A REPORT ON INFANT MORTALITY RESEARCH AND POPULATION ESTIMATION METHODOLOGY, EGYPT

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The consultant would like to express his gratitude to Dr. Hallouda, President of CAPMAS, for inviting him to participate in the International Fertility Conference. Thanks are also due to Mr. Lanni Kangas, Director, Office of Population, USAID/Cairo, for facilitating his attendance at the conference and subsequent discussions at CAPMAS; and to Dr. M. Nizamuddin, UNCTA, for arranging meetings with various CAPMAS officials, and for making his stay fruitful as well as enjoyable.

ABBREVIATIONS

AID	Agency for International Development
CAPMAS	Central Agency for Population Mobilization and Statistics
EFS	Egyptian Fertility Survey
IMR	Infant Mortality Rate
IUSSP	International Union for the Scientific Study of Population
LLB	Last Live Birth
POPLAB	International Program of Laboratories for Population Statistics
UNC	University of North Carolina
UNCTA	United National Chief Technical Advisor
WFS	World Fertility Survey

I. BACKGROUND AND SCOPE OF WORK

BACKGROUND AND SCOPE OF WORK

After arrival in Cairo the consultant met with the director of the Office of Population, USAID mission in Cairo, Mr. Lanni Kangas, and United National Chief Technical Advisor (UNCTA)/Demographer assigned to CAPMAS, Dr. M. Nizamuddin, to discuss and finalize the scope of work. According to the original scope of work, the consultant was requested to provide technical assistance at a CAPMAS conference on fertility to be held on December 20-22, 1983 and to help analyze data and findings of the comparative study of infant mortality in Egypt and Jordan.

Later, the consultant met with several CAPMAS officials and a separate meeting was held with Mr. Shellaby, director of general technical affairs. In the light of these discussions with CAPMAS officials, and in view of the fact that two senior CAPMAS staff members had worked closely with the consultant and other University of North Carolina (UNC) faculty members in Chapel Hill in the analysis of the Egyptian Fertility Survey (EFS) infant mortality and breastfeeding data, and were coauthors of the papers relating to these topics, it was considered appropriate to modify the scope of work. According to the revised scope of work the consultant was to participate in the CAPMAS conference and present and discuss results of infant mortality analyses; and to review and examine the methodology of the yearly post-census population estimate figures announced by CAPMAS and suggest appropriate recommendations if necessary.

Itinery

The consultant arrived in Cairo on December 17 and left on December 27, 1983. The consultant stayed in Cairo during the entire period of the consultancy.

II. OBSERVATIONS AND ACTIVITIES

OBSERVATIONS AND ACTIVITIES

A. PARTICIPATION IN THE INTERNATIONAL FERTILITY CONFERENCE

The conference began on December 20, 1983, and lasted for three days. The primary purpose of the conference was to disseminate findings of the primary and secondary stage analyses of the 1980 EFS data. The conference agenda included a total of six sessions, four of which -- 1) Recent Population Trends in Egypt, 2) Determinants of Fertility and Infant Mortality, 3) Fertility Attitude and Preferences, and 4) Population Development and Family Planning -- included the technical papers on various topics (see Appendix II for detailed agenda).

The conference was held in a well-equipped conference room with simultaneous translation in English and Arabic. Overall it was well-organized and attended. The quality of the papers was good and discussions were pertinent.

The paper on levels, trends and differentals in infant and child mortality prepared by Adlakha and Suchindran of UNC-Chapel Hill and Ashy and Ismail of CAPMAS, who worked with the conslultant in Chapel Hill from August through December 1983, was included in the session on determinants of fertility and infant mortality (see Appendix III). Mr. Ashy gave a brief presentation highlighting the major findings of the paper. A summary of discussions on this and a related paper is presented in the next section.

Infant and Child Mortality Research Based on the 1980 EFS Data

The paper by Adlakha et al. (1983) presented an analysis of the levels, time trends, differentials, and determinants of infant and child mortality based on tahe data from the 1980 EFS. This paper was prepared for a larger project that is investigating determinants of infant and child mortality in selected Near East countries (Jordan, Egypt, Tunisia, and Yemen). To achieve comparability in the results, a standard methodology was developed and was previously applied to the data from Jordan.* Two senior CAPMAS investigators, Mr. Hosni S. Ashy and Mr. Abdel Fatteh E. Ismail, had worked closely with Adlakha in the analysis of the data from Egypt and were coauthors of the paper.

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*Several copies of the detailed Jordan Methodology paper (Sullivan et al. 1982) and the Jordan summary paper (Sullivan et al. 1982) were given to Dr. Nizamuddin, UNCTA/Demographer with CAPMAS for distribution to relevant CAPMAS and AID personnel.

In addition to the paper by Adlakha et al., the session on fertility and infant mortality determinants included a paper by Ismail and Casterlane (1983) entitled "Differentials in Infant and Child Mortality in Egypt." Since Ismail and Casterlane had also used the 1980 EFS data, there was considerable overlap between the two papers.

However, each paper had its own distinctive features. The distinctive features of the paper by Adlakha et al. were as follows:

1. It undertook a thorough examination of the quality of the data and highlighted problems that had some bearing on the estimated mortality rates.

2. It provided regional and national trends in infant and child mortality.

3. It analyzed breastfeeding data in relation to the survival of children.

The distinctive feature of the paper by Ismail and Casterlane was that the differentials and determinants analysis included community-level variables in addition to the same demographic and socioeconomic factors which were considered in the paper by Adlakha et al.

The discussion was focused primarily on the following three points.

First, the analysis of the 1980 EFS data indicated that the level of infant mortality in Egypt during 1976-79 was substantially greater, between 134 and 146 infant deaths per 1000 births, than the registered rate of approximately 85 deaths per 1000 births. Although the registration of infant deaths in Egypt is considered to be incomplete, such a large difference between the survey estimate and the registration estimate could not be explained in terms of the available estimate (National Academy of Sciences 1982) of the under-registration of infant deaths.

Second, the infant mortality rate (IMR) estimates based on the 1980 EFS data are not very satisfactory for determining the regional time trends in infant mortality. The estimates are not satisfactory due to the small numbers involved. In addition, regional location is determined by place of residence at the time of the survey while the IMR estimates are made for the several years prior to the survey when respondents may have resided in and given birth to their children in a region different to their current residence.

Third, the inclusion of the community variables in the model of determinants of infant mortality did not add much to the explanatory power of the model that included only socioeconomic and demographic factors. The discussion pointed out that the study did not necessarily indicate that community characteristics do not influence the level of infant mortality. Rather, the lack of apparent significant contribution could be due to the problems associated with measuring community characteristics.

In spite of some limitations, the findings from the two papers have various implications for maternal/child health programs and for various government policies which impact on mortality. They also suggest the need for further research on infant mortality in Egypt in order to obtain deeper insight into the phenomenon. A few recommendations are listed in the following section.

Recommendations for Further Research in Infant Mortality in Egypt

(1) The vital registration system has been a source of estimates of infant mortality and other demographic parameters in Egypt and is likely to continue to be so in the future. In view of this, it is a matter of particular concern that the EFS estimate of IMR (134-146) exceeds the estimate from the registration system (85) by nearly 60 percent. This situation creates ambiguity about the current level of infant mortality in Egypt, and a proper evaluation of time trends in mortality cannot be made. The paper by Adlakha et al. concludes from their evaluation of the data, using indirect procedures, that the quality of the EFS data is satisfactory. Nevertheless, the collection of data by the pregnancy history approach used in the EFS could suffer from various errors, such as misplacement of births in time and the difficulty of separating live births and still births. If these types of errors exist in the data, then the IMR estimates would be biased. Thus, it is suggested that that in-depth analysis of the data from other related surveys (e.g., the 1980 Egypt Contraceptive Prevalence Survey, and the planned 1984 Contraceptive Prevalence Survey) and reassessment of the coverage of the vital registration system be made to obtain an accurate picture of the current level of infant mortality in Egypt.

In this respect, it may be mentioned that the International Program of Laboratories for Population Statistics (POPLAB) has developed an extended last live birth (LLB) questionnaire for collecting data on recent births and infant deaths using the single round survey approach (Sullivan et al., 1981). The extended LLB questionnaire (see Appendix IV) follows a structure which resembles a condensed pregnancy history and employs probing questions which have been previously used in various demographic questionnaires. Nevertheless, it is new in several ways. It differs from the usual preganancy history format in that information on events is collected in a reverse chronological order. It brings multiple probing procedures into a single, logically designed questionnaire, and the questions are asked of all respondents (thereby eliminating interviewer discretion in their application). A final innovative aspect of the questionnaire is that it collects mortality data for reported births only and can be used to estimate infant mortality rates indirectly with the aid of a demographic model.

The extended LLB questionnaire was used in the East Java Population Survey and was found to be suitable for the estimation of recent levels of fertility and infant mortality. Thus, future surveys in Egypt may consider the use of the extended LLB questionnaire as it is a particularly attractive alternative for estimating levels of infant mortality as well as fertility.

(2) The 1980 EFS was not specially designed to investigate infant mortality; some pertinent information pertaining to determinants of infant mortality, as described in the paper by Adlakha et al., was not obtained. Also, it is not surprising that satisfactory estimates of the IMR by regions cannot be made from the survey data as this was not an explicit objective of the survey. Therefore, it is suggested that an appropriate comprehensive data collection instrument and procedure be designed for a special study of mortality in Egypt.

(3) In June 1983, a seminar sponsored by the World Fertility Survey (WFS) was held in London to discuss the problems with the community-level data and measurement procedures. This seminar resulted in a revised community-level module. Using this module in future surveys in Egypt may provide a better understanding of the influence of community characteristics on infant mortality.

B. CURRENT POPULATION ESTIMATES FOR EGYPT

Introduction

The primary source of the data on population size in Egypt is the census. A census has been taken periodically since 1882; the last one was in 1976. The population of Egypt is, however constantly changing and, therefore, for most current purposes the information from the 1976 census on the size of population is not adequate. The planning of economic and social programs in Egypt requires a fairly accurate knowledge of the current population size. To meet this need, CAPMAS has developed a national population estimates program whereby the current (post-census) estimates of the population size are annually prepared and announced in a statement (Appendix V).

Methodology

The current estimates of the population size for Egypt prepared by CAPMAS pertain to the total combined population of Egyptians living in Egypt and abroad. The methodology consists of taking the 1976 census count and adding to it first an estimate of Egyptians living abroad in 1976 and then an estimate of the natural growth computed from the data on registered births and deaths since the 1976 census date. The basic estimating equation for estimating current population (P_t) is as follows:

$$P_t = P_{1976} + E_{1976} + B - D$$

where P_{1976} is the 1976 census count of the population, E_{1976} is the estimated number of Egyptians living abroad on the census date, and B and D are the numbers of registered births and deaths since the census date.

Considering the data available in Egypt, the method used for the current population estimates is satisfactory and preferable over the alternative method of updating the base population by the use of an assumed rate of growth (Shryock and Siegel, 1973, p. 733). However, uncertainty about the accuracy of the estimates exists because known errors in the data from various sources are not taken into account. Although some errors cancel out, there can be no assurance, until the data is properly assessed, that they all indeed balance. Some observations concerning errors in the data and suggestions on how the estimates can be improved are discussed below.

Errors in Data and Recommendations

Population statistics in Egypt, as in many countries, are not completely accurate. A rigorous evaluation of the data on which estimates are based is important for determining the reliability of estimates and for making compensating adjustments when the estimates are prepared. A considerable amount of attention and effort is being devoted to improve the basic quality of demographic data in Egypt. However, certain gaps still exist. Those that have bearing on the estimated current size of the population are listed below.

(1) The 1976 census which provides the base data for estimating the current size of the population has not yet been rigorously evaluated for coverage errors. Also, no post-enumeration survey was undertaken to measure the under-count in the census. Available evidence seems to indicate that about a million people may have been missed in the 1976 census.* This estimate is not precise, it merely illustrates that errors in the base data contribute to errors in the estimate and underscores the need to develop an adequate program for evaluating the accuracy of census figures. It is heartening to note that the CAPMAS census plans for 1986 include a post-enumeration survey check for measuring coverage of the census.

