A PRELIMINARY APPLICATION OF THE THEORY OF EPIDEMIOLOGIC TRANSITION TO EGYPT

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The theory of epidemiologic transition, as demonstrated elsewhere[1], goes beyond the description of population phenomena to the complex changes which take place in patterns of health and disease and, further, to the interactions among these patterns and their demographic, and sociologic determinants and consequences. The purpose of this paper is to present a preliminary and brief application of the theory to the Egyptain experience. Five major propositions will be considered.

Proposition One : The theory of epidemiologic transition begins with the major premise that is often the fundamental factor in population dynamics.

It is not necessary to go into detail in order to illustrate this point. It is sufficient to mention the premodern and pre-industrial patterns of population change in which mortality fluctuations (extremely high in years of epidemics, famine and wars and relatively high in the non-crisis years), shaped the size, structure and distribution of population and-directly or indirectly-influenced the other two components of population change, namely fertility and migration.

In the case of Egypt, «good» data on vital rates are available only for a relatively short historical period. Yet, from scattered reports and from inferences based on the population growth patterns in the nineteenth and twentieth centuries, one can postulate that (a) fertility was extremely high in the nineteenth and most of the twentieth centuries until the mid-1960s, (b) mortality was also high and fluctuating, with towering peaks in the epidemic and war years, (c) sometime in the latter part of the nineteenth century, mortality started to decline in such a way that by 1906 when vital rates became

available a significant demographic gap was evident and was maintained for sometime, and (d) the gap increased substantially following World War II. (See Figure 1.)

In fact, the population growth rate in Egypt since 1805 can be explained mostly by the phasic decline in mortality while fertility was sustained at a high level ; external migration had only a very small effect, if any.

Proposition Two : During the transition, a long-term shift occurs in patterns of mortality, disease and health whereby pandemics of infection are to a large extent replaced by degenerative and man-made diseases.

Typically, a complete transition includes three stages : Age of Pestilence and Famine, Age of Recording Pandemics and Age of Degenerative and Man-Made Disease.

In the case of Egypt, the Age of Pestilence and Famine encompassed the pre-modern and par of the modern periods. Epidemics, which have always plagued Egypt, as well as endemics and chronic malnutrition (rather than outright famine) kept mortality at extremely high levels. A slight recession in these conditions may have occurred sometime during the nineteenth century when mortality declined, but the most important recession happened only in recent decades. Thus, Egypt passed through the Age of Pestilence and Famine during the nineteenth century, entered a very slow Age of Receding Pandemics in the latter part of the nineteenth and early twentieth centuries and has experienced an accelerated phase of recession since World War II.

Egypt has yet to enter the third phase, Degenerative and Man-Made Diseases, although many such diseases (especially heart disease) are slowly appearing on lists of the leading causes of mortality and morbidity.

Since the recession of epidemics is a prominent feature in the Egyptian transition, some discussion of the behavior of epidemics and endemics since the turn of this century is appropriate here. (See Figure 2.)

The « international» or «quarantinable» diseases : Of the six major diseases governed by international sanitry regulations and and conventionally called « quarantinable, » five have troubled Egypt for many centuries : cholera, plague, smallpox, epidemic typhus and relapsing fever. Although Egypt has always been considered a « receptive area » for yellow fever because of the prevalence of the *Aedes*

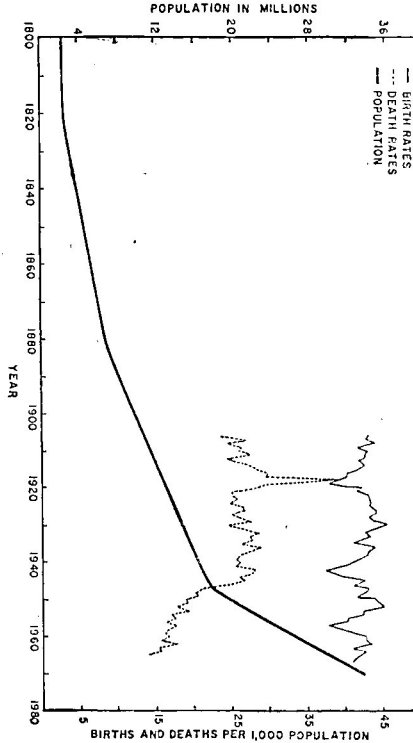

FIG 1:—Egyptian Population Growth Since 1800 and Annual Birth and Death Rates Since 1906.

