.15	7.56	4,789	4.03	4.15	4,596	1.68	1.70
	R^2 = .033 R = .182			R^2 = .030 R = .174			R^2 = .014 R = .119			R^2 = .005 R = .07		
Urban	2,465	4.14	4.39	2,363	8.38	8.55	2,165	3.56	3.68	2,088	1.63	1.71
Rural	4,549	7.41	7.27	4,212	8.12	8.02	3,870	5.09	5.03	3,673	2.21	2.17
	R^2 = .036 R = .190			R^2 = .030 R = .174			R^2 = .015 R = .123			R^2 = .005 R = .074		
	GRAND MEAN = 6.26			GRAND MEAN = 8.21			GRAND MEAN = 4.54			GRAND MEAN = 2.00		

TABLE 7.15

The Impact of Subsequent Interval

On the Survival of the Index Child

DEPENDENT VARIABLE	DURATION OF SUBSEQUENT INTERVAL (YEARS)					GRAND MEAN
	1	2	3	4	5+	
DEAD0	12.83	3.73	2.89	4.11	4.15	6.56
N	2,191	2,518	1,246	487	337	6,779
PNNDEAD	14.66	6.81	4.05	6.85	4.33	8.53
N	1,910	2,424	1,210	467	323	6,334
DEAD23	6.87	4.60	3.88	3.45	2.27	4.88
N	1,630	2,259	1,161	435	309	5,794
DEAD35	2.50	1.48	1.08	2.14	1.32	1.72
N	1,518	2,155	1,116	420	302	5,511

DEAD0 = Neo-natal Mortality (before age one month)

PNNDEAD = Post-neo-natal Mortality (before reaching 12 months)

DEAD23 = Infant died before its second birthday

DEAD35 = Children died before reaching 3 years old

TABLE 7.16

F Statistics for Subsequent Birth Interval and

Survival or death of Index Child according to Place of Residence

VARIABLE	MAIN EFFECT	NEXTINT	CHSURV	V702	TWO-WAY INTER-ACTION	NEXTINT AND CHSURV	N
DEAD0							
N							8,718
F	753.28	46.10	2,074.63		108.65	108.65	
Signif F	0.000	0.000			0.000	0.000	
F	583.10	41.75	1,858.2	9.84			
Signif F	0.000	0.000	0.000	0.002			
Missing							1,939
PNNDEAD							
N							8,718
F	1,770.63	45.14	5,108.77		174.55	174.55	
Signif F	0.000	0.000	0.000		0.000	0.000	
F	1,275.33	37.68	4,293.06	6.96			
Signif F	0.000	0.000	0.000	0.008			
Missing							2,384
DEAD23							
N							8,718
F	2,077.29	9.83	6,193.25		162.86	162.86	
Signif F	0.000	0.000	0.000		0.000	0.000	
F	1,524.41	8.42	5,292.53	0.000			
Signif F	0.000	0.000	0.000	0.991			
Missing							2,924
DEAD35							
N							8,718
F	1,621.29	3.36	4,849.59		218.38	218.38	
Signif F	0.000	0.009	0.000		0.000	0.000	
F	1,160.39	2.76	4,044.67	0.280			
Signif F	0.000	0.025	0.000	0.59			
Missing							3,207

TABLE 7.17

Adjusted and Unadjusted Survival Chances by Subsequent Birth Interval and Place of Residence

VARIABLE AND PLACE OF RESIDENCE	DEADO			PNNDEAD			DEAD23			DEAD35		
	N	UNAD-JUSTED	AD-JUSTED FOR INDE-PENDENT	N	UNAD-JUSTED	AD-JUSTED FOR INDE-PENDENT	N	UNAD-JUSTED	AD-JUSTED FOR INDE-PENDENT	N	UNAD-JUSTED	AD-JUSTED FOR INDE-PENDENT
NEXTINT												
1 Year	2,191	12.82	11.15	1,910	14.66	12.83	1,630	6.87	6.06	1,518	2.50	2.02
2	2,518	3.73	4.47	2,420	6.81	7.29	2,259	4.60	5.06	2,155	1.48	1.93
3	1,246	2.88	4.33	1.210	4.05	5.81	1,161	3.87	4.09	1,116	1.07	1.27
4	487	4.10	3.57	467	6.86	6.21	435	3.44	3.06	420	2.14	1.45
5+	337	4.15	4.89	323	4.34	6.04	309	2.26	2.9	302	1.32	.74
CHSURV												
1	5,350	0.00	0.34	5,350	0.00	0.19	5,350	0.00	.01	5,350	0.00	0.00
2	467	6.06	4.10	434	34.11	31.31	286	54.19	53.49	131	54.96	54.8
3	969	42.82	42.35	550	71.28	71.66	158	81.01	81.72	30	76.66	77.21
	R^2 = .38 R = .61			R^2 = .59 R = .77			R^2 = .65 R = .81			R^2 = .60 R = .77		
Urban	2,347	4.73	5.53	2,236	8.81	9.34	2,014	3.87	4.88	1,960	1.27	1.64
Rural	4,432	7.53	7.15	4,098	8.37	8.09	3,761	5.43	4.88	3,551	1.97	1.76
	R^2 = .38 R = .61			R^2 = .59 R = .77			R^2 = .65 R = .81			R^2 = .60 R = .77		
	Grand Mean = 6.56			Grand Mean = 8.53			Grand Mean = 4.88			Grand Mean = 1.72		

CHAPTER EIGHT

Infant Mortality and Lactation in Egypt

8.1 Introduction

It is generally accepted that infant mortality has an effect on the reproductive behaviour of women who suffer the loss of their children by death. This effect may be physiological or attitudinal and behavioural. The death of infants may shorten post-partum amenorrhoea by interrupting lactation. Demographic interest in breastfeeding has been concerned with the possible impact on population growth. The length of time a mother continues to nurse her baby can affect the spacing and number of additional children she has during her reproductive period. This may mean that the connection between fertility and infant and child mortality is particularly strong in societies where most women nurse their babies.

In many developing countries where efficient contraceptive use is still low, prolonged breastfeeding may be responsible for a longer period of protection from pregnancy. The sterility period after birth (post-partum amenorrhoea) may last between 2-3 months after giving birth. Lactation can further delay the return of ovulation and increase the length of time between births. Breastfeeding can thus affect fertility; by acting as a contraceptive and by increasing the length between births it will indirectly limit the number of children born. Lactation may thus be considered to be one of the indirect determinants of birth interval. It affects the birth interval through the time elapsed before a woman regains her ability to conceive, which in turn may have an influence on breastfeeding. Many women completely wean their children only when they become pregnant again.

In developed countries breastfeeding is now widely recognized as being not only more natural but more healthy both physically and emotionally. It is important to infant nutrition, morbidity and mortality. Human milk alone provides all the necessary nutritional needs for infants (no artificial foods can do so completely) and it transmits antibodies from mother to child which protect the infant in the first six months from certain infectious disease. Moreover, the physical contact involved in nursing promotes an emotional bonding between mothers and babies.

A large and growing body of evidence in previous studies have indicated that there is a relationship between breastfeeding and the well-being of infants and their survival. Likewise, there is a relationship between breastfeeding duration and birth interval through its effect on the post-partum amenorrhoea which is considered one of the three components of birth interval (duration of post-partum amenorrhoea, menstruating interval and duration of gestation).

Davanzo and Butz, 1978, studied the factors influencing fertility and infant mortality in Malaysia and concluded that length of breastfeeding was positively related to the probability that a child will survive its first year. Full breastfeeding (when no other food or beverage was given to the child) was more effective than partial breastfeeding in promoting child survival and it was more effective in delaying the return of ovulation.

Goldberg and others, 1984 in their paper used multivariate techniques to examine the relationship between the failure to breastfeed and mortality among infants in four states of North-East Brazil. They found that breastfed children were significantly more likely to survive infancy than children who were never breastfed even when other socio-economic, demographic and health variables were taken into account. Failure to breastfeed also resulted in shortening of the intervals between births, and shorter birth interval were themselves associated with increased morbidity and mortality. They mentioned also that there was evidence that breastfeeding did, in fact, affect levels of infant mortality in the developing world. The experience of countries like Egypt, Chile, Guatemala and Malaysia was also that mortality of infants who had never been breastfed was substantially higher than that of breastfed babies.

Knodel and Walles, 1967 in their study of breastfeeding, fertility and infant mortality mentioned that there was a strong inverse relationship between breastfeeding and infant mortality. They showed that, in the areas where breastfeeding was customary, considerably lower levels of infant mortality were experienced than in areas where breastfeeding was avoided. Infant mortality in turn showed a strong association with fertility. The death of an infant would terminate breastfeeding and that would lead to a shorter birth interval and thus, in the absence of contraception, would increase fertility.

Friedlander, 1979 studied the effect of child mortality on fertility. He concluded that following the death of an infant, breastfeeding was discontinued and ovulation was likely to be resumed sooner, so that if contraception was not practised an earlier pregnancy could be expected. Therefore, a decline in child mortality would tend to widen inter-birth intervals and lead to a decline in fertility. The longer breastfeeding was continued the stronger the survival chances of the nursed child and the more apparent the physiological effect of child mortality on fertility.

Scrimshaw, 1978, in her study of infant mortality and behaviour in the regulation of family size, revealed that breastfeeding infants experienced lower mortality risks than artificially fed infants both in the currently developed countries and in the contemporary developing world. The advantages of breastfeeding for infant survival appeared greater during the early months of life and diminished or even disappeared by the end of the first year.

In the 1983 summary of findings of the Egyptian Fertility Survey 1980, it was mentioned that the cessation of breastfeeding induced by an early infant death might hasten the return of ovulation and reduce the interval to the next conception. Short birth intervals were themselves associated with higher risks for both children, especially for the child born at the end of the interval. When an infant was not breastfed or was weaned at a younger age, both higher mortality and shorter birth intervals were indicated. It was also found that among urban women breast milk was substituted by bottled milk which resulted in excess infant mortality. The survey revealed also that breastfeeding was an important factor in relation to child health and mortality in Egypt.

Hefnawi and others, 1972 in their study of lactation patterns in Egyptian women revealed that lactation was an extremely important process in Egypt as more than 95% of Egyptian mothers breastfed their babies for at least 6 months. Also, mothers refused contraceptive methods either because they were afraid of suppressing lactation or they believed that lactation could protect them against pregnancy; some of them continued lactation for three years.

Janowitz and others, 1983, in their study on breastfeeding and child survival in Egypt based on data collected in 1977 and 1978, using the maternity records of hospitals and maternity centres and other health service facilities, concluded that early cessation of breastfeeding was associated with higher mortality and the effects were more severe, the lower the educational level of the mother. Breastfeeding, at least through the first year of life, was associated with increased survival. Babies who are breastfed for 15-20 months had a survival probability of 93% while babies who were never breastfed had a survival probability of only 64%. The effect of breastfeeding on child survival was more pronounced if the mother had no education. The children of better educated mothers suffered only slightly higher mortality as a result of early weaning, but the result of terminating breastfeeding early for poorly educated mothers was disastrous. The authors also mentioned in their study that in less developed countries, the breastfeeding pattern influenced the incidence of the three leading causes of infant and child mortality: malnutrition, infection and high fertility.

Mench, 1985, after studying the effect of child mortality on contraceptive use and fertility mentioned that if child mortality was partially determined by breastfeeding, then a spurious association between child mortality and fertility might arise simply because the mother suffering a child death was likely not to have breastfed that child and was therefore likely not to breastfeed subsequent children. However, if a woman became aware of the beneficial impact of breastfeeding on child survival she might choose to breastfeed precisely because a previous child died. It was found that in Malaysia women responded to child mortality by extending the period of breastfeeding for a subsequent birth.