(2) The estimate of current population size is obtained by adding to the base population an estimate of the natural growth computed as the difference between the number of registered births and deaths. Both births and deaths in Egypt are under-registered to varying degrees. However, since both births and deaths are under-registered, it is possible that the estimate of natural growth is not greatly in error because some errors will cancel each other out. Existing information on under-registration of vital events in Egypt** can be used to assess the magnitude of the error in natural growth estimates.

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*The estimate is derived by comparing the census count of children under 10 years of age with the expected number of registered births after adjusting for the under-registration of births and mortality of children.

**Two notable studies that provide estimates of under-registration of births and deaths in Egypt are by NAS (1982) and CAPMAS (1979).

To increase confidence in the population estimates, such an assessment should be made. The latest estimates of under-registration, however, are for the 1970s and cannot necessarily be considered valid for the 1980s. Thus, a reassessment of the coverage of the vital registration system is needed. The method of direct check using sample survey techniques (such as an earlier study by CAPMAS in 1974-5) is the best procedure for evaluating the covereage. The post-enumeration check for the 1986 census, with appropriate data collection instruments* for births and deaths, can also be used for evaluating the vital registration system.

(3) Accurate figures on Egyptians living abroad also affect the reliability of population estimates. CAPMAS estimated that there were about 1.425 million Egyptians abroad at the time of the 1976 census; however, no details on how this estimate was derived were provided. Other studies arrive at different numbers of Egyptians living abroad (see for example Naseef, 1982). Because of variations in the estimated number of Egyptians abroad, it is suggested that CAPMAS provide details on the procedures and data sources used to obtain its estimate and a statement on the magnitude of the possible error that may exist in it.

Because of the generally unsatisfactory state of methods to deal with international migration, the council of the International Union for the Scientific Study of Population (IUSSP) created a working group in 1977 for the study of international migration. The IUSSP working group has devised new techniques for estimating emigration from data collected in a census or survey using special questions (IUSSP, 1981). The data on emigration abroad is needed for population estimates; it also has important implications for the economy of Egypt. The use of the new techniques, thus, may be explored to improve the accuracy of international emigration data.

*The data instruments should include appropriate information for matching births (or children under 1 year of age) and deaths reported in the survey with births and deaths in the registration system.

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APPENDIX I

LIST OF PERSONS CONTACTED

CAPMAS

Dr. Awad Mokhtar Hallouda	President
Mr. Ismail Raafat	First Under Secretary and Head of Statistical Section
Mr. Abdelhamid Shallaby	Director, General Technical Affairs
Mr. Saad Zaghoul Amin	Under Secretary/McHaye Population Student Research Center
Mr. Ahmed El Baz	Director General, Population Studies Research Center
Mr. Tahir Ainin	Statistician, Central Administration for Statistics
Mr. Nabil M. Soliman	Demographer, Office of Technical Affairs

UNITED NATIONS

Dr. M. Nizamuddin	UNCTA/Demographer at CAPMAS

POPULATION COUNCIL

Dr. Fredric Shorter	Service Representative, Cairo Demography Center
Dr. K.S. Sarma	Demography Expert
Dr. Badrud Douza	Demographer

ILO

Dr. K.S. Seetha Ram	Demographic Expert

USAID

Mr. Lanni Kangas	Director, Office of Population, USAID

APPENDIX II

INTERNATIONAL CONFERENCE ON FERTILITY

IN EGYPT

DECEMBER 20 -22, 1983

CAIRO

DETAILED AGENDA

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DETAILED AGENDA

Dec., 1983

p.m. Registration

p.m. Inaugural Session

Dr. Mohamed Sabri Zaki

Dr. Awad Mokhtar Hallouda

The Representative of WFS Dr. Halvar Gille

The Representative of ISI Dr. Van De Kaa

The Representative of USAID Mr. Lini Kangas

The Representative of UNFPA Mr. Hamed Fahmi

J p.m Tea Break

'0 p.m. First Session "Population Trends in Egypt

hairman : Dr. Mohamed Sabri Zaki

apers: - Recent Population Trends In Egypt

Dr. Awad Mokhtar Hallouda

- Demographic Responses to Socio-Economic Change in Egypt

Dr. Samir M. Farid

- Comparison of Husbands and Wives Fertility Attitudes and Preferences, Contraceptive Knowledge and Use

Dr. Susan Cochrane

'iscussants:

Dr. Mohamed A. El Badry.

Dr. Aziz El Bendary

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Wednesday: 21 Dec., 1983

9.30 : 11.30 a.m Second Session "Determinants of Fertility & Infant Mortality.

Chairman: Dr. Mohamed A. El Badry

Papers: - An Analysis of Determinants of Fertility in Egypt.
Mrs Laila Nawar and Dr. John Hobcraft

- Patterns of First Marriage in Egypt
Mr. Nosshy Orabey.

- Differentials in Infant and Child Mortality In Egypt.
Mr. Ismail M. Eid and Dr. John Casterline

- Level, Trends and Differentials of Infant and child Mortality in Egypt.
Mr. Hosni Soliman, Mr. Abdel Fattah E.Ismail, Dr. Arjun . Adlakha and Dr. C.M. Suchindran

- Village Characteristics and Reproductive Beheviour In Rural Egypt.
Dr. John Casterline and Mr. Ismail M. Eid

Discussants:
Dr. Frederick Shorter
Dr. Hamed Abou Gamrah
Dr. Mohamed Nizamuddin

11.30 : 12.00 p.m Tea Break

12.00 : 1.30 p.m Third Session "Fertility Attitudes and Preferences".

Chairman: Dr. Aziz El Bendary

Papers: - Achieved Fertility, Family Size Desires and Contraceptive Use
Mr. Samir Boraie and Dr. J. Maccarthy

- The Determinants of the Demand for Children Among Husbands and Wives in Egypt.
Mr. Ibrahim Khodair Taha and Dr. Susan Cochrane

Discussants:

Dr. Atif Khalifa

Dr. Sarah Loza

1.30 : 3.00 p.m Lunch at Sonista Hotel - Nasr City

3.00 : 5.00 p.m Fourth Session "Family Planning"

Chairman: Dr. Aziza Hussein

Papers: - Distribution System of Contraceptives in Egypt.
Dr. Mostafa Hamamy

- Contraceptive Use in Egypt
Mrs. Bothina El Deeb and Dr. John Casterline

- Breast Feeding Patterns and Determinants in Egypt.
Mr. Hosni Soliman, Mr. AbdelFattah E.Ismail

Discussants:

Dr. Malek El Numrosy

Mr. Lini Kangas

8.00 p.m Reception at Mariot Hotel - Zamalek.

Thursday: 22 Dec., 1983

9.30 : 11.30 a.m Fifth Session "Population, Development & Family Planning".

Chairman: Dr. Halvor Gille

Papers: - Socio-Economic Development in Egypt
Dr. Awad Mokhtar Hallouda

- Household Income: Its Determinants and Correlates.
Dr. Susan Cochrane

- Community Development and Family Planning
Dr. Hussein Abdel Aziz

- Employment Planning in Egypt, An Insurance Policy for the Future.
Dr. Samir Radwan

Discussants:

Mr. Mostafa El-Guindy
Dr. Abdel Fattah Nassef
Dr. Nader Fergani
Dr. Nabil El Khorazati

11.30 : 12.00 p.m Tea Break

12.00 : 1.30 p.m Closing Session

Chairman: Dr. Awad Mokhtar Hallouda
Open Discussion

Discussants:

Dr. Aziz El Bendary
Dr. Maher Mahran
Dr. Samir Mohamed Farid
Dr. Susan Cochrane

APPENDIX III

Central Agency For Public Mobilisation and Statistics & International Statistical Institute (WFS)

الجهاز المركزى للتعبئه العامه والاحصاء
المعهد الدولى للاحصاء
(هيئه المسح العالمى للخصوبه)

DOC.CAPMAS/Con 83/17

International Conference on Fertility in Egypt
20 - 22 December 1983
Cairo, Egypt.

المؤتمر الدولى للخصوبه فى مصر
٢٠ ـ ٢٢ ديسمبر ١٩٨٣
القاهرة ، جمهورية مصر العربية

LEVELS, TRENDS AND DIFFERENTIALS OF INFANT AND CHILD MORTALITY IN EGYPT

BY

HOSNI SOLIMAN M. ASHY

ABDEL FATTAH E. ISMAIL

AND

ARJUN L. ADLAKHA

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Acknowledgements

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We are grateful to the Central Agency for Public Mobilization and Statistics (CAPMAS), Government of Egypt (President, Dr. Halouda), and to the World Fertility Survey, London, for the permission to use the data tape of the 1980 Egypt Fertility Survey.

I. Introduction

According to census counts Egyptian population nearly doubled from 19 million in 1947, to slightly over 38 million in 1976 . Rapid population growth during this period is attributed to decline in infant mortality and in the crude death rate rather than to changes in the fertility rate (NAS, 1982). Although in recent decades declines in infant and child mortality have occurred, a large variation still exists among different population subgroups (Nour, 1979 and NAS, 1982). Because of lack of reliable data a study of differentials of infant and child mortality by various socioeconomic factors until now, was not possible. Knowledge of their differentials is an important step in the formulation of programs and policies to improve the survival and health of the population. Because infant mortality is influenced by the reproductive behavior of couples a study of infant mortality may have implications for population policy programs.

In this paper we study the levels, trends, and differentials of infant and child mortality in Egypt. The data used in this study are from the 1980 Egypt Fertility Survey conducted as a part of the World Fertility Survey. A brief description of the data and its quality is given in Section II. Section III presents information on time trends in infant and child mortality for Egypt and for the major regions of Egpyt. Infant and child mortality differentials by selected demographic and socioeconomic variable are given in Section IV. Section V presents the results from multivariate regression analysis performed to study the net effects of selected demographic and socioeconomic factors.

Mortality rates for four age intervals of life are presented in the paper. The definitions of these rates are consistent with conventional demographic usage. Infant mortality rates ($_1q_0$) represent the probability of

dying between birth and one year of age. Neonatal rates represent the probability of dying between birth and one month of age, while post-neonatal rates represent the probability of a birth dying in the last 11 months of infancy (i.e., neonatal and post-neonatal rates sum to the infant mortality rate). Child mortality rates ($_4q_1$) represent the probability of a child, who survives to age one, dying between age one and age five.

A few points about the EFS data which affect our analysis should be clarified.

First, the data evaluation in Section II finds that the data on age at death suffers from two problems: 1) There is evidence of age misreporting (heaping at 12 completed months of age) and 2) for a significant number of deaths age at death was not known. Approximate adjustment was made to correc the former defect. No adjustment was made for those deaths for which no information on age at death was available. They were excluded from the estimates presented in the text and they are, therefore, understated to some extent. However, some estimates on trends and regional differences were made by making some allowance for this defect. These adjusted estimates are given in the Appendix.

The second concerns the types of data available for the study of the determinants of mortality. A wide variety of factors are related to infant and child mortality levels. These can be grouped under the headings of genetic, demographic and socioeconomic factors. Genetic factors, which include such things as birth defects and birth weight, are particularly important in determining mortality rates within a few days of birth. Demographic factors refer to the attributes of a birth which are biologically determined (e.g., mother's age at birth and birth order). In general, these factors influence the state of health of a newborn and are particularly influential in determining neonatal mortality rates. Socioeconomic factors

are those characteristics of the parents or household which determine the quality of the environment to which an infant or child is exposed. A great many variables representing socioeconomic characteristics have been shown to be associated with infant and child mortality. Some of the variables found to be strongly related to mortality are the following: social class, parental education, household income, mother's work status, housing conditions, availability of piped water, breastfeeding and supplemental feeding practices, prenatal maternity care and access to preventive and curative health services. These factors usually impact more strongly on late infant and early child mortality than on neonatal mortality.