Sources :—Plotted from the following data: to 1933 from Cleland, *The Population Problem in Egypt: A Study of Population Trends and Conditions in Modern Egypt* (Lancaster, Pa.: Science Press, 1936); since 1934 from M.A. el-Badry, «Trends in the Components of Population Grow in the Middle East,» *Demography 2* (1965): 140—186 and from government estimates.

aegypti which transmits the disease, the country has been spared this disease.

Within the twentieth century, two epidemics of cholera occurred-one in 1902 as a result of the religious pilgrimages (with 40,613 cases and 34,595 deaths) and the other imported from India through the British troops in the Suez Canal Zone in 1947 (with 20,804 cases and 10,277 deaths).[2] Epidemic waves of plague occurred in Egypt between 1899 and 1947, with peaks of more than 1,000 cases per year in 1907, 1908, 1911, 1916, and 1923. The last wave ended in 1947 with only 15 cases and five deaths. Since then plague has receded from Egypt. Several epidemics of smallpox occurred with peaks in 1904-1905, 1909 - 1920, 1926 - 1927, 1933 - 1934 and 1943 - 1947, after which only sporadic cases are on record.

Three epidemic waves of louse-borne typhus rose above the usual annual outbreak level--two during wartime and one during peacetime. The first wave started in 1917 during World War I and reached its peak in 1918. The second wave was less serious, beginning in 1932 and reaching a peak in 1933 ; it was actually precipitated by the economic depression due to a reduction in cotton prices. The third wave stated in 1942 during World War II, reached a peak in 1943, and did not decline significantly until 1947 when DDT was used to kill the louse vector.

Two significant epidemics of relapsing fever are on record. The first began during War I and continued until 1923 with a peak in 1915 - 1918 and an annual average of 115,000 cases. The second wave occurred in 1945 - 1947 with a peak of 110,405 cases and 2,414 deaths in 1946. The disease disappeared in 1947, again after the use of DDT.

Other epidemic diseases : Epidemics of other infectious and parasitic diseases including malaria, cerebrospinal meningitis, diphtheria, chickenpox, whooping cough, pneumonia, bronchitis, influenza, typhoid and paratyphoid, dysentery, gastroenteritis, ophthalmia, streptococcicosis, mumps and infectious hepatitis are on record. For example, many successive malaria epidemics have been noted. Recent severe epidemics peaked in 1937 (36,238 cases), 1944 (37,847 cases) and 1960 (88,033 leases). Similarly, epidemics of cerebrospinal meningitis occured almost yearly with three high epidemic waves -- the first between 1912 and 1917, the second and much higher wave between 1931 and 1935 and the third betwen 1948 and 1953. A fourth wave

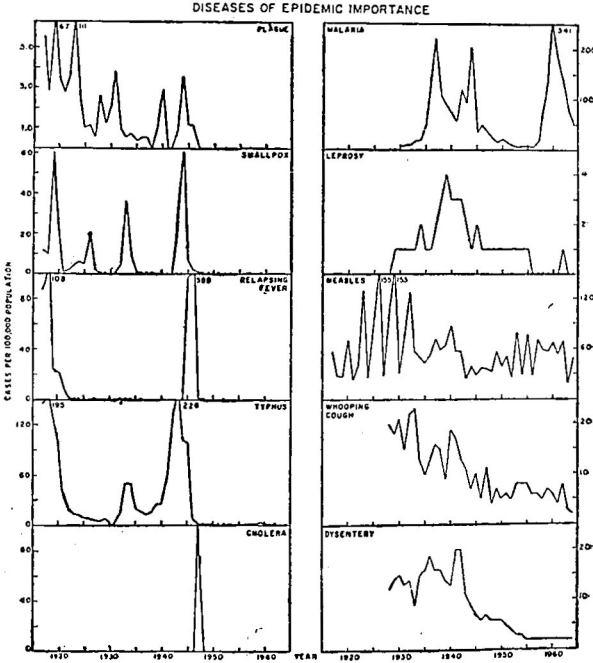

FIG 2:—Diseases of Epidemic Importance.