Cantrelle, Ferry and Mondot, 1978, in their study about lactation and post-partum amenorrhoea in tropical Africa concluded that across countries as well as within countries the later the average weaning age, the longer the average birth interval. They revealed also that the death of an infant which was equivalent to weaning, had an impact on fertility. Their results consistently showed that death of an infant led to a short interval between that birth and the next. In general, the longer the period of breastfeeding the longer the period of amenorrhoea. Moreover, they noticed that breastfeeding lengthened birth intervals and consequently reduced fertility through physiological phenomena examplified by post-partum amenorrhoea.

Ware, 1977, in her study of the relationship between infant mortality and fertility mentioned that in most developing countries where prolonged breastfeeding was quite common, a decrease in infant and child mortality tends to increase the lactational period of mothers, because lactation extended the average duration of amenorrhoea up to 9 or 10 months.

Huffman, 1984 studied the determinants of breastfeeding in developing countries. She showed that breastfeeding played an important role in developing countries because of its relationship with child health and birth spacing. She concluded that breastfeeding had a significant impact on reducing mortality in infancy. Aside from this major role, breastfeeding was equally important in controlling fertility in developing countries. Post-partum infertility associated with the practice of breastfeeding was a major determinant of spacing between births with resulting reduction in overall fertility levels.

Winikoff, 1983 in his study of the birth spacing on child and maternal health mentioned that in developing societies, traditional lactation practices produced birth spacing patterns that for most children, avoided the worst hazards of short intervals. In such cases family planning propoganda might not need to emphasize birth spacing for improved child health as long as lactation patterns could be maintained. He also showed the importance of lactation for the health of children in high fertility/high mortality countries. If traditional lactation patterns were abandoned in these countries, children would be subjected to the double jeopardy of greater likelihood of birth after a short interval and the nutritional, immunological detriment of lack of mother's milk in an unfavourable environment.

This review of studies suggests the following hypotheses:

1. (a) there may be a strong inverse relationship

between breastfeeding and infant mortality;

(b) whether or not mothers breastfeed their children may affect their survival chances;

(c) shortening the duration of breastfeeding may lead to excess infant mortality. At the same time infant mortality may interrupt lactation and shorten the post-partum amenorrhoea which leads to a short birth interval which in turn leads to a high risk of infant mortality.

2. Mother's age at birth, sex of the child, time since last birth, mother's level of education, mother's last occupation since marriage and place of residence may all affect the breastfeeding duration may therefore be used as independent variables to test their effect on breastfeeding duration.

These hypotheses will be examined in the light of data from EFS (Egyptian Fertility Survey) 1980. The EFS questionnaire focuses on birth history and collects background and breastfeeding information only for the last two births. Specifically, the woman is asked whether she breastfed each of her last two children and if so for how long (in months). The period concerned here is 12 years prior to the survey date, i.e. all children born through this period were included in the analysis. Measuring breastfeeding is a difficult task as shown by the different measurements used in this section, and the quality of the data limits the scope of analysis. In addition to the different biases obtained when using data pertaining to the open and closed intervals, the reliability of the data remains doubtful, especially in view of the heaping at certain values in the observed distribution of the closed interval. This heaping also appears in reporting the breastfeeding duration which is found to be 6, 12,18 . . . months, as if it is often a multiple of 6.

8.2 Plan of Analysis

The pattern which is used here is confined to women with a period of twelve months or more since last birth and with the previous number of births less than or equal to two. Children who survived less than one year are excluded on the grounds that the breastfeeding period will be very short that it may bias the results. Multiple births are considered as one birth.

Breastfeeding duration is considered first through the open birth interval, if the mother is still breastfeeding her child until the date of the survey. Secondly, it is observed also through the last closed birth interval if she has two births. Moreover, the breastfeeding duration until the death of the child is taken into account. But, it is found that some strange results are reached as to the breastfeeding duration especially if the child died because when the duration is counted it sometimes has a longer duration than the child's age at death.

This error is corrected within the model itself by applying a constraint to ensure that the duration of breastfeeding does not exceed the period of survival. This error may be attributed also to digital preference, i.e. that respondents have a greater preference for certain time units whether the child died or is still alive. To get rid of this heaping error the breastfeeding duration is scored as follows:

Ever-breastfed takes 0 and no breastfeeding takes 1. Infant mortality takes 1 if the child survived less than one year and 0 if he survived. After the pattern was computed, it was found that the results were not reliable enough. So further adjustments were made; for example, ever-breastfeeding is grouped into less than six months and six months and over. The time since index birth was divided into two groups: less than 5 years and 5 and more years. Mother's age at birth was grouped in three groups < 25, 25-34 and 35+ years. Mother's level of education was also grouped in three classes according to the percentage of women in each group. Three groups were considered: illiterate, no school; illiterate with some school, can read and write; and primary or more school. Mother's last occupation since marriage was grouped as follows: did not work; professional; clerical; sales; agricultural; self-employed; and skilled and unskilled. The unit of measurement was the child.

The analysis was carried out in two stages:

First: A descriptive analysis for the variables used in the multiple classification analysis for those who were ever-breastfed and for breastfeeding duration. Cross-tabulation were calculated to test for any apparent associations between breastfeeding, infant mortality, and other variables.

Secondly: MCA (Multiple Classification Analysis) was used to discover the effect of infant mortality on breastfeeding and breastfeeding duration. This technique was selected for its ability to handle non-interval variables and non-linear relationships. Since MCA is a form of dummy variable regression, the implied model is additive rather than interactive, but interaction terms may be included as independent variables. The explanatory or background variables consist of a mixture of scaled continuous variable as age at birth, dichotomous variables (type of place of residence) and categorical variables like mother's level of education and occupations and these variables have a complex pattern of intercorrelations.

Separate calculations were performed for lower and upper areas in Egypt after calculations had been made for the sample as a whole. This separation was done to find out whether the effects of breastfeeding and other variables differ in lower and upper Egypt areas and to reduce the danger of multicollinearity between the explanatory variables. Various models were designed for this analysis, the first was about women who ever-breastfed their children, the second used breastfeeding duration in general, the third examined the breastfeeding duration of six months, the fourth tested both together women who ever-breastfed their children and for six months.

All the former dependent variables were used with time since last birth, mother's age, mother's level of education, mother's last occupation infant mortality and place of residence as independent variables.

The effect of breastfeeding and infant mortality on the last closed birth interval was calculated too, taking into consideration the death or survival of the child next to the last birth, and sex by place of residence. This model considered all births that occurred five years prior to the survey date.

The interest in studying breastfeeding is aroused from its effect on fertility and infant and child mortality. Breastfeeding a child is associated with a delay in the return of ovulation and consequently in the biological capacity to conceive. In Egypt, the use of contraceptives is still low especially in rural areas, therefore, breastfeeding may extend the interval to the next conception and eventually affect a woman's fertility. Moreover, the mechanism through which infant mortality may affect fertility is breastfeeding, because the death of an infant before it is weaned may reduce the period of non-susceptibility to conception. It is found that most infants in Egypt are breastfed (93%) for a period of at least 11 months on average and they are not weaned before 17 months.

8.3 Breastfeeding and Mortality

Table 8.1 reveals that the percentage of mothers who ever breastfed their children in the longer period (5+ years) prior to the date of survey was higher than at present. The percentage of women who breastfed their children according to mother's age increases from 96 per cent at age < 25 years to 97 per cent at age 35+ years and increases from 93.79 per cent to 98.20 per cent between urban and rural areas respectively. In the Egyptian Fertility Survey report, it was observed that among women living in the modern urban areas, there was a tendency to breastfeed fewer children and for a shorter period. The traditional pattern of universal and prolonged lactation appears in rural areas, especially in upper Egypt. Table 8.1 shows also that the percentage of women who breastfeed their children decreases with the increasing level of education from 97.74 per cent for illiterate women to 88 per cent for primary and over. The right hand side of Table 8.1 shows the mean duration of breastfeeding according to different variables. It is found that the breastfeeding duration increases with mother's age, this increase may indicate the biological effect of maternal age on reproductive ability (which decreases with the age), and also the breastfeeding effect on post-partum amenorrhoea. It can be noticed also that the breastfeeding duration is longer in rural areas than in urban areas (19.03, 14.89 months respectively) and it is shorter for educated women than that for illiterate women (23.11, 7.33 months respectively). It may seem that with modernization and higher education levels women breastfeed fewer infants and for shorter periods. Table 8.2 shows the percentage of women who breastfed their children and the mean duration of breastfeeding according to some selected variables. Table 8.1 and Table 8.2 are alike except that Table 8.2 concentrates on lower and upper Egypt. It seems that the percentage of women who breastfed their children in the long past (5+ years) is larger in upper Egypt than in lower; it is even larger than the whole sample (Table 8.1).

Likewise, the mean duration of breastfeeding is also longer in the past than now especially in upper Egypt. It seems that the percentage of women who breastfeed their children according to mother's age has changed slightly in lower Egypt but it has not changed in upper Egypt and it is higher in upper than in lower Egypt. The breastfeeding duration is longer in upper Egypt than in lower Egypt up to age group 35+. Table 8.2 also shows the difference in the percentage of women who ever breastfed their children according to mother's level of education. The percentage decreases with increasing level of education. But in upper Egypt the percentage is always higher than in lower Egypt and at the level of primary and over, it is lower in upper than in lower Egypt. The breastfeeding duration also decreases with the level of education but it is longer in upper than in lower Egypt. These differences between upper and lower Egypt may be due to different characteristics. Upper Egypt is characterized by a high illiteracy rate especially among females with a negligible female participation rate in the labour force, a high level of infant and child mortality, a high rate of out-migration and a traditional farming life, shortage of purified water and shortage of health services and care centres for mothers and their children. Table 8.3 reveals the effect of breastfeeding on children who died during their first year of life. It can be noticed that mortality is higher for children whose mothers had their last birth before age 25 years, women with less than a complete primary education and women who lived in rural areas. Mortality is lower for children whose mothers are educated, having a desk job and living in urban areas. It is shown at the head of Table 8.3 that the association between breastfeeding and mortality is present for those born five years ago and further in the past it is less than in the recent five years.

This may be due to the increasing urbanization that is taking place in Egypt now that both the percentage of women and the duration of breastfeeding are decreasing with urbanization. Another possibility is that breastfeeding and infant mortality have both changed, but they are not related to each other and this may be classified by the multiple classification analysis.

Table 8.4 shows the association between infant mortality and breastfeeding in both areas of lower and upper Egypt. It appears that infant mortality for those who ever breastfed their children in lower Egypt does not change with mother's age or education or occupation but in upper Egypt some changes in mortality can be seen with mother's age and occupation but not with mother's level of education. This may be due to the fact that the majority of women (about 71% of the cases) are illiterate.

In Table 8.5 breastfeeding duration is divided into two groups to avoid the heaping effect on breastfeeding duration. It is divided into: less than 6 months and 6 and over months. This may help to show the effect of breastfeeding duration on infant mortality. Table 8.5 indicates a strong association between breastfeeding duration and infant mortality. Women whose children were breastfed less than six months were exposed to higher risks of mortality (.09) than those who were breastfed more than six months (.06). This may explain the importance of mother's milk to an infant during the first few months of life. Mother's milk provides not only the necessary nutritional needs for infant but it also transmits antibodies that protect the child from certain infectious diseases in the first few months of life.

Table 8.5 reveals also that among all the selected variables, infant mortality is higher for those who were breastfed less than six months and decreases for those who were breastfed more than six months. It is even higher in rural areas (.13) than in urban areas (.08) and for illiterate women (.14). It decreases to .06 for those who were breastfed more than six months. For mother's age < 25 it reaches .11 and decreases to .07 with more than six months of mother's milk. For the recent 5 years prior to the survey, it appears that infant mortality is less than .06 for those who breastfed more than six months as compared with .09 for those who breastfed less than six months.