In the individual woman's survey there is no information about genetic influences on mortality but there is a rather complete set of variables on demographic factors and a fair number of variables representing socioeconomic variables. The socioeconomic factors on which we have no information are: household income, housing conditions, availability of piped water, supplemental feeding practices, prenatal care and access to health services. Thus, variables which specifically represent these factors are not included in our analysis.

The third concerns the type of information available for studying the relationship between breastfeeding and mortality. The information on breastfeeding is extremely limited and the sample is very selective. As a result analysis of the effects of breastfeeding on mortality was carried out separately from the main analysis pertaining to differentials.

II. Evaluation of the Mortality Data

The individual woman's questionnaire obtained pregnancy history data from ever-married women 15-49 years of age. For each reported birth, data were collected on the date of birth, sex, survival status and, if appropriate, age at death. The coding of age at death is in terms of completed months of age. We evaluate the quality of these data by the analysis of 1) sex ratios at birth, 2) age distributions of deaths and proportion of unknown deaths, 3) truncation bias, and 4) ratio of deaths in the neonatal and post-neonatal periods. For the purpose of data evaluation, the data are grouped into one decennial birth cohort (1946-55), four quinquennial birth cohorts (1956-65, 1961-65, 1966-70 and 1971-75) and one three year birth cohort.

Sex Ratio at Birth

The retrospective information on vital events could suffer from sex-selective recall of births because the attitude favoring male children prevails in many societies. Sex ratio at birth, which varies between a relatively narrow band of 100 to 107, is commonly used to detect this problem. Sex ratios by period of birth from the EFS data are shown in Table 1. For all births the sex ratio is 107. This figure is reasonable, judging from information on sex ratio at birth for other countries. Furthermore, the sex ratio of reported births for different periods in Table 1 vary between 106 and 109 and do not show any monotonic increasing or decreasing patterns. This analysis, therefore, does not show any obvious sex-selective recall of births in this data set.

Age Reporting of Deaths

An investigation of the data on age death finds two kinds of problems: 1) There is evidence that information suffers from age misreporting and 2) for significant proportion of the total deaths reported in the survey, information on age death is missing.

With respect to the age misreporting problem, in the EFS responses on age at death were coded in completed months of life. Figure 1 presents a graph for each birth cohort of the percentage of deaths in each month during the first 24 months of life. The important point is to note the heaping at 6, 12, 18 and 24 months of age. The degree of heaping is most pronounced at 12 months, indicating a net transfer of deaths out of infancy which would tend to negatively bias infant mortality rates. Moreover, heaping at 12 months is more pronounced in the earlier birth cohorts than the recent birth cohorts, a situation which would result in an understatement of the magnitude of infant mortality declines.

We experimented with three alternative procedures to correct for age heaping at 12 months. The first procedure involved an arbitrary redistribution of half of the deaths at 12 months back into infancy (Goldman, et al., 1980). The second procedure involved calculating the probabilities of dying between birth and exact age two [q(2)] from the reported number of deaths from 0 to 23 months of age and estimating IMRs with the aid of the West model life table systems of Coale and Demeny (1967). The third procedure was identical to the second, except that q(2) values are calculated after adjusting for age heaping at 24 months (by redistributing half of the deaths at 24 months to under age two).[1]

IMRs estimated from these three procedures, along with unadjusted IMRs are reported in Table 2. In almost all cases, the adjusted rates exceed the unadjusted rates. The only exception is the 1976-79 birth cohort where adjusted rates by procedures II and III are lower than the unadjusted rate by 1 to 3 percent. For the cohorts of 1961-65, 1966-70 and 1971-75, all three adjustment procedures yield adjusted rates which differ by only a few

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[1] The q(2) values on which the IMRs of the second and third adjustment procedures are based are presented in Table 3.

points from each other (4 points in 1971-75, 3 points in 1966-70 and 8 points in 1961-65). However, for the cohorts of 1946-55 and 1956-60, the alternative procedures yield adjusted rates which differ by more than a few points. For example, for the 1946-55 birth cohort, the adjusted rates by the alternative procedures differ by 15 points. Thus, it seems that we can have greater confidence in results of the adjustments for the four most recent birth cohorts and that the simple procedure of redistributing half the deaths at 12 months back into infancy is reasonable. Accordingly, throughout the remainder of this report, all analyses and all reported rates are based on data which have been adjusted by this procedure.

Note, however, that the estimates in Table 2 exclude from the analysis those deceased children for which information on age at death was missing. Over all for about 10 percent of the total deaths reported in the survey information on age at death was not available. This percent figure, however, slightly varied by birth cohorts. For the two most recent birth cohorts, of 1976-79 and 1971-75, information on age at death was missing respectively for 5% and 8% of the total deaths. For the earlier birth cohort percent of the total deaths with missing age was relatively higher and varied between 10 and 12 percent. Since various rates presented in this paper are not corrected for this deficiency, the net effect is that they are understated to a certain extent.

However, estimates of the infant mortality rates for the whole country and the three major regions (Cairo and Alexandria, Lower Egypt, and Upper Egypt) were made with additional adjustments for the deaths with unknown ages. Thus, adjustments are made by making an assumption that the unknown ages deaths have age distribution identical to the age distribution of deaths with known ages. The deaths with the known ages were classified by sex, region, and birth cohort and within each category unknown ages

were distributed according to the distribution of deaths with known ages in that category. The rates for the country and the regions were arrived at by pooling the data.

Estimates of the IMR for four birth cohorts from 1961 to 1979 with the additional adjustment for the deaths with unknown ages are shown in Table 4 (the estimates for the cohorts prior to 1961 are not shown because as described later they suffer from the truncation bias). This adjustment increases the IMR of 1976-79 by about 4%, of 1971-75 by 7%, of 1966-70 by 11%, and 1961-65 by 10%. These adjusted rates show a more regular decline in the IMR than unadjusted rates and rates adjusted only for the age heaping. Table 4 also compares the estimates of IMR from the survey with those made by the NAS panel. For the birth cohorts of 1966-70, and 1961-65 adjusted estimates from the survey are quite close to the NAS estimates. However, for the two most recent birth cohorts, 1971-75 and 1976-79, all estimates whether adjusted or unadjusted are higher than the NAS estimates. This discrepancy between the two sets of rates is a cause of concern. We, however, find no obvious evidence to support that deaths of infants in the survey for the recent cohorts were overreported.

Truncation Bias

The pregnancy history data of the EFS, as is the case with all pregnancy history data, are susceptible to truncation effects. The EFS collected retrospective data from women who, at the time of the survey, were between the ages of 15 and 49. Thus, for the time period 0 to 5 years preceding the survey, the collected data are representative of births to women of all reproductive ages. However, for the time period 20 to 25 years preceding the survey, the collected data are representative of only births to women

up to age 30 (i.e., the birth data for earlier time periods are truncated). If the risk of infant mortality is correlated with mother's age at birth, the truncated data may yield biased estimates of infant mortality.

Truncation bias has the potential of being serious for time periods in which the observed distribution of births (by age of mother) differs substantially from the true distribution. The birth distributions observed in the EFS by age of mother and by time period are presented in Table 5 (Panel A) The potential for truncation bias occurs in the 1946-55, 1956-60 and 1961-65 birth cohorts. In those cohorts, births under age 20 constitute 64 (1599/2481), 35 (1316/3750) and 26 (1578/6060) percent, respectively, of all observed births. This contrasts sharply with the 1976-79 birth cohort where births under age 20 constitute only 16 (934/5884) percent of observed births. Since infant mortality rates are relatively high for women under age 20, the observed data may yield infant mortality estimates for the 1946-55, 1956-60 and 1961-65 which are positively biased.

We tested for bias in the mortality estimates for 1946-55 and 1956-60 and 1961-65 by a standardization procedure. IMRs were computed for the 1966-70, 1971-75 and 1976-79 birth cohorts which were standardized on the observed (i.e., truncated) birth distributions of the 1946-55, 1956-60 and 1961-65 birth cohorts. The differences between the standardized and observed IMRs for the three recent birth cohorts are an index of the degree of bias in the observed IMRs for the 1946-55, 1956-60 and 1961-65 cohorts. When standardized on the 1946-55 observed birth distribution, the standardized rates exceed the observed rates by between +14% and +22%, suggesting a positive bias in the observed rates for the 1946-55 birth cohorts by approximately that amount (Table 5, Panel C). Similarly when standardized on the 1956-60 birth distribution, the standardized rates differ from the observed rate by between +7% and +9%, suggesting that the 1956-60 observed rates also

suffer significantly from truncation bias. However, when standardized on the 1961-65 birth distributions, the standardized rates differ from the rate by between +2% and 5%, suggesting that for this birth cohort truncation is not serious.

The Proportion of Infant Deaths in the Neonatal Period

The proportion of infant deaths that occur in the neonatal period (0 completed month of age) is sometimes used to asses the completeness of reporting of the neonatal deaths. The proportion of the neonatal death is known to vary inversely with the level of infant mortality. At levels of infant mortality in excess of 100 per 1000, it has been widely accepted that about one third of infant deaths occur in the neonatal period. This view is based on historical data from western publications (U.N. 1954) and on the rationale that infectious diseases, which cause infant deaths primarily in the post-neonatal period, are primarily responsible for high infant mortality rates. The applicability of such an age pattern of mortality within infancy among the developing populations is, however, questioned. Two recent studies that have analyzed Bangladesh data found that at levels of infant mortality 128 and 150, 60 percent of infant deaths occurred in the neonatal period. At levels of infant mortality rate of 150 or more, such as reported in Table 6 data on the proportion of infant deaths in the neonatal period for developing populations are generally lacking.

Table 6 presents IMRs and the proportion of infant deaths which occur in the NN period as reported in the EFS. The proportion shows a systematic rise from .30 in 1946-55 to .42 in 1976-79. This rise is consistent with the finding that when infant mortality declines the proportion of the infant deaths in the neonatal period increases. Further, proportions are also reasonable when judging from the experience of western populations. On the basis of this analysis, all that can be said, is that there is no apparent gross underreporting of neonatal deaths in the EFS.

III. Time Trend in Mortality Rates and Regional Differences

Levels and Trends

Table 7 presents neonatal, post-neonatal, infant and child mortality rates by sex for four birth cohorts from 1961 to 1979. With the exception of the neonatal mortality rate, which changed very little during this period, all rates display a trend of declining mortality.

Between 1961-65 and 1976-79, the infant mortality rate of both sexes combined declined by 11 percent (from 160 to 142), the post-neonatal mortality rate declined by 20 percent (from 112 to 84). With respect to child mortality Table 6 presents rates for three quinquennial cohorts from 1961 and 1975. Between 1961-65 and 1971-75, the child mortality rate of both sexes combined declined by 30 percent (from 93 to 65). Thus over the period from 1961 to 1975, the percent decline in child mortality exceeds the percent decline in the PNN and NN mortality over the longer time period from 1961-65 to 1971-79. The pattern of successively large decline in mortality at ages more removed from the time of birth is consistent with the general view that improved socioeconomic conditions, which have occurred in Egypt, usually have less impact on reducing NN mortality which is greatly associated with environmental factors.

The separate rates for males and females show time trend pattern which is similar to the pattern of both sexes combined. However, when rates by sex are compared an important difference is observed. With respect to infant mortality, the sex differential in the IMR is small and there is no consistent pattern. However, within infancy, the NN rate is consistently higher for males and the PNN rate is consistently higher for females. The finding of higher NN mortality of males than females is common to most populations and reflects greater susceptibility of male births than female births to mortality from genetic causes. Also, in most populations, mortality of males is

generally found to exceed that of females in the PNN interval. In the case Egpyt estimates apparently indicate a reverse pattern. This reverse pattern of sex differences in mortality is generally observed in populations in which preference for male children exists and is considered to suggest the possibility of preferential care and attention to male offspring.

It should be remembered that the mortality rates in Table 7 exclude deaths with unknown ages. However, when an approximate allowance is made then the level of the rates changes, but time trend and sex differential patterns remained essentially the same.