Sources :—Based on data from the Statistical Division of the Ministry of Health, Cairo (Personal communication).

started in the mid-1950s, but despite the high incidence, the use of sulfa drugs and penicillin has helped to hold the case-fatality ratio down.

Major endemic diseases : Formidable endemic diseases including schistosomiasis, tuberculosis, intestinal and other parasites, trachoma, leprosy, and skin diseases have always existed in Egypt. Of these, only the first two will be considered here.

Schistosomiasis (bilharziasis) has occurred in Egypt for several millennia and is still highly prevalent in rural areas, affecting a large segment of the population. Although it rarely appears as a primary cause of death, this disease is frequently an underlying cause. The general consensus is that the prevalence of bilharziasis has not varied much over the years, which is discouraging, compared to many other epidemic diseases which have receded or at least begun to decline. Our studies in the Qalyub area have shown a shift in the peak of incidence in some areas from very early childhood to school age, indicating first that the environment exposure of young children has decreased, and second, that the peak incidence occurs at an age when treatment becomes at least theoretically more feasible through school health services. However, further intensive research is still needed to discover how to interrupt the cycle of transmission, particularly since the incidence of bilharziasis is expected to increase due to the change in many areas from basin to perennial irrigation following the High Dam project.

Tuberculosis, another of the endemic diseases, has always been prevalent in Egypt, claiming a sizable toll from the population. No accurate longitudinal record of its incidence is available, but surveys put the prevalence in certain areas at 1.9 precent (Sindbis survey, 1950-1951),[4] 1.7 percent (Qalyub survey, 1954-1955),[5] and 1.4 percent (WHO survey, 1960).[6] Our own studies in the Qalyub area have indicated the beginning of a decline in the disease prevalence as indicated by tuberculin tests.[7]

In order to conclude this brief discussion of epidemic disease patterns in Egypt, a few observations should be made: Many major epidemic diseases have already receded or are starting to recede, especially since 1947. Most of the recession has occurred in response to modern technology-better environmental control such as the use of insecticides, water purification, and the use of antibiotics and chemotherapy. Environmental control will reduce the incidence of disease, while better treatment will reduce the case-fatality. Rising social standards, improved nutrition among mothers and children and increasing availability of health services also exert some effect on disease patterns.

Proposition Three: During the epidemiologic transition, children and young women benefit most from declines in mortality.

In the case of Egypt, the greatest decline in mortality has definitely occured among children under 15 years of age-more precisely, among

children under five and under one. Therefore, the population continues to be relatively young or actually becomes younger, since the surviving children have widened the base of the population pyramid. As to the improvement among women, females have also benefited from the mortality decline more than males and the variance in life expectancy by sex is increasing. However, the experience in Egypt is somewhat peculiar. Available data from life tables (q) since 1937 indicate that women in Egypt were dying at a lower rate even then. This tendency is in contrast to the expected higher female mortality during pre-industrial periods, especially in the adolescent and fertile groups, which had been the pattern in England and Sweden in the nineteenth century and in Japan until 1930. This reduced mortality rate among women is also in contrast to data based on model life tables until a life expectancy at birth of between 45 and 50 years is attained. The higher mortality risks among Egyptian males may be partially explained by the prevalence of bilharziasis, which shows higher predilection to males. The generally lower mortality among children and females substantiates the theory that both the size and structure of the population are being influenced primarily by mortality changes and perhaps additionally by fertility variations such as the temporary rise of age-specific fertility rates between 1947 and 1960.

Proposition Four: The shifts in health and disease patterns that characterize the epidemiologic transition are closely associated with the demographic and socioeconomic transitions that constitute the modernization complex.