It may be concluded that breastfeeding duration can be affected by infant mortality, mother's age, level of education, occupation and place of residence and at the same time it affects infant mortality in all the sub-groups.

Multiple classification analysis is designed to estimate the relationship between each independent variable and children who were ever breastfed, breastfeeding duration in general, breastfeeding duration of six months.

The independent variables in the four series of regressions are the same (time since last birth, mother's age at birth, mother's level of education, mother's last occupation since marriage and infant mortality). The number of children included in the analysis is 11,654 and there are no missing case for the total population. For lower Egypt, the number of children are 5,150 and for upper Egypt the number of children are 3,618. Tables 8.6 to 8.11 show that the overall F (25.52, 6.11, 10.26) for total population, lower and upper Egypt are significant (under the .05 level).

But it is not significant for either mother's age or time since last birth. The level of education and mother's last occupation are highly significant. These results certainly seem to support the earlier analyses in this Chapter, that as the mother's level of education increases the breastfeeding decreases and it is the same for work status. Table 8.6, shows that time since last birth, mother's age or level of education in the 2-way interactions has no significant effect between each other. For lower and upper Egypt, the same trends of results appear. The overall F is significant (under .05 level) and it is highly significant for mother's level of education. At the bottom of Table 8.6 is shown the effect of infant mortality on breastfeeding. The overall F shows a significant effect but the coefficient of infant mortality does not show the same significance. It seems that infant mortality of a previous child does not affect the mother's decision to breastfeed or not her child. But Table 8.8 where the breastfeeding duration is used as an a dependent variable, it can be noticed that infant mortality has a significant effect on the breast-feed duration and, furthermore, the survival or the death of the index child affects the duration of breastfeeding. If it survives the duration of breastfeeding is 18.15 months, it decreases to 4.98 in the case of death. This result may show the effect of infant mortality on breastfeeding duration, because the death of an infant will interrupt and end the breastfeeding. Cessation of lactation may in turn lead to a reduction in the period of amenorrhoea, to a short birth interval and an early conception. Table 8.8 reveals also that mother's age at birth, mother's level of education and mother's last occupation are all significant variables (under level .05).

The evidence presented here points towards a strong relationship between duration and infant mortality, mother's age, level of education and last occupation. Table 8.9 shows that the lower levels of maternal education are associated with longer durations of breastfeeding. The younger the mother is, the shorter the breastfeeding duration. The higher the occupation status like professional and clerical, the shorter the breastfeeding, because usually the educated Egyptian woman is associated with professional or clerical jobs.

Table 8.10 considers breastfeeding of 6 months duration as a dependent variable. It shows the same effect as with breastfeeding duration in general (Table 8.8) which is that the overall F is significant (under .05 level). The coefficient for mother's level of education and work status shows a significant effect but not the coefficient for infant mortality.

Table 8.11 reveals the effect of the independent variables when the dependent variable is confined to breastfeeding of 6 months taking into account those who ever breastfed their children. Comparing the results of Tables 8.8, 8.10,8.11 seems to give the same indication that there is a relationship between mother's age, level of education and work status on breastfeeding or not and the duration of breastfeeding. They also reveal that infant mortality shortens the breastfeeding duration which affects the birth interval but infant mortality does not affect the decision to breastfeed or not the next child.

8.4 Breastfeeding and Birth Interval

The last pattern in this analysis confines itself to the last closed birth interval to test the effect of breastfeeding or not on the death or survival of the child next to last and its sex on the duration of the last closed birth interval. It includes all children born within five years of the survey date, mothers with 2 children and all multiple births considered as one. If the woman breastfeeds her child it takes 1 and 0 otherwise and if the child next to last dies it take 1 and 0 if it is still alive. Multiple classification analysis is used also to ascertain the results.

Table 8.12 shows the mean duration of last closed birth interval according to the survival or death of the child next to last in the case of breastfeeding or not. It indicates that in urban areas the relationship between breastfeeding, infant mortality and the duration of the interval is clear. Breastfeeding may prolong the interval from 21.68 months if the mother does not breastfeed to 25.92 months if the mother does breastfeed. Infant mortality can shorten the interval; from 25.92 months if the child survives to 22 months if it dies. It shows also that if the child is breastfed and is alive the duration is longer (26.36 months) but if it is breastfed and then dies it is only 22.46 months and it is even shorter if it is not breastfed and dies (20.72 months). In rural areas the same indications appear but with longer period than in urban areas if the child is alive and shorter period if he dies.

In some developing countries, sex preference may exist. Female children may be neglected because of a strong preference for male children. If this feeling exists in Egypt one may expect it to result in a shorter birth interval due to the shorter breastfeeding period after girls than after boys.

Results in Table 8.13 do not support this hypothesis completely. It is found that if the child is alive and is breastfed there is a slight difference in the mean duration of the last closed birth interval. But if the child is breastfed and dies the duration will be shorter for boys (20.63 months) than for girls.
Here the replacement effect may play a role because as soon as the mother resumes her ability to conceive, she will try to replace the dead boy. In the case of no breastfeeding it is noticed that the mean duration of last closed birth interval is longer if the child is a boy and alive than if it is a girl and alive. This may indicate that if the child is a boy the mother will support him nutritionally and physically for a long time before she thinks of having another child. In the case of a girl the period is always short if she is alive or dead because with no breastfeeding the post-partum amenorrhoea is going to be short, secondly, after a girl, the mother will try to have another child as soon as possible hoping that the next outcome will be a boy. The same results are obtained in Table 8.14 which takes into account the place of residence (urban - rural). It is found that in rural areas the last closed birth interval is shorter after a girl whether alive or dead than in urban areas. It also reveals that after a surviving boy it is always longer whether he is breastfed or not.

A multiple classification analysis is performed here too, to ascertain the previous results and to estimate the relationship between each of the independent variables (ever breastfed, infant mortality, sex of previous child and place of residence) and the duration of last closed birth interval. Table 8.15 reveals that the overall F is significant and that there is a negative relationship between mortality and the duration of last closed interval. Type of previous birth (girl or boy) and place of residence do not show a significant effect on the mean duration of last closed birth interval. Table 8.16 reveals that there is a difference of 4.6 months and 6.07 months in the last closed birth interval if the mother breastfed her child or not and if it dies or not.

It appears from the former analysis that there is an association between child mortality, breastfeeding, sex of the previous child and the mean duration of the last closed birth interval. A death of an infant may shorten the duration by about 6 months, because infant mortality may cause a cessation of lactation. Cessation of lactation may lead to a short post-partum amenorrhoea or a resumption of ovulation which permits another conception. Previous studies concluded that women who breastfed for extended periods had longer birth intervals than women who did not.

In conclusion, the analysis provides support for the hypothesis that there is an inverse relationship between breastfeeding and infant mortality. The relationship probably holds throughout the population but its magnitude varies according to mother's age, education, occupation and place of residence. A lower level of maternal education is associated with a larger percentage of women who breastfeed their children and for a longer duration.

Thus, educated mothers breastfeed for shorter periods than uneducated mothers. This may be a consequence of the fact that educated mothers are able to obtain professional or clerical jobs so that they breastfeed their children for a shorter time. It can be said here that modernization in general in Egypt now leads to higher educational and employment opportunities for women in urban areas. Moreover, the introduction of powdered milk and feeding bottles will shorten the breastfeeding duration and this will increase the risks of infant deaths as a result of the loss of the protective value of maternal milk to which we have already referred earlier in the text. Moreover, in a country like Egypt where effective contraceptive use is still very low, a long breastfeeding duration may be used to space pregnancies and this will affect indirectly the total fertility. The analysis shows also that breastfeeding duration increases with mother's age at birth but it does not show a significant effect in the regression analysis. Breastfeeding plays an important role according to the death or survival of the child; it seems that the survival chances of a child increases with breastfeeding and the risk of mortality increases with no breastfeeding. This may be due to the association between lactation and child health and birth spacing as already mentioned. Finally, decreasing infant mortality may lead to an increase in breastfeeding period and ultimately a decrease in fertility.

TABLE 8.1

Means and Standard Deviation of Some Variables

VARIABLES	EVER BREASTFED			BREASTFEED DURATION		
	MEAN	SD	N	MEAN	SD	N
TLB						
< 5	95.95	19.70	6,007	16.37	21.10	5,074
5+	96.62	18.08	5,647	18.06	20.95	5,394
TOTAL	96.28	18.94	11,654	17.24	21.04	10,468
MAGE						
< 25	96.04	19.49	4,424	15.71	8.54	3,854
25-34	96.24	19.02	5,800	17.31	15.99	5,200
35+	97.13	16.69	1,430	21.38	47.04	1,430
TOTAL	96.28	18.94	11,654	17.24	21.04	10,468
Place of Residence						
Urban	93.79	24.13	5,090	14.89	16.72	4,525
Rural	98.20	13.29	6,564	19.03	23.65	5,943
TOTAL	96.28	18.94	11,654	17.24	21.04	10,468
Mother's Level of Education						
Illiterate, no school	97.74	14.85	6,916	18.55	23.11	6,284
" some school	96.62	18.08	3,371	16.81	19.54	3,048
Primary or more	88.00	32.50	1,367	11.19	7.33	1,136
TOTAL	96.28	18.94	11,654	17.24	21.04	10,468

NOTE:

Unit of Measurement: A child

TLB: Time since last birth
MAGE: Mother's age at index birth
SD: Standard Deviations

TABLE 8.2

Means and standard deviation of some variables in Lower and Upper Egypt.

Variables	Lower			Upper		
	Mean	SD	N	Mean	SD	N
Ever Breastfed						
TLB						
<5	96.49	18.41	2761	97.24	16.38	2030
5+	97.45	15.78	2389	97.80	14.69	1588
Total	96.93	17.25	5150	97.49	15.66	3618
MAGE						
<25	96.64	18.02	1906	97.39	15.95	1456
25-34	96.79	17.62	2588	97.70	14.99	1654
35+	98.32	12.85	656	97.05	16.94	508
Total	96.93	17.25	5150	97.49	15.66	3618
LEDU						
Illiterate, no school	97.69	15.02	3164	98.05	13.84	2559
Illiterate, some school	97.15	16.65	1507	98.32	12.86	893
Primary or more	91.23	28.31	479	84.34	36.45	166
Total	96.93	17.25	5150	97.49	15.66	3618
Breastfeeding duration						
TLB						
<5	16.84	29.67	2335	17.66	8.76	1719
5+	18.82	21.89	2300	20.95	27.04	1535
Total	17.82	26.11	4635	19.21	19.70	3254
MAGE						
<25	16.12	7.56	1644	17.71	9.69	1271
25-34	17.86	21.57	2363	19.33	9.51	1508
35+	22.16	55.78	628	22.85	45.88	475
Total	17.82	26.11	4635	19.21	19.70	3254
LEDU						
Illiterate, no school	18.86	32.63	2865	19.53	9.81	2312
Illiterate, some school	17.11	7.40	1365	19.30	35.60	811
Primary or more	12.92	7.58	405	13.05	8.01	131
Total	17.82	26.11	4635	19.21	19.70	3254

N.B. TLB = time since last birth
MAGE = mother's age at birth of index child
LEDU = mother's level of education
SD = standard deviation

TABLE 8.3

Breastfeeding Impact on Infant Mortality

By Time Since Last Birth, Mother's Age at Birth

Level of Education, Last Occupation and Place of Residence

VARIABLES	EVER BREASTFED		
	MEAN	SD	N
TLB			
< 5	.07	.25	5,764
5+	.06	.24	5,456
Total	.06	.25	11,220
MAGE			
< 25	.07	.26	4,249
25-34	.06	.23	5,582
35+	.06	.23	1,389
Total	.06	.25	11,220
LEDU			
Illiterate, no school	.07	.25	6,760
Illiterate, some school	.07	.25	3,257
Primary or more	.03	.18	1,203
Total	.06	.25	11,220
WSTAT			
Did not work	.07	.25	9,125
Professional	.02	.15	265
Clerical	.05	.21	132
Sales, Agric., self-employed	.06	.24	1,486
Skilled - unskilled	.08	.27	212
Total	.06	.25	11,220
Place of Residence			
Urban	.06	.24	4,774
Rural	.07	.25	6,446
Total	.06	.25	11,220

NOTE:

TLB: Time since last birth.
LEDU: Mother's Level of Education
WSTATE: Mother's Last Occupation since Marriage

TABLE 8.4

Breastfeeding impact on Infant Mortality by time since last birth, Mother's age at birth, level of education, last occupation in Lower and Upper Egypt.