Regional Estimates

Table 8 shows infant and child mortality rates for three major regions of Egypt. The three regions are combined governorates of Cairo and Alexandria; upper Egypt (the Nile valley which is south of Cairo) and lower Egypt (the Nile Delta which is north of Cairo). In interpreting these rates it must be remembered that regional location was determined by place of residence at the time of the survey, but that the mortality rates pertain to time periods in the past when the respondents may have lived somewhere else. Also many of these rates are based on a small number of cases and, thus, would have large sampling errors. Hence, these rates should be considered only for discerning broad patterns.

With respect to the most recent cohort of 1976-79, the IMR was 117 for the region of Cairo and Alexandria, 122 for the region of Lower Egypt, and 184 for Upper Egypt. Thus, the IMR was substantially higher in Upper Egypt than in the other two regions. The Upper Egypt IMR slightly exceeds the IMR for Cairo and Alexandria which has the lowest IMR. This pattern of differences in the regional IMRs exists throughout the period of 1961-65 and 1971-79. All regions experienced declines in the IMR during this period but the proportionate decline was slight in the IMR of Cairo and Alexandria (3%) and Lower Egypt (2%) and was substantially greater in Upper Egpyt (22%). With

respect to rural-urban differences, a higher infant mortality in villages than in towns and cities is observed from these data. With one exception, the IMR in villages was always higher than the rate in towns and cities. These observations on time differentials in the regional infant mortality are broadly consistent with the observations from the estimates prepared by the National Academy of Sciences (1982), although estimated IMR in this paper differ from those prepared by the NAS panel.

With respect to child mortality (Table 9), the rate for the 1966-70 birth cohort was 49 for Cairo and Alexandria, 67 for Lower Egypt and 72 for Upper Egypt. Thus, as was the case with the IMR, the CMR was highest in Upper Egypt and lowest in Cairo and Alexandria. During the period child mortality declined in all three regions and throughout the period the urban child mortality rate was lower than the rural rate .

IV. Bivariate Analysis: Mortality Differentials

The analysis of differentials is restricted to births which occurred in the ten year period preceding the survey, i.e., from 1970 through 1979. This restriction was applied to minimize the bias that arises from the truncation effect. Also the use of the most recent data minimizes the problem of memory and recall lapse that may be existing in the data.

Mortality rates for the neonatal, post-neonatal, infant, and childhood ages are presented for selected demographic and socioeconomic characteristics and are discussed below.

Demographic Factors

Demographic factors which are biological attributes at birth are considered most proximate correlates of mortality. Age of mother at time of birth, birth order, and birth interval are the demographic factors most commonly analyzed. The earlier studies seem to show that there is apparently a range for each of these factors in which risk of infant death is minimal (U.N., 1954; Suchindran and Adlakha, 1981; Sullivan, et al, 1983). With respect to age, infant mortality is higher when the mother is very young, and decreases to a minimum around age 25-30, then rises again first slowly and then more rapidly as the mother approaches menapause. For birth order, lowest mortality rate usually occurs among second births and the first order births and births order 6 and higher have higher mortality. In the case of interval preceding successive births, various studies indicate that short birth interval preceding a child birth is associated with higher mortality. Some studies also indicate that infants born after too long interval also suffer from higher infant mortality.

The relationship between demographic characteristics and mortality of infants are partly considered as a result of certain biological factors, e.g., varying frequencies of premature or low weight births, complications associated with pregnancies at different ages and birth orders (Shapiro, et al,

1969). However, other factors could also be partly responsible for these associations. For example, young mothers, having relatively little experience in childbearing, may be less capable of providing necessary care for their infants, which may result in a higher mortality of their infants. Similarly, birth interval may be viewed as a measure of the amount of pressure on the mother for the care of children. When birth interval is short, there will be two children in a family with similar demands which may cause severe pressure on the mother responsible for the care, and, thus, result in a higher mortality of children.

The infant and childhood mortality rates by demographic characteristics are given in Table 10. With respect to the neonatal mortality rate mother's age at birth displays an expected U-shaped pattern. The neonatal mortality rate for births to women under 20 is 75. The rate decreases to 62 at ages 20-24, 61 at ages 25-29, and to 52, the lowest rate, at ages 30-34. Thereafter, a rise in the neonatal mortality rate is observed for mothers of ages 35-39 and 40-44 years old, the rates being 67 and 78, respectively. Birth order also displays a 'U' shaped pattern. The rate for first order births (66) and births for order 5-6 (71) and 7+ (79) are relatively high and relatively lower for intermediate birth orders (51 and 53 respectively for birth order 2 and 3-4). Length of the preceding birth interval shows a strong inverse relation with the neonatal mortality rate. The neonatal mortality rates decline rapidly with the increase in the length of interval. The rate for births with a birth interval of less than 2 years is 95 and decreases rapidly to 42 for births with 2-3 years birth interval, to 32 for 3 to 5 years interval and 24 for 4-5 years interval. Large differences are also observed with regard to the survivorship of the previous birth. The NN rate for births when the previous birth had died (119) is about two and one half times the rate when the previous birth had survived (47).

In the case of PNN, mother's age shows a 'U' type pattern, though minimum in this case is found for women 35-39. Birth interval and survivorship status of the last birth show strong associations with the PNN rate. For example, the PNN rate for births with the interval less than 24 months (124) is about twice as high for other births (56). Similarly, the PNN rate for births when previous birth had died (247) was about twice the rate as when the previous birth had survived.

Infant mortality differentials reflect the joint finding of the NN periods. All four demographic variables are found to be associated with infant mortality. Both mother's age and birth order show 'U' type association with the infant mortality rate. As in the case of NN and PNN mortality the infant mortality rate decreased when the length of the preceding birth interval increased or when the previous birth had survived.

Child mortality rates do not show any clear trend with age of mother, birth order or the survivorship of the previous birth. However, it is strongly associated with the length of the preceding interval. The childhood mortality rate decreased from 97.9 when the length of the preceding interval was <24 months to 30.4 when the length was over 60 months.

Socioeconomic Factors

In any society the incidence of infant and child mortality, under existing levels of social and economic development, including public health and medical facilities, may vary between different social and economic strata. These variations may be reflections of differentials in the sophistication of parents with relation to understanding and practicing modern methods of childcare and differentials in their access to modern health care facilities. In this section we present results on infant and child mortality by certain selected parental characteristics.

Mortality rates were computed for five socioeconomic characteristics:

Mother's education; father's education; father's occupation; work status of mother since marriage; and place of residence (Table 11). Two types of biases relevant to this analysis should be noted. First, the characteristics data generally apply to the survey date while mortality rates are for the longer period from 1970 to 1979. It is possible that socioeconomic conditions have changed over time. Thus, observed relationships of these variables to mortality rates are subject to this time discrepency. Second, as reported earlier, for a significant number of deceased children information on age at death was not available. While estimates show lower mortality for those who are better educated, or are in higher status occupations, or live in urban areas than those who are less educated, work in agriculture related occupations or live in rural areas, the observed differentials are perhaps conservative. This is because our analysis indicates that proportion of the unknown deaths was generally lower for the former categories than the latter categories (see Appendix).

For the purposes of discussion, the selected variables can broadly be divided into three categories:

1) Social class status (mother's education, father's education, father's occupation;
2) Work status (whether mother worked since marriage); and
3) Residence (rural or urban residence).

Many studies have shown that the social status is associated with mortality of children and thus may be an important factor in determining their level of mortality. For example, infant and child mortality differentials, based on individual data by social class, measured in terms of income, education or occupation, find that mortality decreases with an increase in social class (Sullivan, et al, 1983; Suchindran and Adlakha, 1981; Arriaga and Hobbs, 1980; Adlakha, 1970; Chase, 1964). Over all differentials in mortality rates by social class variables in Egypt are generally similar to

those found in other populations (Table 11). When mother's or father's education is used as a measure of status a pronounced inverse relationship is observed with each age interval mortality rate. For example, the IMR for mothers with no schooling is 158 and is about 89% greater than the IMR of 84 for mothers with 6 or more years of schooling. Similarly the NNR of mothers with no schooling is greater by 91%, the PNN is greater by 86% and CMR is greater by 108% than the corresponding rate for mothers with 6 or more years of schooling. Similar differentials in mortality rates are observed with respect to father's education.

With regard to father's occupation pronounced differentials in mortality rates are also observed. Over all rates are highest for the agriculture category, lowest for the white collar category, and the intermediate status categories of transitional and blue collar, have rates in between the rates for the agriculture and blue collar categories. The only exception to this pattern is the PNN interval in which the rate for the agriculture workers is slightly lower than the rate for the transitional workers.

With respect to mother's working status, women were classified into two categories, whether she ever worked after marriage or not, when births are classified into these two categories, the results show no differences in mortality rates.

With respect to rural-urban residence, the mortality rates show an expected pattern of higher mortality of infants and children in rural areas than urban areas. In each age interval the rural mortality rate is higher than the urban mortality rate. With the exception of the PNN interval, differences between the rural-urban rates are substantial. The rural neo-natal mortality rate of 74 is 68 percent higher than the urban rate of 44. Similarly the rural infant mortality rate is 30% greater and child mortality rate is 52% greater than the corresponding urban rate. However, in the PNN interval, the difference in the mortality rate between rural and urban areas

is relatively small, the rural rate is only 9% greater. This is somewhat unexpected because one would expect that the advantage of the urban residence as observed in the NN interval would also extend in this interval.

V. Multivariate Analysis: Net Effects

In this section we discuss the net effects of various demographic and socioeconomic factors on infant and childhood mortality. The approach followed here is that of Sullivan et al (1983). Results are presented separately for the neonatal, post-neonatal, infant and childhood age intervals. For each age interval, logistic regression model was used to investigate the effect of the selected factors on mortality.

The logistic model is specified as follows:

$$\ln\left(\frac{q}{1-q}\right) = \beta_0+\beta_1 x_1+ \ldots +\beta_r x_r+E$$

When q is an age-specific mortality rate (neonatal, post-neonatal, infant or childhood),

x_i denotes an independent variable,

β_i denotes a regression coefficient, and

E is the error term.

The independent variables in the model are those previously considered, namely, demographic factors: mother's age at birth, length of the preceding birth interval, survivorship of the previous birth and birth order, and socioeconomic factors: mother's education, father's education, mother's work status, father's occupation, place of residence and religion.

The data for the main regression model is restricted to births in 10 years preceding the survey (January 1970 to February 1979). Since earlier analysis showed that the length of the preceding birth interval and survivorship of the previous birth are strongly associated with mortality rates, these variables are included in the analysis which requires restricting the data set to births of order two or higher.[2]

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[2] To determine if our findings concerning the net effects of particular factors on mortality are valid when first births are added to the universe

For each age interval considered, three logistic regression models were run. Model I included only demographic factors, Model II only socioeconomic factors, while Model III included both sets of factors. A comparision of the β coefficients for Model I and III can determine whether any significant relationships between demographic factors and death rates are explainable through their association with the socioeconomic variables. Similarly, the comparison of the coefficients for Model II and III can determine whether any significant relationship between socioeconomic variable and death rates are explainable through their correlation with the demographic variables.

Regression results are presented below for each of the four age intervals investigated. The sign and standard error of the β coefficients are used to draw conclusions about the direction and statistical significance of the independent variables. However, the β coefficients represent the impact of the independent variables on the logit of a mortality probability [$\ln \frac{q}{1-q}$] rather than on a mortality probability [q value]. To provide an indication of the impact of an independent variable on a mortality probability, we have calculated two additional statistics for all variables found to be significant at the 5% level. The first of these statistics, <u>the absolute response value</u>, measures the absolute difference between the mortality rate for one value of an independent variable as opposed to some other value, while holding all other variables constant (e.g., the absolute mortality differential of being born in a rural as opposed to an urban area). The second statistic, <u>the relative</u>

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the ran regression models dropping the variables length of the preceding birth interval and survivorship of the previous birth. The model was run with data exclusive as well as inclusive of first order births. The results were identical for neonatal and post-neonatal mortality, and dropping the variables did not make any change. For infant and child mortality, the exclusion of first order births from the universe did not make any significant change in the results. However, dropping the two demographic variables produced significance of birth order changed from non-significance to significance. Since the dropped variables are correlated with birth order, this result is not a surprising one.

risk ratio, is the ratio of the mortality rates associated with two alternative values of an independent variable, again, while holding all other variables constant.[3]

Neonatal Mortality (NN)

Table 12 presents regression results for the neonatal period. Model I indicates all demographic variables (age, birth order, length of preceding birth interval, and survivorship of previous birth) have a significant effect on NN mortality. A comparison of Model I and III indicates that the significant effects of the demographic variables remain after controlling for the socioeconomic factors.