A complete consideration of this proposition would require considerable space; hence, only a very brief mention will be given here. On a worldwide basis, two types of mortality decline can be distinguished, one that is socially determined and another that is primarily medically determined. The first pattern typically occurred in western countries where mortality declined in response to the social improvement brought obout by the industrial revolution and modernization as well as by ecobiologic recession. The single most important factor in that decline was nutrition improvement. Such a mortality decline was mistakenly attributed to medical achievements, but close analysis will prove that the medical variable had very little to do with mortality decline in Europe during the eighteenth and nineteenth centuries. The medically determined battern of mortality decline occurred after the introduction of antibiotics, disinfectants, disease control programs and better health services. This pattern has characterized experience of

most developing countries since World War II. In Egypt, however, both patterns may be traced. The small decline in mortality late in the nineteenth century and early in the twentieth century was socially determined while the accelerated decline after World War II was medically determined.

Proposition Five: Based on variations in the pattern, the pace, the determinants and the consequences of population change, three models of the epidemiologic transition can be identified:

The Classical Model: occurred typically in western countries and describes the gradual, progressive transition from high mortality and fertility to low mortality and fertility that accompanied the process of modernization. In this model, mortality declined slowly; after a lag of 50 years or more fertility started to decline. Both variables are affected by social and modernization forces. It is of interest that in this model once mortality reached low levels, fertility became the more fundamental factor in population change. However, both fertility and mortality come under control during the latter part of the transition.

The Accelerated Model: describes the rapid mortality decline followed, after a short lag, by an accelerated fertility decline, as in Japan, for example. While the mortality decline is influenced mainly by socioeconomic and partly by medical forces, the acclerated decline in fertility is due largely to induced abortion. Naturally, all developing countries would desire an accelerated fertility transition, but it is difficult for many of these countries to pay the same price as did Japan. Considerable research is needed to determine whether or not such countries can achieve an accelerated transition without resorting to widespread induced abortion.

The Contemporary or Delayed Model: is currently encountered in developing countries and describes the relatively recent and yet-to-be-completed transition in such countries. The transition from an Age of Pestilence and Famine to an Age of Receding Pandemics started in many developing countries only after World War II. Public health measures have been a major component of the imported, internationally sponsored medical packages that have played a decisive role in rapid mortality decline in the economically handicapped countries. These programs, while successfully manipulating a mortality decline, have left fertility at high levels with the inevitable result of explosive population growth. By this model, it seems that fertility decline

also has to be «manipulated» by deliberate population policy, including family planning programs, which are often national and which usually receive international support. This model contrasts with the classical transition model in which fertility control did not necessitate the implementation of national programs. It is encouraging to note that fertility actually began to decline in a few countries which experienced the delayed transition model. Peculiarly enough, most of these countries are islands-Taiwan and Ceylon, for example-where a community family planning program seems to spread widely and have visible effects in one or two decades.

In the case of Egypt's transition, the classical model apparently started at a low level, sometime in the nineteenth century in response to the prosperous society of that time. However, during the economic and social declines of that century, the transition was interrupted before fertility decline could be achieved. Had the economic progress continued, and had a classical transition been completed in Egypt, Egypt could have emerged in the twentieth century as another Japan. But neither continued. Then after 1947 a contemporary type of transition started with explosive population growth. In the 1960s, however, indications of fertility decline are on record. Whether this decline will reassert itself after the present conflict is over or will revert to a «baby boom» depends greatly on both the diffusion of social determinants of low fertility and on the efforts of the family planning program.

CONCLUSION

This paper presents a preliminary application of the theory of epidemiologic transition (Omran, 1971) to the Egyptian experience. It indicates that Egypt began a classical (western type) transition in the eighteenth century, with relative mortality decline. This transition was unfortunately halted until 1947, when further recession of epidemics and rapid mortality decline started a new transition of the contemporary variety. Further elaboration of the Egyptian experience with more complete characterization of both the mortality and natality transitions will be considered in subsequent publications.

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8. See, for example, ABDEL R. OMRAN, editor, *Egypt : Population Problems and Prospects* (Chapel Hill, N.C. : Carolina Population Center, 1973), Part I, Chapters 1, 2 and 3 and Part VI.