Variables	Lower			Upper		
	Ever Breastfed			Ever Breastfed		
	Mean	SD	N	Mean	SD	N
TLB						
<5	.06	.23	2664	.08	.28	1974
5+	.04	.20	2328	.09	.29	1553
Total	.05	.22	4992	.09	.28	3527
MAGE						
<25	.05	.22	1842	.11	.31	1418
25-34	.05	.21	2505	.07	.26	1616
35+	.05	.21	645	.08	.26	493
Total	.05	.22	4992	.09	.28	3527
LEDU						
Illiterate, no school	.05	.22	3091	.09	.28	2509
Illiterate, some school	.05	.22	1464	.09	.28	878
Primary or more	.03	.18	437	.09	.28	140
Total	.05	.22	4992	.09	.28	3527
WSTATE						
Did not work	.05	.22	3813	.09	.28	3046
Professional	.04	.20	93	-	-	30
Clerical	.02	.15	45	.11	.33	9
Sales, Agric, Self-emp.	.04	.21	950	.09	.29	388
Skilled, unskilled	.04	.21	91	.09	.29	54
Total	.05	.22	4992	.09	.28	3527

N.B. TLB = time since last birth
MAGE = mother's age at index child birth
LEDU = mother's level of education
WSTATE = mother's last occupation since marriage
SD = standard deviation

TABLE 8.5

The impact of breastfeeding duration (<6 months and 6+ months) according to Mother's age, level of education, last occupation and place of residence on infant mortality.

Variables	Breastfeed <6 months			Breastfeed 6+ months		
	Mean	SD	N	Mean	SD	N
Infant mortality	.09	.29	1198	.06	.23	10456
TLB						
<5	.09	.29	646	.06	.24	5361
5+	.09	.29	552	.05	.23	5095
Total	.09	.29	1198	.06	.23	10456
MAGE (years)						
<25	.11	.31	518	.07	.25	3906
25-34	.08	.27	587	.05	.23	5213
35+	.08	.27	93	.06	.23	1337
Total	.09	.29	1198	.06	.23	10456
LEDU						
Illiterate, no school	.14	.35	415	.06	.17	6501
Illiterate, some school	.11	.31	337	.06	.24	3034
Primary or more	.03	.18	446	.03	.24	921
Total	.09	.29	1198	.06	.23	10456
WSTATE						
Did not work	.11	.31	897	.06	.24	8548
Professional	.02	.15	132	.02	.13	172
Clerical	.04	.20	73	.03	.18	90
Sales, Agric, Self-emp.	.12	.33	67	.06	.23	1448
Skilled, unskilled	.07	.26	29	.07	.26	198
Total	.09	.29	1198	.06	.23	10456
Place of Residence						
Urban	.08	.27	865	.05	.22	4225
Rural	.13	.34	333	.06	.24	6231
Total	.09	.29	1198	.06	.23	10456

N.B. TLB = time since last birth
MAGE = mother's age at birth
LEDU = mother's level of education
WSTATE = mother's last occupation

TABLE 8.6

The impact of time since last birth, Mother's age, level of education, last occupation and infant mortality on children who Ever Breastfed according to place of residence.

Source of variation	Total Population		Lower		Upper	
	F	Signif F	F	Signif F	F	Signif F
Main Effects	63.74	.000	13.11	.000	25.73	.000
TLB	5.61	.018	3.05	.081	.72	.396
MAGE	.19	.827	1.30	.272	.40	.669
LEDU	155.80	.000	28.51	.000	63.41	.000
2 way Interaction	1.63	.111	1.73	.085	.60	.781
TLB MAGE	4.49	.011	3.13	.044	.35	.707
TLB LEDU	.37	.691	0.22	.806	1.35	.260
overall F	25.52	.000	6.11	.000	10.26	.000
Main Effects	29.70	.000	10.87	.000	18.26	.000
TLB	2.93	.087	2.26	.133	.57	.451
MAGE	.95	.389	1.37	.254	.50	.606
WSTATE	50.23	.000	16.88	.000	31.51	.000
2 way Interaction	1.66	.056	*	*	*	*
TLB MAGE	5.25	.005	*	*	*	*
TLB WSTATE	1.96	.098	*	*	*	*
MAGE WSTATE	.54	.83	*	*	*	*
overall F	11.01	.000	10.87	.000	18.26	.000
Main Effects	9.35	.000	4.24	.002	2.62	.034
TLB	3.52	.061	3.80	.051	.85	.357
MAGE	1.78	.169	2.27	.104	.35	.703
INFMORT	30.48	.000	8.51	.004	.72	.003
2 way Interaction	2.68	.020	1.71	.130	.15	.980
TLB MAGE	6.45	.002	4.06	.017	.30	.744
TLB INFMORT	.17	.679	.20	.657	.07	.798
MAGE INFMORT	.11	.896	.13	.881	.03	.969
overall F	5.64	.000	2.84	.002	1.25	.262

N = 11645 No missing cases

TABLE 8.7

The impact of the independent variables on breastfeeding six months for children who Ever Breastfed unadjusted and adjusted for independents.

Variables and Category	Total Population			Lower			Upper		
	N	unadjusted	adjusted	N	unadjusted	adjusted	N	unadjusted	adjusted
TLB									
<5	6007	.90	.89	2761	.92	.92	2030	.94	.95
5+	5647	.90	.91	2389	.94	.94	1588	.96	.96
MAGE									
<25	4424	.89	.89	1906	.92	.92	1456	.94	.94
25-34	5800	.90	.90	2588	.93	.90	1654	.95	.95
35+	1430	.94	.92	656	.97	.91	508	.96	.96
LEDU									
Illiterate, no school	6916	.94	.94	3164	.91	.91	2559	.96	.96
Illiterate, some school	3371	.90	.90	1507	.93	.93	893	.95	.95
Primary or more	1367	.68	.68	479	.76	.76	166	.74	.74
	R^2 = .08 R = .28			R^2 = .05 R = .22			R^2 = .05 R = .21		
TLB									
<5	6007	.90	.90	2761	.92	.92	2030	.94	.95
5+	5647	.90	.90	2389	.94	.94	1588	.96	.96
MAGE									
<25	4424	.89	.88	1906	.92	.92	1456	.94	.94
25-34	5800	.90	.91	2588	.93	.93	1654	.95	.95
35+	1430	.94	.93	656	.97	.96	508	.96	.96
WSTATE									
Did not work	9445	.91	.91	3934	.93	.93	3114	.95	.95
Professional	304	.57	.57	100	.65	.66	39	.57	.56
Clerical	163	.56	.56	56	.65	.66	13	.70	.70
Sales, Agric, Self-Emp.	1515	.95	.95	963	.89	.89	393	.92	.92
Skilled, unskilled	227	.88	.88	97	.90	.90	59	.90	.90
	R^2 = .06 R = .24			R^2 = .04 R = .20			R^2 = .04 R = .20		
TLB									
<5	6007	.90	.90	2761	.92	.92	2030	.94	.94
5+	5647	.90	.90	2389	.94	.94	1588	.96	.96
MAGE									
<25	4424	.89	.89	1906	.92	.92	1456	.94	.94
25-34	5800	.90	.90	2588	.93	.93	1654	.95	.95
35+	1430	.94	.94	656	.97	.96	508	.96	.96
INFMORT									
0	10932	.90	.90	4907	.90	.90	3309	.95	.95
1	722	.93	.93	243	.88	.88	309	.94	.94
	R^2 = .003 R = .06			R^2 = .01 R = .07			R^2 = .00 R = .04		

N.B.
* due to empty cells or a singular matrix higher order interactions have been suppressed.
TLB = time since last birth
MAGE = mother's age at index child birth
LEDU = mother's level of education
WSTATE = mother's last occupation since marriage
INFMORT = infant mortality, 0 = if alive, 1 = if died

TABLE 8.8

The impact of time since last birth, Mother's age at birth, Mother's level of education, Mother's last occupation and infant mortality on Breastfeeding Duration by place of residence.

Source of variation	Total Population		Lower		Upper	
	F	Signif F	F	Signif F	F	Signif F
Main Effects	40.25	.000	9.55	.000	11.62	.000
TLB	15.99	.000	4.84	.028	19.96	.000
MAGE	29.59	.000	10.42	.000	10.85	.000
LEDU	56.89	.000	9.28	.000	6.73	.001
2 way Interaction	.73	.67	.68	.710	2.67	.006
TLB MAGE	.83	.44	1.01	.365	1.27	.282
TLB LEDU	1.38	.25	.28	.759	.94	.392
MAGE LEDU	.30	.88	.70	.589	4.03	.003
overall F	15.93	.000	4.09	.000	6.11	.000
Main Effects	21.64	.000	6.24	.000	9.50	.000
TLB	13.23	.000	5.41	.020	16.35	.000
MAGE	32.94	.000	6.67	.001	10.95	.000
WSTATE	16.12	.000	4.38	.013	3.47	.031
2 way Interaction	0.51	.93	*	*	*	*
TLB MAGE	.60	.55	*	*	*	*
TLB WSTATE	.62	.64	*	*	*	*
MAGE WSTATE	.37	.94	*	*	*	*
						*
overall F	7.55	.000	6.24	.000	9.50	.000
Main Effects	90.25	.000	22.59	.000	60.71	.000
TLB	10.41	.001	3.23	.072	21.82	.000
MAGE	32.67	.000	10.95	.000	8.93	.000
INFMORT	272.18	.000	60.88	.000	195.89	.000
2 way Interaction	1.24	.289	.62	.683	1.41	.218
TLB MAGE	.49	.610	.90	.407	1.80	.166
TLB INFMORT	.71	.401	.18	.674	1.81	.178
MAGE INFMORT	2.10	.122	.54	.582	.79	.452
overall F	40.80	.000	10.39	.000	27.77	.000
N = 11654 Missing = 1186			N = 5150 Missing = 515		N = 3618 Missing = 364	

N.B. TLB = time since last birth: MAGE = mother's age at index child birth LEDU = mother's level of education: WSTATE = mother's last job since marriage INFMORT = infant mortality. * due to empty cells or singular matrix, higher order interaction has been suppressed.

TABLE 8.9

The impact of time since last birth, Mother's age at birth, Mother's last occupation, Mother's level of education and infant mortality on Breastfeeding Duration, unadjusted and adjusted for independents.