The mother's age at birth, which has a significant net effect on the probability of NN death, is found to be non-linear. A significant negative linear coefficient together with a significant positive coefficient for the square term indicates that the risk of NN death decreases initially with age and then increases at older ages (Table 12). The calculation of absolute response values show that from the reference NN mortality rate or 48.1 per 1000, at mother's age at birth at 18 the death rate declines by 11.1 at age 30. The relative risk ratios indicate that when mother's age at birth changes from 18 to 30 the NN rate is only .72 times as great (Table 13).

The birth order is found to have significant positive relationship to

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[3] Absolute response values and relative risk ratios were calculated as follows: First, equation (1) was transformed into the form:

$$q = \frac{e^{\Sigma \beta_i X_i}}{1 + e^{\Sigma \beta_i X_i}} \qquad (2)$$

where all variables are as defined in equation 1 and e is the base of the natural logarithm system.

Second, a reference value for q was computed after assuming a reference set of values for the independent variables (X_i). Third, a second value for q was computed after changing the value of one idependent variable. The absolute response value is the difference betwen the two q values, while the relative risk ratio is the ratio of the two q values.

NN mortality. When birth order changes from 2 to 5, the absolute increase in NN mortality was 13.7. For corresponding changes in birth order, the relative risk ratio was 1.28.

The preceding birth interval shows a significant negative relationship with NN mortality. When the birth interval changed from 12 to 24 months, the NN mortality on an average declined by 13.7 or from 12 to 36 months, the decline was 23.1. In terms of the relative risk, an increase in preceding birth interval from 12 to 36 months the NN rate is .52 times as great.

The survival of the previous birth implied a lower NN mortality. A change in the survival status of the previous birth from alive to dead shows an absolute increase in the NN rate by 46.7. The risk of NN death is 1.97 times greater when the previous birth had died than when the previous birth had survived.

Models II and III show that among the socioeconomic variable considered the place of residence of the mother and religion have significant effect on NN mortality. A comparision of Models II and III indicate that the significance of these two variables persists even after adjusting for demographic variables.

The NN mortality rate of urban mothers is significantly lower than that of rural women. When mother's place of residence changes from urban to rural the NN mortality rate increased by 32.1. The relative risk ratio indicates that the NN death is 1.7 times greater when the mother lives in a rural area than if she lived in an urban area.

Mother's religion also showed significant influence on NN mortality rate. The NN rate is higher for Christian than Muslim mothers. The risk of death is 1.6 times greater for children of Christian religion than that of Muslim religion.

Post-Neonatal Mortality (PNN)

As in the case of NN mortality all demographic variables considered show significant affect on PNN mortality (Table 14). Comparison of Models I and III

show that the inclusion of the socioeconomic variables did not weaken their impact. Model II indicates that mother's education has a significant effect on PNN mortality. Unlike NN mortality the place of residence of mother and religion do not show any statistically significant effect on PNN mortality.

The mother's age at birth has a significant non-linear effect on the PNN mortality. The risk of PNN mortality decreases with age and then increases at older ages. The absolute PNN mortality rate decreased from a reference value of 159.1 at age 18 to 9.4 at age 30 and increased to 10.5 at age 40. When mother's age at birth changes from 18 to 30 the PNN rate is only 0.59 as great.

The PNN death rate is found to increase with birth order. When the birth order changed from 2 to 5, the PNN mortality rate increased by 39.1 (Table 15). The risk of PNN is 1.43 times greater when birth order changed from 2 to 5.

The length of preceding interval shows a negative effect on the PNN mortality. When the birth interval changed from 12 to 24 months the PNN decreased by 45.8. For such a change in birth interval, the relative risk indicates that PNN was only 0.71 times as great.

When the previous child dies in infancy, the probability of the ensuing birth dying in PNN period is about 1.39 times that of the birth in which the previous child survived. Changes in the survivorship of the previous birth from alive to dead increases the absolute PNN mortality rate by 61.8.

The PNN mortality decreased significantly with increase in mother's education. When mother's education changed from illiterate to 6 or more years of schooling, the PNN mortality decreased by 46.2. For such a change in mother's education, the risk of PNN death is only 0.71 times as great for mothers with 6 or more years of schooling than that of illiterate mothers.

Infant Mortality

Results of infancy (i.e., the NN and PNN periods combined) need not necessarily follow from the separate analysis of the NN and PNN periods. Since the standard type of analysis looks at infant death as a category we present here the results in that format (Tables 16 and 17).

Table 16 shows that the following factors have a significant net effect on infant mortality: mother's age at birth, birth order, length of preceding birth interval, survivorship of the previous birth, mother's education, place of residence and religion.

The relative risk ratio shows that when mother's age is 30, the infant mortality is only 0.65 times as great as that at age 18. The infant mortality rate increases with age and at birth order 5, the rate is 1.23 times as great as the rate at birth order 2. The infant mortality rate decreased significantly with the length of the preceding birth interval. An increase in the birth interval from 12 to 26 months implies approximately 27 percent reduction in the infant mortality rate. Also when the survival outcome of the previous infant changes from "alive" to "dead" the infant mortality increased by 54 percent.

Among the socioeconomic factors, mother's education, place of residence and religion are found to have significant effect on the infant mortality. Expressed in terms of the relative risk ratio, change in mother's education category from "illiterate" to 6 or more years of schooling, the infant mortality is reduced by 26 percent. A change in the place of residence from urban to rural increased the rate by 12 percent. The infant mortality of Christians was about 22 percent higher than that of Muslims.

Childhood Mortality

The net effect of demographic and socioeconomic variables on child mortality rates differed from that of infant mortality rates (Table 18).

In the case of child mortality, birth order and survivorship of previous birth did not show any significant net effect. Mother's age at birth had only marginal effect on child mortality (significant at 10% level). The length of previous birth interval was found to be statistically significant. The absolute response to a change in the length of the birth interval from 12 to 24 (or 36) months was -29.2 (or -51.3). Expressed in terms of the relative risk, an increase in birth from 12 to 24 (or 36) months implies a mortality rate of .73 (or .42) times as great (Table 19).

Father's education and place of residence show significant net effect on childhood mortality. Unlike infant mortality, religion and mother's education did not show any significant net effect on child mortality. The probability of child death reduced significantly with the increase in the number of years of schooling the father has received. The risk was 0.72 (or .42) times greater when the father has had 6-9 years (or 10 or more years) schooling than when the father has had less than 6 years of schooling. Births to urban women experienced significantly lower child mortality than that of rural women. The estimated regression coefficient shows that the risk of child mortality is 1.33 times greater when the mother is from rural area than if she is from an urban area (Table 19).

Breastfeeding: Gross and Net Effects on Mortality

For the last two births of respondents the EFS collected information on whether the birth was breastfed and, if breastfed, the duration of breastfeeding. Several aspects of the data limit their suitability for an analysis of the relationship between breastfeeding and mortality. First, the information on breastfeeding is extremely limited. The data do not provide any information on 1) the frequency of breastfeeding and supplemental feeding and 2) the reasons for never breastfeeding or stopping breastfeeding. Second, there is evidence that information on the duration of breastfeeding

was not always accurately reported by respondents.[4] Third, the universe consisting of the last two births of women constitutes a very selective population.[5]

The analysis which follows is restricted to births occurring between January 1970 and February 1979 for which data on breastfeeding is available.[6] There were 7973 such births of all orders of which 275 had died in infancy. The analysis involves computing mortality rates for breastfeeders and non-breastfeeders for the following age intervals: the early PNN periods (1-5 months), the late NN period (6-11 months), the entire PNN period (1-11 months) and the childhood age interval (12-59 months).[7]

Gross Effects

For the purpose of computing mortality rates, births are classified as breastfeeders or non-breastfeeders following two alternate procedures. In the first procedure for each age interval investigated, births are classified according to their breastfeeding status at the beginning of the age interval. Mortality rates for cases classified by breastfeeding status according to this procedure is presented in Table 20. For the age 1-5 months, 6-11 months and 1-11 months, mortality rates were much lower for breastfeeders than for non-breastfeeders. However, for the age interval 12-59 months, mortality

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[4] The evidence is of two kinds: the data on the duration at which breastfeeding stopped exhibited a substantial degree of heaping at 6, 12 and 18 months. For 68 cases in the data the duration of breastfeeding exceeded either age of these 68 cases were excluded from the analysis child.

[5] The data set included in the present analysis consisted of 7973 children of all births between January 1970 and February 1979 for which breastfeeding data were available. The post-neonatal for this population is 34.5 which is well below the corresponding death rate of 84.2 observed for all the births during the same period.

[6] The life table analysis performed in the section included all births between January 1970 and the interview date.

[7] No analysis is conducted for the NN period (0 months). This is so because it is probably the case that many neonatal deaths, even late neonatal deaths, occur to infants who are too ill to breastfed, so that the causation runs from illness to breastfeeding status rather than vice-versa.

rates were almost identical for both breastfeeders and non-breastfeeders. The table also indicates the mortality rates of never breastfed is higher than those who stopped breastfeeding during 1-5 months, but the rate is lower during 6-11 months and 12-59 months.

In the second classification procedure births are classified as breastfeeders for each month of age on the basis of their breastfeeding status at the close of the previous month. This procedure involves the calculation of monthly death probabilities by breastfeeding status and the calculation of mortality rates for broad age intervals from the monthly rates (i.e., the life table approach). The life table calculation for the interval 1-11 months is illustrated in Table 21.[8] The corresponding rates for the intervals studies are given in Table 22. For both the interval 1-5 months and 6-11 months, the breastfeeders have considerably lower mortality than the non-breastfeeders.

Net Effects

We investigated the differential mortality rate for breastfeeders and non-breastfeeders among gross rates further by estimating the net effect after controlling for a number of confounding factors. Logistic regression model with births of order 2 and higher for which breastfeeding data were available. The model included all demographic and socioeconomic variables used earlier and, in addition, a dummy variable which indicated the breastfeeding status of a child at the beginning of the age interval under investigation. The results are given in Table 23.

The coefficient on the breastfeeding variable is negative (indicating that breastfeeding is associated with lower mortality) and is highly significant for all the age intervals considered (PNN and childhood intervals).

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[8] Because of small sample size life table calculations were not extended beyond 12 months.

For the 1-5 month period, the mortality rate for non-breastfeeders is 8.39 times that of the breastfeeders. The corresponding relative risk ratio for the intervals 6-11, 1-11 and 12-59 months are respectively 5.78 6.38 and 1.98 (Table 24).. These results suggest that the effects of breastfeeding on mortality rates decreases as the age interval increases.

Summary

This paper presents an analysis of the levels, time trends and determinants of infant and child mortality in Egypt using data from the 1980 Egyptian Fertility Survey (EFS). The data on mortality in the 1980 EFS was obtained as part of the birth history of ever married women. Much of the analysis is conducted in terms of four mortality rates for neonatal, post-neonatal, infant and childhood ages.

Various indirect tests were applied to evaluate the quality of the mortality data. Two points that have bearing on the various computed rates were highlighted. First evidence was found indicating misreporting of age death. An adjustment to the data to approximately correct for this defect was made. Second, for about 10% of the total deaths reported in the survey, information on age at death was not available. No correction or adjustment was made for this problem. As a result the estimated rates in this paper are most probably underestimates of the true levels.

The analysis of the time trend which was limited to the period of 1965-79 indicated a modest decline in the IMR (11%) during the period and relatively greater decline (30%) in child mortality during a shorter time period from 1961-65 and 1971-75. Within infancy, the PNN rate declined by 20 percent while the NN rate remained virtually unchanged. Thus decline in child mortality was greater than that in infant mortality. This finding is consistent with frequent observations that with the socioeconomic improvement in a population over time, the mortality rates for age intervals far removed from the time of birth decline relatively faster.

A persistent pattern of mortality differentials by sex was found in the data. For all birth cohorts between 1961 and 1979, male NN mortality exceeded female NN mortality but male PNN mortality as well as childhood mortality was less than female PNN and child mortality. This pattern

suggests preferential care and treatment of male offspring.

Analysis of mortality differentials was restricted to data on births in the 10 year period from 1970 to 1979. Differentials were calculated for four demographic factors: mother's age at birth, birth order, survivorship of the previous birth and length of the preceding birth interval. All four factors showed systematic associations with neonatal mortality and post-neonatal mortality. However, with respect to child mortality only birth interval showed strong association. Differentials were investigated for five socioeconomic factors: mother's and father's education, mother's work status, father's occupation and place of residence. All factors except mother's work status were associated with infant and child mortality.

Multivariate analysis with a logistic regression model was conducted to determine the net effect of the demographic and socioeconomic factors on mortality. Separate regression runs were made for the neonatal, post-neonatal, infant and childhood age interval.

For the neonatal, post-neonatal and infant mortality all the demographic factors considered ; i.e., mother's age at birth, birth order, survivorship of the previous birth and the length of the preceding birth interval, had a statistically significant effect on mortality. For child mortality only the length of the preceding birth interval had significant effect.

For NN, PNN and infant mortality, the mother's age at birth showed a 'U' shaped pattern of effect; the effect increased with birth order, decreased when the length of the preceding birth interval increased and when the previous birth had survived. The inverse relationship with the length of the preceding birth interval also presisted for the childhood mortality.

The relationship of socioeconomic variables and mortality varied by the type of mortality. For NN mortality, mother's place of residence and

and religion had statistically significant effect. Rural mothers and Christians experienced higher mortality. For PNN mortality mother's education is the only variable showed statistical significance. PNN mortality decreased significantly when mother's had six or more years of schooling. Mother's education, place of residence, and religion had significant effect on infant mortality. The effect was similar to that of NN and PNN mortality.

The data provided information on breastfeeding duration for births which were last and next to the last birth of the respondents in the survey. The effect of breastfeeding was to significantly reduce the death rate for all the age intervals considered. However, it should be noted, that the data on breastfeeding lacked detailed information on reasons for stopping breastfeeding and are provided by a very selective sample.

Table 1

Sex Ratios of Births and Infant Mortality Rates by Birth Cohort Based on Unadjusted Survey Data[a]

(The 1980 Egypt Fertility Survey)

Birth Cohort	Births			Infant Mortality Rates		
	Males	Females	Sex Ratio	Males	Females	Sex Ratio
1976-79[b]	3073	2810	109.4	138.0	133.1	103.7
1971-75	4162	3931	105.9	145.8	136.9	106.6
1966-70	3730	3426	108.9	139.9	139.8	100.1
1961-65	3125	2935	106.5	146.9	147.9	99.3
1956-60	1925	1825	105.5	169.4	159.5	106.2
1946-55	1274	1207	105.6	207.2	179.0	115.8

Notes: a) Results are based on data which are not adjusted in any manner. Rates are per 1000.

b) Excludes births occurring within one year of the interview date.

c) This and all the text tables, unless otherwise specified, exclude deceased births for whom information on age at death was missing.

Table 2

Unadjusted and Adjusted Infant Mortality Rates by Sex and Birth Cohort[a]

(The 1980 Egypt Fertility Survey)

Birth Cohort	Unadjusted IMRs	IMRs Adjusted for Age Heaping at 12 Months		
		Procedure I	Procedure II	Procedure III
			West	West
		BOTH SEXES		
1976-79[b]	135.6	141.9	131.7	133.8
1971-75	141.5	149.1	141.4	145.0
1966-70	139.9	150.1	146.9	153.0
1961-65	147.4	160.4	158.2	166.2
1956-60	164.5	184.0	182.6	193.8
1946-55	193.5	218.1	219.9	233.5
		MALES		
1976-79[b]	138.0	141.9	134.5	135.6
1971-75	145.8	152.3	142.5	145.5
1966-70	139.9	147.7	144.2	149.8
1961-65	146.9	159.7	158.4	166.7
1956-60	169.4	189.6	188.5	201.3
1946-55	207.2	233.1	230.9	240.8
		FEMALES		
1976-70[b]	133.1	142.0	128.6	131.8
1971-75	136.9	145.8	140.2	144.7
1966-70	139.8	152.7	149.9	156.4
1961-65	147.9	161.2	157.6	165.4
1956-60	159.5	178.1	176.1	185.7
1946-55	179.0	202.2	208.0	225.6

Notes: a) Rates are per 1000.

b) Unadjusted and adjusted (Procedure I) rates for 1976-79 exclude births occurring within one year of the interview date. Adjusted rates (Procedures II and III) for 1976-79 are based on q(2) values which were computed from data which excludes births occurring within two years of the interview date.

Table 3

Unadjusted and Adjusted Values of the Probability of Dying Between Birth and Age Two[a] [q(2)] by Sex and Birth Cohort

(The 1980 Egypt Fertility Survey)

Birth Cohort	Unadjusted q(2)[b]			Adjusted q(2)[c]		
	Both Sexes	Males	Females	Both Sexes	Males	Females
1976-79	164.4	164.5	164.3	167.1	165.9	168.5
1971-75	177.1	174.9	179.3	181.9	178.8	185.2
1966-70	184.2	177.2	191.8	192.0	184.5	200.2
1961-65	198.5	195.5	201.7	208.6	205.8	211.6
1956-60	229.1	232.7	225.2	242.9	248.3	237.3
1946-55	274.9	284.1	265.1	291.4	295.9	286.7

Notes: a) Rates are per 1000.

b) Used to estimate IMRs of Table 2 (Procedure II).

c) Used to estimate IMRs of Table 2 (Procedure III).

d) Excludes births occurring within two years of the interview date.

Table 4

Estimates of Infant Mortality Rate from the Survey Data and the NAS Report by Birth Cohort

Survey Estimates

Birth Cohort or Period	Unadjusted	Adjusted		NAS Rates
		For Age Heaping at 12 Months	For Age Heaping and for Deaths with Unknown Ages	
1976-79	136	142	148	118[a]
1971-75	142	149	160	134[b]
1966-70	140	150	166	160[b]
1961-65	147	160	176	160[b]

Notes: a) Rate is for 1975-76.

b) Unweighted average of rates by single year.

Source: NAS (1982). The Estimatation of Recent Trends in Fertility and Mortality in Egypt. Report No. 9, National Academy Press, Washington, D.C., 1982.

Table 5

Births and IMRs by Mother's Age at Birth and Birth Cohort[a]

(The 1980 Egypt Fertility Survey)

Mother's Age at Birth	Birth Cohort					
	1946-55	1956-60	1961-65	1966-70	1971-75	1976-79[b]
			Panel A: Births			
<20	1599	1316	1578	1423	1443	934
20-24	874	1624	2121	2263	2383	1789
25-29	8	799	1645	1896	2093	1560
30-34	0	11	712	1188	1358	955
35-39	0	0	4	382	667	487
40-44	0	0	0	2	149	143
45-49	0	0	0	0	1	16
All Ages	2481	3750	6060	7156	8094	5884
			Panel B: IMRs			
<20	228.3	215.0	189.5	180.4	184.3	197.0
20-24	201.4	171.8	155.4	156.4	147.7	130.2
25-29	0.0	157.7	144.7	136.6	141.9	134.0
30-34	-	181.8	146.1	126.3	124.4	129.8
35-39	-	-	250.0	141.4	143.9	117.0
40-44	-	-	-	0.0	181.2	174.8
45-49	-	-	-	-	0.0	187.5
All Ages	218.1	184.0	160.4	150.1	149.1	141.9
			Panel C: Standardized IMRs			
Standardized on the 1946-55 Birth Dist.	na	199.6	177.4	171.8	171.3	173.3
% Deviation of STD. IMR from OBS. IMR	na	+8%	+11%	+14%	+15%	+22%
Standardized on the 1956-60 Birth Dist.	na	na	na	160.5	159.2	154.4
% Deviation of STD. IMR from OBS. IMR	na	na	na	+7%	+7%	+9%
Standardized on the 1961-65 Birth Dist.	na	na	na	153.7	152.9	148.6
% Deviation of STD. IMR from OBS. IMR	na	na	na	+2%	+3%	+5%

Notes: a) Results are based on data which are adjusted for heaping at 12 months in the reporting of age at death. Rates are per 1000.

b) Excludes births occurring within one year of the interview date.

Table 6

The Distribution of Infant Deaths Between the Neonatal and Post-Neonatal Periods[a]

(The 1980 Egypt Fertility Survey)

Birth Cohort	Neonatal Mortality Rate	Post-Neonatal Mortality Rate	Infant Mortality Rate	Proportion of Deaths in the NN Period
1976-80[b]	61.9	80.0	141.9	.44
1971-75	63.1	86.0	149.1	.42
1966-70	61.9	88.2	150.1	.41
1961-65	59.6	100.5	160.4	.37
1956-60	69.6	114.4	184.0	.38
1946-55	65.3	152.8	218.1	.30

Notes: a) Results are based on data which are adjusted for heaping at 12 months in the reporting of age at death. Rates are per 1000.

b) Excludes births occurring within one year of the interview date.

Table 7

Infant and Child Mortality Rates by Sex and Birth Cohort[a]

(The 1980 Egypt Fertility Survey)

Birth Cohort	Mortality Rates				Persons Exposed	
	Neonatal Mortality	Post-Neonatal	Infant Mortality	Child Mortality	Infant Mortality	Child Mortality
			BOTH SEXES			
1976-79[b]	61.9	80.0	141.9	-	5884	-
1971-75	63.1	86.0	149.1	65.0	8004	5632
1966-70	61.9	88.2	150.1	74.8	7156	6083
1961-65	59.9	100.5	160.4	93.0	6060	5088
			MALES			
1976-79[b]	69.3	72.6	141.9	-	3073	-
1971-75	70.4	81.9	152.3	58.0	4162	2873
1966-70	67.6	80.2	147.7	64.5	3730	3179
1961-65	70.7	89.0	159.7	85.3	3125	2626
			FEMALES			
1976-79[b]	53.7	88.3	142.0	-	2810	-
1971-75	55.5	90.3	145.8	71.4	3931	2759
1966-70	55.8	96.9	152.7	86.1	3426	2903
1961-65	48.4	112.8	161.2	101.1	2935	2462

Notes: a) Results are based on data which are adjusted for heaping at 12 months in the reporting of age at death. Rates are per 1000.

b) Excludes births occurring within one year of the interview date.

Table 8

Infant Mortality Rates by Region and Birth Cohort

(The 1980 Egypt Fertility Survey)

Region	Birth Cohort			
	76-79	71-75	66-70	61-65
Rate				
Cairo and Alexandria	117.2	117.8	119.9	122.6
Lower Egypt	121.8	120.6	124.5	123.8
Cities and Towns	105.3	117.5	129.3	115.5
Villages	126.6	121.5	123.1	126.6
Upper Egypt	183.5	204.6	204.4	234.6
Cities and Towns	167.0	148.9	159.3	223.7
Villages	188.3	218.7	217.1	237.7
Persons Exposed				
Cairo and Alexandria	1117	1536	1534	1370
Lower Egypt	2702	3763	3245	2674
Cities and Towns	608	817	719	684
Villages	2094	2946	2526	1990
Upper Egypt	2005	2795	2377	2016
Cities and Towns	449	564	521	447
Villages	1556	2231	1856	1569

Notes: a) Rates are based on data which are adjusted for heaping at 12 months in the reporting of age at death. Rates are per 1000.

b) Excludes births occurring within one year of the interview date.