Variable and Category	Total Population			Lower			Upper		
	N	unadjusted	adjusted	N	unadjusted	adjusted	N	unadjusted	adjusted
TLB									
<5	5074	16.37	16.39	2335	16.38	16.97	1719	17.66	17.75
5+	5394	18.06	18.04	2300	18.82	18.68	1535	20.95	20.85
MAGE									
<25	3854	15.7	15.89	1644	16.11	16.3	1271	17.71	17.99
25-34	5270	17.31	17.27	2363	17.85	17.79	1508	19.33	19.08
35+	1344	21.37	20.99	628	22.16	21.9	475	22.85	22.87
LEDU									
Illiterate, no school	6284	18.55	18.53	2865	18.85	18.9	2312	19.53	19.45
Illiterate, some school	3048	16.80	16.76	1365	17.1	16.89	811	19.3	19.5
Primary or more	1136	11.19	11.41	405	12.92	13.35	131	13.05	13.09
	R^2 = .02 R = .14 Grand Mean = 17.24			R^2 = .01 R = .10 Grand Mean = 17.82			R^2 = .02 R = .13 Grand Mean = 19.21		
TLB									
<5	5074	16.37	16.47	1829	16.19	16.44	1520	17.54	17.66
5+	5394	18.06	17.97	1835	18.58	18.33	1327	20.97	20.84
MAGE									
<25	3854	15.7	15.79	1332	15.72	15.87	1131	17.51	17.77
25-34	5270	17.31	17.30	1849	17.72	17.67	1305	19.24	19.01
35+	1344	21.37	21.17	483	20.73	20.50	411	23.31	23.33
WSTATE									
Did not work	8505	17.28	17.29	3534	17.63	17.62	2809	19.25	19.25
Professional	258	9.43	9.32	92	10.54	10.71	29	10.14	9.3
Clerical	123	9.30	9.90	38	11.77	12.6	9	13.67	15.62
Sales, Agric, Self-Emp.	1385	19.33	19.18	*	*	*	*	*	*
Skilled, unskilled	197	16.14	16.24	*	*	*	*	*	*
	R^2 = .014 R = .12 Grand Mean = 17.24			R^2 = .01 R = .09 Grand Mean = 17.39			R^2 = .02 R = .13 Grand Mean = 19.14		
TLB									
<5	5074	16.37	16.56	2335	16.83	17.13	1719	17.66	17.72
5+	5394	18.06	17.88	2300	18.82	18.52	1535	20.95	20.88
MAGE									
<25	3854	15.7	15.98	1644	16.11	16.32	1271	17.71	18.41
25-34	5270	17.31	17.13	2363	17.85	17.75	1508	19.33	18.82
35+	1344	21.37	21.27	628	22.16	22.02	475	22.85	22.59
INFMORT									
0	9746	18.16	18.15	4392	18.53	18.52	2945	20.74	20.72
1	722	4.76	4.98	243	4.95	5.2	309	4.61	4.79
	R^2 = .03 R = .18 Grand Mean = 17.24			R^2 = .02 R = .14 Grand Mean = 17.82			R^2 = .07 R = .26 Grand Mean = 19.21		

N.B.
TLB = time since last birth
MAGE = mother's age at index child birth
LEDU = mother's level of education
WSTATE = mother's last occupation at marriage
INFMORT = infant mortality 0 = alive, 1 = died

* due to empty cells or a singular matrix, higher order interactions have been suppressed.

TABLE 8.10

The impact of time since last birth, Mother's age at birth and Mother's level of education, last occupation and infant mortality on Breastfeeding Duration (6 months) by place of residence.

Source of variation	Total Egypt		Lower		Upper	
	F	Signif F	F	Signif F	F	Signif F
Main Effects	145.80	.000	43.38	.000	13.14	.000
TLB	6.55	.011	12.25	.000	2.98	.084
MAGE	10.86	.000	2.84	.059	2.31	.099
LEDU	342.89	.000	95.67	.000	28.34	.000
2 way Effect	2.69	.006	4.43	.000	.70	.695
TLB MAGE	.51	.599	1.75	.175	.42	.660
TLB LEDU	1.023	.360	1.03	.358	.72	.487
MAGE LEDU	4.540	.001	7.51	.000	.91	.458
overall F	57.73	.000	19.45	2.21	5.48	.000
N = 11654 1186 missing			N = 5150 515 missing		N = 3618 364 missing	
Main Effects	85.53	.000	31.95	.000	13.06	.000
TLB	2.91	.088	7.41	.007	4.03	.045
MAGE	17.93	.000	3.29	.037	2.93	.054
WSTATE	138.97	.000	68.94	.000	28.07	.000
2 way Interaction	3.49	.000	*	*	*	
TLB MAGE	.32	.730	*	*	*	
TLB WSTATE	3.09	.015	*	*	*	
MAGE WSTATE	4.38	.000	*	*	*	
overall F	30.84	.000	31.95	.000	13.06	.000
Main Effects	10.16	.000	6.27	.000	2.74	.027
TLB	3.14	.077	13.07	.000	3.56	.059
MAGE	17.73	.000	4.81	.008	2.13	.119
Infant mortality	.13	.717	0.18	.671	2.08	.149
2 way interaction	.98	.428	0.79	.558	.77	.575
TLB INFMORT	3.68	.055	0.67	.413	.003	.955
MAGE INFMORT	.24	.784	0.89	.412	1.36	.258
overall F	5.06	.000	3.23	.001	1.64	.098

N.B. TLB = time since last birth: MAGE = mother's age at birth of index child LEDU = mother's education levels: WSTATE = mother's last occupation since marriage: INFMORT = infant mortality.
* due to empty cells or singular matrix, higher order interactions have been suppressed.

TABLE 8.11

The impact of time since last birth, Mother's age, level of education, work and infant mortality on Breastfeeding six months for children who Ever Breastfed according to place of residence.

Source of variation	Total Population		Lower		Upper	
	F	Signif F	F	Signif F	F	Signif F
Main Effects	203.89	.000	52.23	.000	33.91	.000
TLB	5.27	.022	9.85	.002	1.93	.165
MAGE	7.04	.001	3.33	.036	.86	.424
LEDU	492.02	.000	117.41	.000	82.38	.000
2 way Interaction	3.15	.001	3.98	.000	.60	.781
TLB MAGE	2.42	.089	1.36	.257	.43	.650
TLB LEDU	2.37	.094	.72	.486	.77	.464
MAGE LEDU	3.81	.004	6.88	.000	.59	.667
overall F	80.36	.000	22.54	.000	13.41	.000
Main Effects	105.17	.000	32.05	.000	22.10	.000
TLB	1.37	.241	7.26	.007	1.94	.164
MAGE	13.98	.000	4.17	.016	1.58	.207
WSTATE	175.39	.000	49.57	.000	37.48	.000
2 way Interaction	2.11	.000	*	*	*	*
TLB MAGE	3.56	.029	*	*	*	*
TLB WSTATE	2.82	.024	*	*	*	*
MAGE WSTATE	3.07	.002	*	*	*	*
overall F	37.13	.000	32.05	.000	22.10	.000
Main Effects	9.74	.000	6.62	.000	1.25	.287
TLB	1.63	.202	11.06	.001	2.47	.117
MAGE	15.18	.000	6.17	.002	.76	.469
INFMORT	6.32	.012	1.36	.243	.43	.511
2 way Interaction	2.41	.035	1.03	.398	.48	.795
TLB MAGE	4.77	.009	1.86	.157	.41	.663
TLB INFMORT	2.20	.138	.53	.468	.004	.952
MAGE INFMORT	.17	.844	.59	.553	.75	.475
overall F	5.67	.000	3.51	.000	.82	.598

N = 11654 No Missing Cases

TABLE 8.12*

Mean Length of Last Closed Birth Interval If the Mother Breastfed or not The Child next to last Birth According to his Death or Survival by Place of Residence

BREASTFEEDING	URBAN			RURAL		
	MEAN DURATION OF LCBI**					
	ALIVE	DEAD	TOTAL	ALIVE	DEAD	TOTAL
No	22.07	20.72	21.68	23.52	19.35	21.39
N	89	36	125	46	48	94
Yes	26.36	22.46	25.92	27.48	21.48	26.71
N	796	101	897	1492	220	1712
Total	25.92	22.00	25.40	27.36	21.10	26.43
N	885	137	1022	1538	268	1800

NOTE:

* This table is confined to:

1. Women with at least 2 births
2. Children under 5 years of age
3. Multiple birth considered as one birth

** Last closed birth interval (LCBI) is defined as, the duration between the date of birth of the last birth and the date of birth of the one next to the last birth.

TABLE 8.13

The Impact of Breastfeeding, Survival or Death of the Previous Child and its Sex on the Mean Duration of Last Closed Birth Interval in Egypt

BREAST-FEEDING	MEAN DURATION OF LAST CLOSED BIRTH INTERVAL								
	TOTAL			BOY			GIRL		
	ALIVE	DEAD	TOTAL	ALIVE	DEAD	TOTAL	ALIVE	DEAD	TOTAL
No	22.56	19.94	21.56	24.34	20.30	22.26	23.22	19.29	21.77
N	135	84	219	35	37	72	41	24	65
Yes	27.09	21.79	26.43	27.87	20.63	27.01	27.99	23.45	27.39
N	2,288	321	2,609	887	119	1,006	869	134	1,003
TOTAL	26.83	21.40	26.06	27.73	20.55	26.69	27.78	22.82	27.04
N	2,423	405	2,828	922	156	1,078	910	158	1,068

TABLE 8.14

Mean Length of Last Closed Birth Interval if the Mother Breastfed or not

The Child next to last Birth according to Sex by Place of Residence

BREAST-FEEDING	MEAN DURATION OF LAST CLOSED BIRTH INTERVAL											
	URBAN						RURAL					
	BOY			GIRL			BOY			GIRL		
	ALIVE	DEAD	TOTAL	ALIVE	DEAD	TOTAL	ALIVE	DEAD	TOTAL	ALIVE	DEAD	TOTAL
No	22.33	21.07	21.85	24.33	20.29	23.42	28.73	19.77	22.76	21.65	18.88	20.26
N	24	7	31	24	7	31	11	22	33	17	17	34
Yes	27.59	22.10	27.02	28.08	23.76	27.47	27.99	20.11	27.01	27.95	23.27	27.34
N	268	31	299	299	49	348	619	88	707	570	85	655
TOTAL	27.16	21.76	26.43	27.80	23.32	27.14	28.00	20.05	26.82	27.77	22.54	26.99
N	292	38	330	323	56	379	630	110	740	587	102	689

TABLE 8.15

The Impact of Breastfeeding, Child Mortality, Type of Previous Fertile Pregnancy and Type of Place of Residence on The Mean Duration of Last Closed Birth Interval

VARIABLES	F	SIGNIFICANCE OF F
Main effects	31.08	0.000
EVERBF	15.24	0.000
INFMORT	86.01	.000
PFPTYP	0.711	0.399
V702	0.003	0.960
Two-way Interaction	1.31	0.251
EVERBF INFMORT	0.865	0.352
EVERBF PFPTYP	1.774	0.183
EVERBF V702	0.096	0.757
INFMORT PFPTYP	3.581	0.059
INFMORT V702	1.317	0.251
PFPTYP V702	0.473	0.492
TOTAL (N) 2828 missing 682		

NOTE:

LCBI = Last Closed Birth Interval
EVERBF = Ever Breastfed
INFMORT = Child Mortality
PFPTYP = Type of Previous Fertile Pregnancy
V702 = Place of Residence (1) urban (2) rural

TABLE 8.16

Adjusted and Unadjusted Independent Variables

(Ever-breastfed, Child Mortality, Type of Previous Fertile

Pregnancy, Type of Place of Residence) and their Impact on the

Duration of Last Closed Birth Interval

Grand Mean 26.87

Variable and Category	N	Unadjusted		Adjusted for Independents	
		DEV'N	ETA	DEV'N	BETA
EVERBF					
0 NO	137	22.03		23.69	
1 Yes	2,009	27.20		27.09	
			0.13		0.08
INFMORT					
0 Alive	1,832	27.76		27.68	
1 Dead	314	21.69		22.13	
			0.22		0.20
PFPTYP					
1 Boy	1,078	26.70		26.70	
2 Girl	1068	27.05		27.05	
			0.02		0.02
V702					
1 Urban	717	26.80		26.88	
2 Rural	1,429	26.90		26.86	
			0.000		0.000
R^2	0.055				
R	0.234				

NOTE: EVERBF = Ever Breastfed (0) didn't breastfeed (1) breastfed
INFMORT = Child mortality (0) if alive (1) if dead
PFPTYP = Type of previous fertile pregnancy (1) if boy (2) if girl
V702 = Place of Residence (1) urban (2) rural

CHAPTER NINE

REPLACEMENT

9.1 Introduction

Replacement is a behavioural mechanism, defined as an attempt to secure the same number of surviving children at the end of the reproductive span whatever the incidence of child death.