Table 9

Childhood Mortality Rates by Region and Birth Cohort

(The 1980 Egypt Fertility Survey)

Region	Birth Cohort		
	71-75	66-70	61-65
Rates			
Cairo and Alexandria	49.4	48.9	74.8
Lower Egypt	66.8	80.6	85.4
Cities and Towns	56.7	47.9	67.8
Villages	69.5	89.8	91.5
Upper Egypt	72.1	84.6	118.6
Cities and Towns	53.4	41.1	83.6
Villages	77.4	97.7	128.8
Persons Exposed			
Cairo and Alexandria	1134	1340	1202
Lower Egypt	2710	2841	2343
Cities and Towns	582	626	605
Villages	2128	2215	1738
Upper Egypt	1788	1891	1543
Cities and Towns	393	438	347
Villages	1395	1453	1196

Note: a) Rates are based on data which are adjusted for heaping at 12 months in the reporting of age at death. Rates are per 1000.

Table 10

Infant and Childhood Mortality Rates by Demographic Characteristics for Births Between 1970 and 1979

(The 1980 Egypt Fertility Survey)

Characteristic	Mortality Rates per 1000 Persons Exposed[a]				Persons Exposed[a]	
	Neonatal Mortality	Post Neonatal	Infant Mortality	Childhood Mortality	NN,PNN & Infant Mortality	Childhood Mortality
Mother's Age at Birth						
<20	75.1	111.9	187.0	77.9	2637	1198
20-24	61.9	83.4	145.2	67.8	4607	2007
25-29	61.3	77.0	138.3	51.8	4028	1794
30-34	52.5	74.4	126.9	68.5	2553	1182
35-39	67.2	70.3	137.5	73.3	1295	587
40-44	78.2	98.6	176.9	46.0	294	87
45-49	176.5**	0.0*	176.5*	-	17	0
Birth Order						
1	66.4	77.5	143.9	53.8	2968	1300
2	51.3	87.7	139.0	56.7	2633	1147
3-4	52.6	79.8	132.4	78.7	4109	1855
5-6	70.9	84.8	155.8	63.8	2876	1285
7+	79.1	93.5	172.6	68.8	2845	1264
Length of the Preceding Birth Interval[b]						
<24 months	95.4	123.9	219.2	97.9	4739	1920
24-35 months	42.4	70.2	112.6	66.1	3891	1756
36-59 months	32.0	47.8	79.8	43.1	1841	928
60+	23.8	32.9	56.8	30.4	1762	889
Survivorship of the Previous Birth[b,c]						
Survived	47.4	74.3	121.7	68.4	10172	4652
Died	119.2	128.0	247.1	70.0	1821	700
TOTAL	63.3	84.2	147.5	65.7	15431	6851

a) The analysis of neonatal, post-neonatal and infant mortality excludes births that occurred within 1 year of the date of interview. The analysis of child mortality, excludes births that occurred within 5 years of the date of interview.

b) Excludes 3198 births which are either first order births or births of plurality more than one.

c) Excludes 240 births for which the information on the age at death of the previous birth was missing.

*) Number of births is less than 50.

Table 11

Infant and Childhood Mortality Rates by Socioeconomic Characteristics for Births Between 1970 and 1979

(The 1980 Egypt Fertility Survey)

Characteristic	Mortality Rates per 1000 Persons Exposed[a]				Persons Exposed[a]	
	Neonatal Mortality	Post Neonatal	Infant Mortality	Childhood Mortality	NN,PNN & Infant Mortality	Childhood Mortality
Mother's Education						
None	68.5	89.1	157.6	68.8	9942	4449
1-5	60.3	84.9	145.1	69.2	4065	1793
6+	35.8	47.8	83.6	32.8	1424	609
Father's Education						
0-5	68.1	87.2	155.3	71.9	12159	5453
6-9	49.8	83.4	133.2	52.3	1727	745
10+	40.7	61.0	101.7	29.6	1524	641
Mother's Work Status						
Worked	63.9	79.2	143.1	66.4	2991	1355
Never Worked	63.2	85.4	148.6	65.5	12440	5496
Father's Occupation						
Agriculture	75.1	86.9	162.0	73.3	6488	2906
Transitional	59.0	91.1	150.1	56.6	2864	1308
Blue Collar	56.4	81.8	138.2	67.8	4241	1843
White Collar	45.1	69.8	114.9	44.6	1819	784
Place of Residence						
Urban	44.3	79.5	123.8	49.6	5711	2602
Rural	74.5	86.9	161.4	75.5	9720	4249
TOTAL	63.3	84.2	147.5	65.7	15431	6851

a) The analysis of neonatal, post-neonatal and infant mortality excludes births that occurred within 1 year of the date of interview. The analysis of child mortality, excludes births that occurred within 5 years of the date of interview.

Table 12

Net Effects on Neonatal Mortality Probabilities of Demographic and Socioeconomic Factors

(The 1980 Egypt Fertility Survey)

Variable	Regression Results by Model					
	Model I Demographic Variables		Model II Socioeconomic Variables		Model III All Variables	
	Beta Coeff.	Std. Error	Beta Coeff.	Std. Error	Beta Coeff.	Std. Error
Intercept	-.432	.688	-2.867**	.106	-.600	.708
Mother's Age at Birth						
Age	-.127*	.050			-.114*	.051
Age Squared	.002*	.001			.002*	.001
Birth Order	.197**	.022			.089**	.023
Length of Preceding Birth Interval	-.028**	.003			-.028**	.003
Survivorship of Previous Birth						
Survived	-.378**	.045			-.364**	.045
Died	.378**	.045			.364**	.045
Mother's Education						
None			.186	.173	.127	.174
0-5			.033	.089	-.008	.090
6+			-.219	.148	-.119	.149
Father's Education						
0-5			.108	.203	.071	.209
6-9			-.093	.115	-.005	.117
10+			-.015	.167	.024	.173
Mother's Work Status						
Worked			.005	.050	.006	.050
Never Worked			-.005	.050	-.006	.050
Father's Occupation						
Agriculture			-.020	.203	-.045	.210
Transitional			.062	.084	.071	.086
Blue Collar			-.045	.091	-.059	.093
White Collar			.003	.161	.033	.167
Place of Residence						
Urban			-.038**	.054	-.273**	.053
Rural			.038**	.054	.273**	.053
Religion						
Muslim			-.282**	.072	-.258**	.073
Christian			.282**	.072	.258**	.073
Number of Observations	11961		11961		11961	
Model of Chi-Square	260.86**		80.01**		311.16**	
Degrees of Freedom	5		10		15	
D Statistic[a]	.021		.007		.025	

Notes: a) The regression models were fit with the maximum likelihood procedure so the standard R-square statistic could not be computed. However, the quantity "D" which has an interpretation similar to R-square was computed (Harroll, 1980).

Symbols: + Significant at the 10% level.
* Significant at the 5% level.
** Significant at the 1% level.

Table 13

Neonatal Mortality: Absolute Mortality Differential and Relative Risk Ratios for Selected Factors

(The 1980 Egypt Fertility Survey)

Variable	Absolute Mortality Differential	Relative Risk Ratio
Reference Neonatal Mortality Rate: 48.1a		
Mother's Age at Birth		
from 18 to 20	-3.7	.92
25	-9.4	.81
30	-11.1	.72
35	-9.4	.81
40	-3.7	.92
Birth Order		
from 2 to 3	+4.2	1.09
5	+13.7	1.28
7	+24.7	1.51
Length of the Preceding Birth Interval		
from 12 to 24	-13.3	.72
36	-23.1	.52
Survivorship of the Previous Birth		
from Alive to Dead	+46.7	1.97
Place of Residence		
from Urban to Rural	+32.1	1.67
Religion		
from Muslim to Christian	+30.0	1.62

Notes: a) For the calculation of the reference mortality rate, all variables in Model III (Table 12) were set at their mean values except the following:

Variable	Reference Value
Mother's Age at Birth	18 Years
Birth Order 2	
Length of the Preceding Birth Interval	12 Months
Survivorship of the Previous Birth	Alive
Place of Residence	Urban
Religion Muslim	

Table 14

Net Effects on Post-Neonatal Mortality of Demographic and Socioeconomic Factors

(The 1980 Egypt Fertility Survey)

Variable	Regression Results by Model					
	Model I Demographic Variables		Model II Socioeconomic Variables		Model III All Variables	
	Beta Coeff.	Std. Error	Beta Coeff.	Std. Error	Beta Coeff.	Std. Error
Intercept	1.214*	.586	-2.511**	.095	1.061	.604
Mother's Age at Birth						
Age	-.191**	.044			-.184**	.044
Age Squared	.003**	.001			.003**	.001
Birth Order	.097**	.020			.089**	.021
Length of Preceding Birth Interval	-.032**	.003			-.033**	.003
Survivorship of Previous Birth						
Survived	-.204**	.042			-.202**	.042
Died	.204**	.042			.202**	.042
Mother's Education						
None			.184	.139	.133	.138
1-5			.174*	.071	.130+	.072
6+			-.358***	.117	-.263*	.118
Father's Education						
0-5			.088	.153	.063	.157
6-9			.079	.086	.085	.086
10+			-.167	.127	-.148	.131
Mother's Work Status						
Worked			.010	.043	.034	.044
Never Worked			-.010	.043	-.034	.044
Father's Occupation						
Agriculture			-.010	.154	-.037	.159
Transitional			-.084	.068	-.088	.060
Blue Collar			-.035	.071	-.029	.073
White Collar			.129	.119	.154	.123
Place of Residence						
Urban			.012	.043	.048	.043
Rural			-.012	.043	-.048	.043
Religion						
Muslim			-.019	.073	-.020	.074
Christian			.019	.073	.020	.074
Number of Observations	11263		11263		11263	
Model Chi-Square	307.00**		19.67*		316.69**	
Degrees of Freedom	5		10		15	
D Statistic[a]	.027		.002		.027	

Notes: a) The regression models were fit with the maximum likelihood procedure so the standard R-square statistic could not be computed. However, the quantity "D" which has an interpretation similar to R-square was computed (Harrell, 1980).

Symbols: + Significant at the 10% level.
* Significant at the 5% level.
** Significant at the 1% level.