Replacement effect is sometime distinguished from replacement strategy. The former includes all fertility responses, voluntary or involuntary, to child mortality, while the latter refers to the deliberate replacement of children who have died.

Complete replacement takes place when one additional child death in the family, prior to the end of the parents' reproductive life induces one additional birth. This is unlikely to happen because it implies among other things perfect family planning, fixed reproductive goals, no sub-fecundity and no other factors which may interfere with reproduction. As these conditions may be considered unrealistic in any society, the replacement effect in general is relatively low.

There are several factors which should be taken into account when we speak of child replacement, such as breastfeeding, resumption of sexual intercourse, contraceptive practice, the sex composition of surviving children, timing and cause of death.

Each study of child mortality seems to add a new factor.

In societies where child mortality is high (that is in traditional societies) replacement motivations could have a potentially important macro demographic impact. However, this is not so because family planning is generally absent and clear reproductive goals are unlikely to be present. Therefore, the replacement effect has meaning only in a modernized society which is a contracepting society.

In conclusion the replacement effect, although important conceptually, may be assumed to have, in practice, only a very limited demographic importance.

The idea of measuring replacement in Egypt comes from a consideration of the conflict between the two strategies, replacement and hoarding, and interest in determining which dominates in the country.

It is said that in the pre-transitional period hoarding plays the major role. It plays a role too through the transitional period - where mortality is declining and fertility is still high. But after the transitional period, when societies are modernized, replacements play the major role.

In trying to measure the replacement rate a new model was available. It was devised by Professor Olsen and applied to data from Colombia in 1983. (Olsen, Demography, 1980, Vol. 17, No. 4).

Olsen's model is a type of simple regression that needs only the number of births and number of child deaths for each woman. It reveals to what extent fertility responds to child mortality, i.e. it quantifies fertility response to child mortality. It determines also the bias in the raw regression coefficient and corrects it to estimate the extent of replacement To do this a variety of assumptions are made about the nature of the relationship between child mortality and fertility.

The advantage of this approach is that it involves direct estimation of the relation under study, namely the effect of mortality on fertility, rather than attempting to estimate the relation indirectly via mortality rates or birth intervals. It is noted also that this technique requires less data than other methods.

An evaluation of this technique was made by Professor Trussell (1983), showing how well it worked on a simulated set of reproduction histories, for which he knew the true extent of replacement. He concludes that the technique performs very well, especially in those cases where the stochastic structure of the data can be diagnosed.

The underlying question to be answered is: "What is the effect of an additional child death on fertility?"

Olsen's technique can be summarized as follows:

First: it calculates the bias in Ordinary Least Squares (OLS) replacement coefficient which results from regressing the number of births (n) on the number of deaths (d). Assuming that the proportion of deaths (P) is constant across all women.

There are two objections to using the observed mortality rate:

1. If number of deaths rather than mortality rate is the correct specification, nothing has been gained from the effort of calculating a rate (for which a denominator is required).

2. The number of deaths specification is more plausible because it directly models the behavioural issue of the impact of an additional death on fertility.

The only advantage of the mortality rate is that it makes a good instrumental variable; it is very highly correlated with the number of deaths, and at the same time uncorrelated with random error.

Second: The probability of death is used as a random variable. How it affects the bias in the determination of the correlation between mortality and fertility can be assessed. The case of (P) random and correlated with (n) is the most general stochastic specification considered.

9.2 Empirical Application

Direct replacement of deaths

The model is applied on data from EFS (Egyptian Fertility Survey, 1980) to estimate child mortality effects on fertility.

Different demographic characteristics are considered in the analysis. It is known that the large regional variation is a notable feature of Egyptian demography.

Table 9.1 reveals the differences in births and deaths in the sample according to different regions. It shows that the highest mean number of child deaths and births is found in upper Egypt where there is still largely a traditional society, and where agriculture is the main economic activity. This high mortality and fertility in upper Egypt is a result of some environmental factors like extreme hot weather in summer impure water, non-availability of medical care in the face of diarrhoea and parasitic diseases, in addition to the high percentage of illiteracy and the low standard of living.

The high number of births may be a response to high levels of mortality. Knodel, 1968, mentions the possible connection between infant and child mortality and fertility. Children in large families may receive less care than those in small families, hence experience higher mortality rates.

Balakrishnan, 1978, reveals that there is a complex relation between child mortality and fertility. The high correlation between the two is a result of socio-economic factors affecting both variables in the same direction and of the direct causal effect of mortality on fertility. He shows that women at any parity seem to exhibit higher subsequent fertility when they have experienced child loss.

David Heer et al, 1968, mentioned in a study by Hassan, supports the idea that the experience of infant and child mortality tends to raise fertility. Hassan interviewed mothers in Cairo aged 45-49 years. He concluded that mothers who had experienced one or more child deaths, had borne a considerably high number of children than those with no mortality experience.

Olsen, 1983, shows that high mortality conditions could create a generalized behavioural response, which ensures that sufficient numbers of children survive to match or exceed the desired number of children.

Table 9.2 reveals that the death rate increases with higher parities, while the variance of death rate is about the same across all parities. The same trend can be noticed in rural and urban areas. The increased mortality rate at higher parities decreases the chances of children surviving. On the other hand, as the number of births increase, the risk of mortality will increase too.

Different factors are playing an important role here. The mother's health is affected by frequent childbearing which has a deleterious effect on the survival chances for early childhood. On the other hand, it will result in what is called 'maternal depletion' which leads to low birth weights and exposes competition for parental and household resources (i.e. food and care).

Moreover, Table 9.2 reveals that the death rate in rural areas is approximately twice the death rate in urban one. Table 9.2a shows how regional differences are enormous.

Upper Egypt shows higher mortality than rural areas. The common characteristic of this region is that villages are more isolated from urban areas, the population are constrained by their customs and norms, and most women are illiterate, negligible female participation rates in labour force, and agricultural activity is along available.

As an example, the fertility rate ranges from 3.9 births in urban areas to 6.3 births in upper Egypt (EFS 1980) The maternal level of education is very low. 77.6% of women and 49.5% for men in rural areas cannot read or write. Maternal education is a determinant of infant and child mortality, because high levels of illiteracy will decrease a mother's understanding of child care, and lead to high mortality rates.

Table 9.2b shows the effect of a mother's education on mortality rate. It is found that the mortality rate is higher among illiterate women with no schooling but decreases with any slight rise in the education level.

It is clear that the mortality rate differs not only according to sex and age at death but also family specification according to occupation, education, economic and place of residence.

Table 9.3 reveals the replacement rate according to different assumptions:

First: it is assumed that mortality rate is constant for all women and since it is difficult to accept that, mortality rate is a fixed parameter or that there is no correlation between mortality and fertility, the second assumption is used, where it is assumed that mortality rate is random variable and how the correlation between mortality and fertility can be determined. The case of mortality is random and correlated with fertility is the most general stochastic specification considered.

First when it is assumed that the mortality rate is fixed which is an extreme and unrealistic assumption, it is found that the biased replacement coefficient is 1.28 and the instrumental variable coefficient is .77. If they are averaged the replacement effect will be 1.02 and this rate considered very high.

The instrumental variable is obtained in two steps:

1. The number of deaths are regressed on the proportion

   $p = d_i/n_i$ (mortality rate)

2. The predicted values of deaths from this regression are employed as the regressor; number of births is regressed on the number of deaths.

Direct replacement is used to describe a conscious action by a couple to increase the number of children born in response to the actual death of one of their children. It may be difficult to have one to one replacement.

Preston, 1978, mentions than an additional child death in the family leads to far less than one additional birth.

The correction which is made to these two coefficients (Appendix) when the mortality rate is considered, as a random variable and the number of births and log death rate are a bivariate distribution, reveals that the corrected replacement coefficient is smaller than the corrected instrumental variable coefficient.

Averaging the two coefficients as suggested by Olsen shows (.18, .16, .19, .13, .19) in total, rural, urban, upper and lower Egypt respectively. It will be noticed that a higher level of replacement exists in urban and lower Egypt where there is more use of contraceptives, more educated people, less fertility and less mortality. Whereas in upper Egypt the replacement effect is low, and may be due to the existence of high fertility and high mortality and a very low use of contraceptives.

When a mother's age is considered, it is found that replacement is (.18, .14, .07) according to the three age groups, 25-34, 35-44, 45-49 respectively. The replacement effect of the first group of age 25-34 may be affected by the high fertility level at this age. Usually the reproduction rate is at its peak at this age.

On the other hand replacement of the dead child will depend on the age at which parents target the survival of their children. The higher that age (age of survival), the more insurance strategies should dominate replacement ones. As parents would be older and the chances of replacement are less, insurance becomes the only hope for survival of their desired number of children. Moreover, if the idea of higher child mortality rate is in the minds of parents (who expect some children to die in the future) they resort to insurance to guarantee that mortality would not deprive them of achieving the desired number of survived children.

In addition parents are always aware that their span of fertility is limited to a certain age; after which they will not be able to have any children.

This may explain the low level of replacement at age group 45-49 since at that age mothers will not be biologically able to replace their dead children.

The replacement effect according to mother's level of education is shown also in Table 9.3 which reveals that the replacement rate is lowest for illiterate women without schooling (.12) while with schooling at primary and over levels it is about .17. As the number of cases at the primary and over level is very small compared with the whole sample, this result can be used as an indicator but is not to be generalized.

In the second run the mortality rate is used as a random variable and both the mortality rate and the number of births are considered as a log-bivariate normal distribution (Table 9.3). The results in this run may be more reliable than the others. The restrictions which are used in the model are more realistic. It is found out that both the correlated replacement coefficient and the instrumental variable coefficient are consistent averaging them resulted in (.13, .10, .15, .07, .15) in total, rural, urban, upper and lower Egypt respectively.

These results show the same trend as in the first run. The lowest level of replacement exists in upper Egypt and it is equal in both urban and lower Egypt. The effect of mother's age shows a consistency with the previous run but with very low replacement at the third age group.

These results reveal that replacement in Egypt as a whole is low and that it appears to be higher in urban areas and lower Egypt than in rural and upper Egypt.

Replacement in urban areas and in lower Egypt may be connected with low fertility and low mortality, in addition to better social, economic and medical conditions than in rural areas and upper Egypt. Different economic activities other than agriculture which is connected with special norms and customs are also very important.

On the other hand, replacement may be important as a motivating behaviour. This is due to the fact that in rural areas families do not think of replacement while they are planning their completed family size.

Contraceptive use is still very low. In total Egypt the percentage of those who have ever used contraceptives is 39.8%, in rural areas it is 23.1%, in urban it is 62.8% in upper Egypt it is 17.5%

Sometimes when the number of living children is very high, i.e. exceeds the desired number, the family will not replace the dead child.

Callum, C.; Farid, S., 1985, on testing the child loss and its effect on the ultimate parity, used the proportion of women who wanted no more children, and those who wanted an additional number of children to measure the attitudinal behaviour, and the proportion of women currently using contraceptives to measure the intentional behaviour.

They conclude that there was a pronounced attitudinal and intentional behavioural replacement response to child loss within each domain of residence. But the response fell short of total replacement in upper Egypt.

On the other hand, Kelly, Khalifa and El-Khorazaty, 1982, tried to measure the magnitude of the replacement effect by using the procedure proposed by B. Boulier that involves a simple adjustment of the child mortality variable which builds on the underlying assumption that the households estimate an expected mortality equal to that of the average experience of the community.

They mentioned another technique, developed and evaluated by J.A. Mauskoph, which was based on a formulation of the decision-making process, whereby households' replacement of children is based primarily on actual mortality experience.

The findings from these two procedures permit them to conclude that the replacement effect is of plausible magnitude, but it is on the low side for rural Egypt and that for parts of this society (upper Egypt) replacement may not be found.

Replacement in Egypt is in general very low and it is difficult to say that it exists in upper Egypt.

The results of this study lead to the conclusion that the insurance effect and not the replacement strategy prevails in Egypt. The "insurance effect" usually prevails in societies where mortality and fertility are high or where fertility is sustained at a high level, while mortality is declining and contraceptive use is low. As the population in Egypt is characterised by a high fertility level and declining mortality and a low level of contraceptive use, it is argued that the insurance effect may dominate in Egypt. Consequently, the insurance effect will tend to raise fertility and its effect on fertility is stronger than that of replacement. So, if Egyptian women were to be made aware that mortality is declining and that more of their children will survive to adulthood than formerly this may help to persuade them to adopt a lower family size norm or at least to start thinking of changing their attitude towards the number of desired children. This may help in the long run to bring fertility down generally.

TABLE 9.1

Summary of some demographic characteristics in Egypt per complete families

Variables	Total Egypt	Rural	Urban	Upper	Lower	Mother's age			Mother's Education		
						24-34	35-44	45-49	Illitrate no school	Some school can read and write	Primary +
*Mean Births	4.64	4.90	4.31	4.89	4.53	4.06	6.31	7.12	4.95	4.74	2.95
Var Births	8.17	8.61	7.38	9.11	7.69	4.35	7.36	9.18	8.29	8.39	3.76
Mean MR	.19	.22	.16	.26	.16	.17	.23	.28	.22	.19	.08
Var MR	.57	.63	.48	.72	.47	.50	.49	.55	.60	.55	.04
*Mean Deaths	1.12	1.29	.89	1.51	.94	.84	1.62	2.17	1.27	1.14	.36
Var Deaths	2.38	2.70	1.86	3.13	1.92	1.43	3.12	4.24	2.60	2.33	.75
Nos of cases	7817	4474	3343	2490	5327	3012	2304	870	4606	2244	967

NOTE:

* Mean number of births or deaths are per completed family
Var Variance
MR Mortality Rate

TABLE 9.2

Mortality and fertility in Egypt, Rural and Urban Egypt

Parity	TotaL Egypt			Rural			Urban		
	Women in Parity	Death Rate	Var of Death Rate	Women in Parity	Death Rate	Var of Death Rate	Women in Parity	Death Rate	Var of Death Rate
1	1080	.10	.000	588	.11	.000	492	.08	.000
2	1119	.13	.01	557	.16	.01	562	.09	.01
3.	1069	.15	.02	562	.18	.02	507	.11	.01
4	948	.18	.01	522	.22	.02	426	.15	.004
5.	829	.20	.01	488	.22	.01	341	.19	.003
6	760	.22	.01	451	.24	.02	309	.20	.007
7	649	.25	.01	399	.26	.02	250	.22	.008
8	511	.28	.01	329	.29	.02	182	.26	.008
9	350	.32	.01	233	.33	.01	117	.31	.02
10	258	.32	.01	180	.33	.01	78	.32	.02
11	109	.39	.02	77	.40	.02	32	.38	.05
12	76	.39	.006	48	.40	.008	28	.38	.003
13	29	.46	.002	21	.47	.002	8	.43	.003
14	17	.50	.02	12	.56	.02	5	.36	.002
15	9	.47	.00	6	.49	.00	3	.44	.00
16	3	.40	.02	1	.50	.00	2	.34	.04
17	1	.82	.000	-			1	.82	.000
Total	7817			4474			3343		

NOTE:

Mortality rate : represents the mathematical expectation of the fraction of the live births of women occurring before the survey which will die by the date of the survey.

TABLE 9.2a

Mortality and fertility in Upper and Lower Egypt

Parity	UPPER			LOWER		
	Women in Parity	Death rate	Variance of death rate	Women in Parity	Death rate	Variance of death rate
1	349	.15	.000	731	.08	.000
2	326	.20	.01	793	.10	.01
3	309	.24	.01	760	.11	.01
4	291	.26	.02	657	.15	.006
5	224	.26	.02	605	.18	.005
6	246	.28	.02	514	.19	.007
7	222	.32	.02	427	.21	.008
8	193	.33	.02	318	.25	.010
9	121	.37	.01	229	.30	.014
10	96	.37	.01	162	.30	.010
11	56	.41	.02	53	.37	.016
12	35	.39	.01	41	.39	.006
13	10	.52	.01	19	.43	.00
14	7	.64	.01	10	.41	.00
15	4	.55	.00	5	.41	.00
16	1	.13	.00	2	.53	.00
17	-	-	-	1	-	-
	2490			5327		

TABLE 9.2b

Fertility and Mortality according to mother'S level of education

	Illiterate and no school			Illiterate, some school can read and write			Primary +		
Parity	Women in Parity	Death rate	Var of Death rate	Women in Parity	Death rate	Var of Death rate	Women in Parity	Death rate	Var of Death rate
1	545	.12	.000	303	.10	.000	232	.06	.00
2	560	.17	.01	304	.13	.01	255	.04	.01
3	564	.18	.02	300	.14	.01	205	.07	.01
4	581	.21	.02	263	.16	.01	104	.10	.00
5	508	.21	.01	251	.20	.01	70	.16	.00
6	490	.23	.01	224	.21	.01	46	.19	.01
7	434	.24	.01	188	.27	.02	27	.21	.00
8	356	.27	.02	145	.30	.01	10	.19	.01
9	231	.32	.01	111	.33	.01	8	.28	.04
10	180	.34	.01	75	.29	.01	3	.30	.00
11	70	.41	.02	35	.36	.01	4	.41	.00
12	48	.41	.01	26	.35	.00	2	.42	.04
13	20	.44	.00	9	.50	.01	1	.64	.00
14	9	.56	.02	7	.41	.02			
15	7	.48	.00	2	.47	.01			
16	2	.31	.02	1	.56	.00			
17	1	.82	.000						
Total	4606			2244			967		

TABLE 9.2c

Fertility and Mortality according to mother's current age

MAGE	25 → 34			35 → 44			45 → 49		
Parity	Women in Parity	Death rate	Var of Death rate	Women in Parity	Death rate	Var of Death rate	Women in Parity	Death rate	Var of Death rate
1	302	.07	.000	77	.17	.000	37	.24	.000
2	481	.09	.01	131	.11	.03	38	.29	.05
3	540	.13	.02	178	.15	.03	33	.14	.02
4	529	.15	.009	210	.17	.02	65	.25	.02
5	436	.20	.008	282	.19	.008	85	.25	.02
6	330	.23	.007	334	.20	.02	91	.24	.02
7	199	.29	.014	329	.23	.01	117	.23	.01
8	110	.31	.009	292	.27	.02	108	.28	.008
9	55	.37	.008	194	.32	.01	101	.29	.02
10				146	.30	.01	91	.35	.01
11				62	.38	.02	41	.40	.01
12+				36	.35	.005	37	.41	.003
TOTAL	3012			2304			870		

NOTE:

MAGE = Mother's current Age

TABLE 9.3

Corrected Estimates of the Replacement Rate for Alternative Assumptions about the Stochastic Structure of the Model based upon Least Square Regressions of Births on Deaths on Table 9.1 in Egypt

Assumed Structure and Parameter Estimated	Total	Rural	Urban	Upper	Lower	25-34	35-44	45-49	Illiterate - no school	Illiterate some school	Primary +
*P_i constant across wives											
Least Squares Replacement coefficient	1.28	1.23	1.39	1.22	1.37	1.11	98	96	1.20	1.33	1.44
Instrumental variables coeeficient	.77	.67	.89	.64	.87	.71	.57	.43	.64	.81	.88
P_i random, $\log(P_i)$ and **M_i bivariate normal											
Corrected OLS coefficient	.087	.071	.089	.039	.092	.12	.09	.05	.05	.08	.18
Instrumental variables coefficient	.28	.25	.29	.23	.29	.25	.20	.09	.19	.30	.17
Correlation between M & F	.40	.35	.50	.36	.46	.42	.33	.31	.37	.44	.51
VAR (MR)	.014	.016	.010	.016	.011	.010	.017	.017	.015	.012	.008
P_i random, $\log(P_i)$ and $\log(n_i)$ bivariate normal											
Corrected OLS coefficient	.17	.13	.21	.09	.20	.18	.12	.07	.11	.17	.36
Corrected Instrumental	.09	.08	.09	.05	.10	.15	.12	.01	.03	.11	.02
Correlation between M & F	.50	.46	.59	.48	.55	.49	.39	.37	.47	.54	.55
VAR (MR)	.02	.02	.01	.02	.01	.01	.02	.02	.02	.02	.01

NOTE: *P_i = Probability of death. ** n_i = Number of births. M & F = Mortality & Fertility. MR = Mortality Rate.
OLS = Ordinary Least Square

CHAPTER TEN

CONCLUSIONS AND FINDINGS

Population growth today derives from the unbalanced acceleration of a long transitional process from the high birth and death rates that are characterizing most of the developing countries to the low birth and death rates that are now a characteristic of developed countries. According to the transitional theory, Egypt is going through the transitional stage, which is characterized by a high rate of population increase due to declining mortality and constant fertility at a high level. This mortality decline has been caused by modern medical aid and the elimination of epidemic diseases without changes in socio-economic variables.

Today, infant and child mortality in developing countries is as high as any in history. Societies according to mortality can be divided into:

1. Traditional societies with high levels of mortality, fertility and a low level of family planning. Therefore, it is argued that high fertility in developing countries is a result of high infant/child mortality. As long as parents do not expect most of their children to survive, it may be unreasonable to expect them to be interested in fertility reduction. Otherwise if mortality is high, low fertility will lead to population decline and extinction.

2. Less modernized societies or transitional societies with rapid decline in mortality level to react what is called the intermediate level.

This intermediate level of mortality is the level which prevails now in most developing countries, and which causes the increase in population growth due to the stable fertility at a high level and low family planning. This rapid decline in mortality is not concomitant with socio-economic development which could lead to fertility suppression.

3. Modern societies with a low level of mortality and fertility and high family planning use. These societies are enjoying a high level of living, a high level of education and a high level of health and social services.

When the mortality rate is high specially among children, couples are biologically incapable of bearing as many children as they would like. Thus, a high mortality level results in only slightly higher fertility and, consequently, the rate of population growth is somewhat lower at a high level of mortality than at an intermediate mortality level. On the other hand, when mortality is low, as in the developed countries, the desired number of births drop precipitously and the rate of population growth declines.

In developing countries, the loss of children is so common that every woman grows up with the certain knowledge that she will lose at least one child. The same does not happen in developed countries.

In Egypt, throughout the last three decades, mortality has been falling with progressive speed. Infant/child mortality, despite its decline, is still at a high level. There is a sizeable disparity between the numbers who are born and the numbers who survive to adulthood.

Infant/child mortality varies within regions, it is higher in rural areas than in urban areas, and it is also higher in upper Egypt than in lower Egypt. The direct causes of infant/child mortality nowadays do not yield easily to direct medical action. These causes are malnutrition, diarrhoea and respiratory disease which cannot be controlled by vaccination or by eliminating a specific vector of infection. Rather they are functions of social and environmental conditions that must be addressed as a part of a larger process of development. Development in this context is not just a reflection of economic activity but also a measure of general well-being. In Egypt, environmental factors play an important role with respect to child survival chances. Moreover, not only the parents' economic and education level may jeopardize their childrens' survival chances, but also their ability to cope with the challenges of rearing a child through the first year of life and their knowledge of the resources available to them and their skill in using them.

It was argued that high fertility in developing countries is affected by infant/child mortality levels. The relationship between infant/child mortality and fertility has been a topic of major concern in developing countries. In a society where child mortality is high, it is quite understandable that parents will produce a large number of children in order to assure the survival of a certain number of children and/or a certain number of each sex they consider satisfactory to them.

Infant/child mortality may affect fertility directly or indirectly. The interaction between them is a complicated one, because of a multitude of additional influences acting on one or both simultaneously.

Both mortality and fertility are related to many socio-economic variables. The impact of child mortality upon fertility can be summarized as follows:

1. The physiological or biological effects which operates through breastfeeding and birth interval. A death of a child may interrupt lactation which will lead to a rapid return of ovulation and this, in its turn, will shorten the interval between births.

2. The behavioural effect which operates through the individual experience of child mortality (individual effect) or the anticipation of mortality from the level of mortality that prevails in society (the societal effect). Individual and societal effects will motivate parents to compensate for the dead child by replacement (replacement effect) or by producing a larger number of children than the desired family size in anticipation of expected deaths in the future (insurance effect). A replacement effect is a sequential response resulting in additional births to make up for actual child loss. It presumes some form of deliberate fertility control causing couples to cease childbearing after attaining the number of surviving children especially sons they consider to be sufficient. The replacement effect is never likely to be complete because there may not be a target number of surviving children, or the target number may be so high that fertility could not possibly be any higher. The target may be framed in terms of one sex only in which case the death of a child of the other sex will not be replaced.

The couple may have fecundity problems or control over fertility may be imperfect so that if a child died no attempt would be made to replace it, and the child death may result in a downward modification of ideal family size.

An insurance (or hoarding) effect operates in anticipation of prospective high child mortality rather than a reaction to actual child mortality in the family. Hoarding is considered as an effort by a couple to bear more children because they anticipate some children will die in the future.

The distinction between replacement and insurance is important for at least two reasons:

1. Quantitatively, the effect on fertility of hoarding in order to achieve a given target is greater than that of replacement.

2. Replacement is a quick response and it is natural to expect replacement to generate a close, short lagged association between fertility and child mortality.

Both are micro level fertility behaviour. Insurance based on expectation, may respond sluggishly to child mortality depending upon the perception of the mortality level that prevails in the society. Replacement is motivated by parents' experience of child mortality. In societies where mortality rates are high and family size norms are large the insurance effect will be higher than the replacement effect. The insurance effect will decrease in response to a shift to lower child mortality and smaller family size norms and its effect may be unimportant in modern societies, or at an intermediate level in transitional societies where mortality is declining and family size norms are still high. The replacement effect has only a meaning in a contraceptive society, where mortality and family size are low.

The present study on fertility responses to infant/child mortality in Egypt is divided into two parts:

The first part deals with population growth in the world and the transitional theory; the differences between the developing and developed countries according to the theory; the population problem in Egypt and what stage of demographic transition and of economic and social development Egypt is passing through; fertility in Egypt, its trends and the factors which cause high fertility; mortality and its trend in Egypt.

The second part consists of statistical analysis which deals with the assumptions, methods and findings.

Assumptions

In testing the behavioural effects, it is assumed that individual experience of child mortality may:

(a) induce parents to increase subsequent fertility;

(b) affect the parents' desired number of children;

(c) affect the mother's decision to cease childbearing.

In addition replacement and hoarding are tested to find out whether replacement or hoarding is operating in Egypt.

As for the physiological or biological effect the analysis in this part deals with the birth interval and breastfeeding. Two separate chapters are devoted to this purpose.

Considering the birth interval, it is assumed that birth interval can affect child mortality and can be affected by it. Child mortality may shorten the interval between births and this in turn may cause a high infant mortality. The birth interval is considered as a measure of fertility, it may affect the number of children a mother can have through her reproductive life. The analysis depends upon two kinds of birth interval, previous birth interval and subsequent birth interval and how they affect infant/child mortality according to the child's age at death, the length of the interval and his survival chances to the third birthday.

The analysis is then applied to breastfeeding and mortality. It is generally assumed that there may be a strong adverse relationship between breastfeeding and infant mortality. A death of a child will interrupt lactation and this will affect the post-partum amenorrhoea and will shorten the birth interval. It is also hypothesized that if mothers breastfeed their children it may affect their survival chances, while shortening the duration of breastfeeding may lead to excess infant mortality.

Methods

Two approaches are used to test these hypotheses:

1. A descriptive analysis to give an idea of the characteristics of the sample or the variables used.

2. Multiple Classification Analysis (MCA) which deals with quantitative as well as qualitative variables (dummy variables). The important use of MCA is to examine the pattern of changes in the effects of a given variable as more variables are introduced as control variables. It can be regarded as a method of displaying the results of analysis of variance especially when there are no significant interaction effects. It is useful to use MCA, if there are two or more interrelated factors, to test the net effect of each variable when the differences in the other factors are controlled. The MCA technique is selected for its ability to handle non-interval variables and non-linear relationships.

Data Source

The data on which the study is based are taken from Egyptian Fertility Survey (EFS) which was carried out in 1980 by the Egyptian Central Agency for Public Mobilisation and Statistics. It was conducted as part of the World Fertility Survey (WFS) with the collaboration of the World Bank.

The EFS was designed as a two-phase survey. The first phase survey covered all households in the sample. It was administered to Egyptian ever-married women under 50 years of age, who were usually resident in the sample households. The second phase survey covered a sub-sample of about one-third of the households interviewed in the first phase survey. Household schedules were successfully completed for 10,079 households out of 10,343 households in the EFS. Within the 10,079 households successfully interviewed for the household schedule, a total of 8,974 ever-married women under fifty years of age were identified as eligible for the individual interviews. The number of questionnaires successfully completed in the individual survey for ever-married women was 8,788 or 97.9 per cent.

The analysis was confined to 8,788 of ever-married women. A child file was created from the 8,788 ever-married. It was preferred to concentrate the interval and breastfeeding analysis on the number of children rather than on the number of ever-married women. Information on breastfeeding was collected only for the open and last closed birth intervals. Confining the analysis into last close interval introduces a bias, because the further back in time one goes, the less representative of all intervals are the open and last closed interval, therefore, the period of time was limited to a certain period before the date of the survey.

In most of the analysis, the region or place of residence (either rural, urban, lower or upper Egypt) is examined, because the variations in demographic features are quite notable, especially in fertility and mortality levels, desired family size, breastfeeding and contraceptive use. In addition to these obvious demographic variations, there are geographical and socio-economic elements such as:

1. Prominence of agricultural features in some regions.

2. Spread of industrial activities in other regions.

3. Adherence to religious and conventional values.

4. Climatic conditions affecting childrens' and mothers' activities.

5. Non-availability of medical services, drinking water and electricity especially in upper Egypt.

All these considerations are indicative of mothers' attitudes and behaviour towards infant/child mortality and fertility.

Findings

In this study, the impact of child mortality on women's reproductive behaviour is analysed. The findings in relation to the hypotheses can be summarized as follows:

1. The variations between women with or without child mortality experience reveals that women with child mortality experience are characterized by lower age at first marriage, higher fertility and mortality, a higher desired family size and a very low level of contraceptive use.

2. Individual child loss affects a woman's subsequent reproductive behaviour. Her subsequent number of children born increases with the increasing number of deceased children. Apparently, those who experience child mortality among their first few children are more likely to experience it at higher parities.

3. Women who proceed to have another birth decrease with a decrease in child mortality. Therefore, increasing child survival may lead to a reduction in a couple's fertility. It is likely that couples are trying to attain a certain number of surviving children, the death of a child may motivate parents to try to offset this disurbance by having more children.

4. Women may like to cease childbearing only when they achieve a certain number of living children (which varies with mortality experience), and when they reach a satisfying balanced

sex composition of living children. It is also found that child mortality in some cases does not affect a mother's decision to cease childbearing. When fertility is very high as in rural and upper Egypt or when couples find themselves with more surviving children than they want they will fail to replace a child who dies.

5. The analysis shows that the desired number of children increases with the increased number of deceased children.

Testing the effect of past mortality rates and fertility rates on recent mortality and fertility rates shows a slight relationship. Recent fertility reaches the same level as that which prevailed in the past and it increases with mortality experience.

The present study analyses the relationship of the length of the previous and the subsequent interval to the age specific probability of death of index children. Results indicate that previous birth interval has an impact on the survival of the index children whether previous siblings die or survive. It is highly significant as a factor affecting the mortality of the index child in the neo-natal and post-neo-natal periods. A causal relationship seems to exist between the death or survival of the previous child and the length of the interval. A short interval whether previous or subsequent may have a detrimental impact on maternal resources and competition for mother's care especially if the resources are limited. Moreover, birth interval length may affect the number of children born and the number of dead children and conversely, it (the duration) is affected by them too.

A short birth interval may therefore be related to both high mortality and high fertility because the death of a child may persuade the parents to replace it as soon as possible and this will lead to high fertility through this replacement effect. The analysis also shows that the duration of birth interval is longer after a previous child survives, and is shorter after a previous child dies. The survival chances seem to increase with the prolongation of the birth interval. Conversely the risk of mortality will decrease with the increasing length of birth interval.

In this study, the relationship between mortality and breastfeeding in Egypt is analysed. The results suggest that there is an inverse relationship between breastfeeding and infant mortality. The relationship probably holds throughout the population but its magnitude varies according to mother's age, education, occupation and place of residence. A lower level of maternal education is associated with a larger percentage of women who breastfeed their children and for a longer duration. It may seem that the period of breastfeeding is associated with mother's level of education, occupation and place of residence. The results reveal also that breastfeeding duration increases with mother's age at birth but it does not show a significant effect. Breastfeeding and the duration of breastfeeding may increase the survival chances of a child. This may be due to the assocation between lactation and child health. It is found that breastfeeding lengthens the birth interval and this will lead to a decrease in infant mortality.
In a country like Egypt where the majority of women breastfeed their children for a long period (at least two years) breastfeeding is used as a method for spacing births.

It appears from the results that birth interval is longer in the case of a surviving child who is breastfed and shorter if he is breastfed and dies. Finally, decreasing infant mortality may lead to an increase in the breastfeeding period and ultimately a decrease in fertility.

Turning to the replacement rate in Egypt, it is found that replacement, in general, is very low and it is difficult to say that it exists in upper Egypt. Probably what prevails in Egypt is over-replacement because the rate of contraceptive use is very low and there is no limited family size goal. In Egypt sex preference still plays a role in the family building; there is no social security, the illiteracy level is high, health services scarcely reach people especially in upper Egypt and children are continuing to be an economic benefit. All these factors help to keep fertility high in Egypt.

APPENDIX (p.330-343)
Estimating the Effect of Child Mortality on the Number of Births
by Randall J. Olsen
has been removed for copyright reasons

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