Table 15

Post-Neonatal Mortality: Absolute Mortality Differential and Relative Risk Ratios for Selected Factors

(The 1980 Egypt Fertility Survey)

Variable	Absolute Mortality Differential	Relative Risk Ratio
Reference Post-Neonatal Mortality Rate: 159.1a		
Mother's Age at Birth		
from 18 to 20	-19.7	.86
25	-51.1	.68
30	-64.8	.59
35	-65.8	.59
40	-54.2	.66
Birth Order		
from 2 to 3	+12.3	1.08
5	+39.1	1.25
7	+68.9	1.43
Length of Preceding Birth Interval		
from 12 to 24	-45.7	.71
36	-79.7	.50
Survivorship of the Previous Birth		
from Alive to Dead	+61.8	1.39
Mother's Education		
None to 1-5 Years	-0.3	1.00
6+	-46.2	.71

Notes: a) For the calculation of the reference mortality rate, all variables in Model III (Table 14) were set at their mean values except the following:

Variable	Reference Value
Mother's Age at Birth	18 Years
Birth Order 2	
Length of the Preceding Birth Interval	12 Months
Survivorship of the Previous Birth	Alive
Place of Residence	Urban
Mother's Education	Illiterate

Table 16

Net Effects on Infant Mortality Probabilities of Demographic and Socioeconomic Factors

(The 1980 Egypt Fertility Survey)

Variable	Regression Results by Model					
	Model I Demographic Variables		Model II Socioeconomic Variables		Model III All Variables	
	Beta Coeff.	Std. Error	Beta Coeff.	Std. Error	Beta Coeff.	Std. Error
Intercept	1.465**	.472	-1.923**	.073	1.304**	.434
Mother's Age at Birth						
Age	-.178**	.035			-.167**	.035
Age Squared	.003**	.001			.003**	.001
Birth Order	.105**	.016			.092**	.016
Length of Preceding Birth Interval	-.031**	.002			-.031**	.002
Survivorship of Previous Birth						
Survived	-.296**	.033			-.289**	.033
Died	.296**	.033			.289**	.033
Mother's Education						
None			.193+	.110	.137	.112
1-5			.125*	.057	.084	.058
6+			-.318**	.094	-.221*	.096
Father's Education						
0-5			.100	.126	.066	.130
6-9			.020	.071	.023	.073
10+			-.120	.104	-.089	.108
Mother's Work Status						
Worked			.008	.034	.023	.035
Never Worked			-.008	.034	-.023	.035
Father's Occupation						
Agriculture			-.018	.127	-.042	.132
Transitional			-.031	.054	-.028	.056
Blue Collar			-.043	.058	-.046	.060
White Collar			.092	.099	.116	.103
Place of Residence						
Urban			-.111**	.034	-.070*	.035
Rural			.111**	.034	.070*	.035
Religion						
Muslim			-.139**	.053	-.125*	.055
Christian			.139**	.053	.125*	.055
Number of Observations	11961		11961		11961	
Model Chi-Square	540.58**		59.63**		563.42	
Degrees of Freedom	5		10		15	
D Statistic[a]	.043		.005		.045	

Notes: a) The regression models were fit with the maximum likelihood procedure so the standard R-square statistic could not be computed. However, the quantity "D" which has an interpretation similar to R-square was computed (Harrell, 1980).

Symbols: + Significant at the 10% level.
* Significant at the 5% level.
** Significant at the 1% level.

Table 17

Infant Mortality: Absolute Mortality Differential and Relative Risk Ratios for Selected Factors

(The 1980 Egypt Fertility Survey)

Variable	Absolute Mortality Differential	Relative Risk Ratio
Reference Infant Mortality Rate: 199.8a		
Mother's Age at Birth		
from 18 to 20	-21.0	.90
25	-54.9	.73
30	-69.3	.65
35	-68.2	.66
40	-51.5	.74
Birth Order		
from 2 to 3	+15.1	1.08
5	+47.8	1.24
7	+83.7	1.42
Length of the Preceding Birth Interval		
from 12 to 24	-53.2	.73
36	-94.2	.53
Survivorship of the Previous Birth		
from Alive to Dead	+108.0	1.54
Place of Residence		
from Urban to Rural	+23.2	1.12
Mother's Education		
from none to 1-5 Years	-8.3	.96
6+	-51.1	.74
Religion		
from Muslim to Christian	+43.5	1.22

Notes: a) For the calculation of the reference mortality rate, all variables in Model III (Table 16) were set at their mean values except the following:

Variable	Reference Value
Mother's Age at Birth	18 Years
Birth Order 2	
Length of the Preceding Birth Interval	12 Months
Survivorship of the Previous Birth	Alive
Place of Residence	Urban
Mother's Education	Illiterate
Religion	Muslim

Table 18

Net Effects on Childhood Mortality Probabilities of Demographic and Socioeconomic Factors

(The 1980 Egypt Fertility Survey)

Variable	Regression Results by Model					
	Model I Demographic Variables		Model II Socioeconomic Variables		Model III All Variables	
	Beta Coeff.	Std. Error	Beta Coeff.	Std. Error	Beta Coeff.	Std. Error
Intercept	.118	1.013	-2.950**	.165	-.251	1.040
Mother's Age at Birth						
Age	-.161*	.076			-.148+	.076
Age Squared	.003*	.001			.003+	.001
Birth Order	.034	.032			.011	.033
Length of Preceding Birth Interval	-.028**	.004			-.028**	.004
Survivorship of Previous Birth						
Survived	-.093	.082			-.096	.082
Died	.093	.082			.096	.082
Mother's Education						
None			-.028	.222	-.034	.224
1-5			.073	.115	.054	.117
6+			-.045	.190	-.020	.191
Father's Education						
0-5			.425	.286	.428	.288
6-9			.074	.158	.073	.159
10+			-.499*	.238	-.501*	.240
Mother's Work Status						
Worked			.013	.069	.024	.069
Never Worked			-.013	.069	-.024	.069
Father's Occupation						
Agriculture			-.169	.254	-.166	.256
Transitional			-.019	.110	-.026	.112
Blue Collar			-.141	.119	-.127	.119
White Collar			.329+	.195	.319	.197
Place of Residence						
Urban			-.186**	.072	-.167*	.072
Rural			.186**	.072	.167	.072
Religion						
Muslim			.031	.122	.019	.123
Christian			-.031	.122	-.019	.123
Number of Observations	5336		5336		5336	
Model Chi-Square	61.97**		21.66*		80.25	
Degrees of Freedom	5		10		15	
D Statistic[a]	.011		.004		.015	

Notes: a) The regression models were fit with the maximum likelihood procedure so the standard R-square statistic could not be computed. However, the quantity "D" which has an interpretation similar to R-square was computed (Harrell, 1980).

Symbols: + Significant at the 10% level.
* Significant at the 5% level.
** Significant at the 1% level.

Table 19

Child Mortality: Absolute Mortality Differentials and Relative Risk Ratios for Selected Factors

(The 1980 Egypt Fertility Survey)

Variable	Absolute Mortality Differential	Relative Risk Ratio
Reference Child Mortality Rate: 111.7a		
Mother's Age at Birth		
from 18 to 20	-8.7	.92
25	-20.3	.82
30	-20.1	.82
35	-8.0	.92
40	-20.2	1.18
Length of Preceding Birth Interval		
from 12 to 24	-29.2	.74
36	-51.3	.54
Father's Education		
from primary to 6-9 Years	-30.7	.72
10+	-64.4	.42
Place of Residence		
from Urban to Rural	+37.6	1.33

Notes: a) For the calculation of the reference mortality rate, all variables in Model III (Table 18) were set at their mean values except the following:

Variable	Reference Value
Mother's Age at Birth	18 Years
Length of the Preceding Birth Interval	12 Months
Father's Education	Primary
Place of Residence	Urban

Table 20

Mortality Rates by Age Intervals and by Breastfeeding Status at the Beginning of the Age Interval[a]

(The 1980 Egypt Fertility Survey)

Age Interval (Months)	Status at the Outset of the Age Interval	Number of Births	Number of Deaths	Mortality Rates (per 1000)
1-5	Breastfeeders	7531	87	11.6
	Non-Breastfeeders	442	30	67.9
	Never Breasfed	415	29	69.9
	Stopped Breastfeeding	27	1	39.0
6-11	Breastfeeders	6948	101	14.5
	Non-Breastfeeders	908	57	62.8
	Never Breastfed	386	22	59.0
	Stopped Breastfeeding	522	35	69.0
1-11	Breastfeeders	7531	218	28.9
	Non-Breastfeeders	442	57	129.0
	Never Breastfed	415	51	122.9
	Stopped Breastfeeding	27	6	222.2
12-59[b]	Breastfeeders	2058	64	31.1
	Non-Breastfeeders	470	15	31.9
	Never Breastfed	127	1	7.9
	Stopped Breastfeeding	343	14	110.8

Notes: a) The data set for this analysis consisted of all births between January, 1970 and February, 1979 (regardless of birth order) for which breastfeeding data were available (i.e., the last two live births of respondents).

b) For the calculation of child mortality rates by breastfeeding status, the data set was restricted to births born five years before the interview date.

Table 21

Life Table Mortality Rates by Breastfeeding Status[a]

(The 1980 Egype Fertility Survey)

Month of Life	Persons Beginning the Month	Events During the Month: Deaths	Stopped Breast-feeding	Withdrawn from Ob-servation[b]	Monthly Mortality Rate	Cumulative Mortality Rate Beginning with Month One
			Breastfeeders			
1	9193	24	111	213	.0027	.0027
2	8845	23	125	208	.0027	.0054
3	8489	19	169	167	.0023	.0077
4	8134	22	104	170	.0028	.0105
5	7838	12	70	158	.0016	.0120
6	7598	35	172	123	.0047	.0167
7	7268	17	93	115	.0024	.0190
8	7043	15	123	138	.0022	.0212
9	6767	8	135	80	.0012	.0224
10	6544	8	75	112	.0012	.0236
11	6349	13	66	94	.0021	.0256
			Non-Breastfeeders			
1	544	9	-	3	.0176	.0176
2	613	3	-	8	.0049	.0224
3	727	10	-	16	.0139	.0360
4	870	14	-	16	.0162	.0316
5	944	12	-	9	.0128	.0638
6	993	19	-	14	.0193	.0818
7	1132	15	-	23	.0134	.0941
8	1187	9	-	13	.0076	.1010
9	1288	9	-	10	.0070	.1073
10	1404	7	-	15	.0050	.1118
11	1457	17	-	23	.0018	.1223

Notes: a) The data set for this analysis consisted of all births between January 1970 and the interview date (regardless of birth order) for which breastfeeding data were available (i.e., the last two live births of respondents).

b) Births under one year of age and alive at the interview data are classified as withdrawn from observation at their age in months as of the interview date.

Table 22

Life Table Mortality Rates for Selected Post-Neonatal Age Intervals by Breastfeeding Status[a]

(The 1980 Egypt Fertility Survey)

Age Interval (Months)	Mortality Rates per 1000 Births[b]	
	Breastfeeders	Non-Breastfeeders
1-11	25.6	122.3
1-5	16.7	81.8
6-11	8.9	40.5

Notes: a) The data set for this analysis consisted of all births between January 1970 and the interview date (regardless of birth order) for which breastfeeding data were available (i.e., the last live births of respondents).

b) Rates calculated from the monthly mortality probabilities of Table 21.

Table 23

Net Effects on Age-Specific Mortality Probabilities of Breastfeeding and Demographic and Socioeconomic Factors

(The 1980 Egypt Fertility Survey)

Variable	Regression Results by Age Interval							
	1-11 Months		1-5 Months		6-11 Months		12-59 Months	
	Beta Coeff.	Std. Error	Beta Coeff.	Std. Error	Beta Coeff.	Std. Error	Beta Coeff.	Std. Error
Intercept	1.405	1.255	3.001	1.736	-1.665	1.781	-.1[illegible]9	2.476
Breastfeeding	-.953**	.004	-1.069**	.131	-.890**	.101	-.350*	.164
Mother's Age at Birth								
Age	-.289**	.087	-.482**	.120	-.129	.123	-.250	.171
Age Squared	.005**	.001	.008**	.002	.002	.002	.005+	.003
Birth Order	.164**	.036	.143**	.054	.182**	.047	-.026	.064
Length of Preceeding Birth Interval	-.013**	.004	-.006	.006	-.174**	.006	-.019*	.007
Survivorship of Previous Birth	.169	.092	.422	.123	-.078	.138	-.334	.239
Mother's Education								
None	.140	.255	.362	.444	.057	.304	.397	.565
1-5 Years	.290*	.132	.293	.227	.323**	.160	.091	.287
6+ Years	-.430	.218	-.655+	.382	-.380	.259	-.488	.487
Father's Education								
0-5 Years	-.068	.266	.223	.472	-.132	.322	.012	.548
6-9 Years	-.043	.162	-.462	.311	.206	.189	-.154	.339
10+ Years	.111	.211	.239	.355	-.071	.261	.142	.431
Mother's Work Status								
Worked	-.025	.095	.083	.139	-.189	.129	-.080	.159
Never Worked	.025	.095	-.083	.139	.089	.129	.080	.159
Father's Occupation								
Agriculture	-.312	.303	-.382	.478	-.243	.387	-.285	.628
Transitional	-.119	.137	-.246	.217	-.045	.175	.345	.256
Blue Collar	.052	.139	.050	.213	.001	.180	-.090	.280
White Collar	.379	.232	.578	.369	.287	.295	.030	.500
Residence	.023	.083	-.001	.128	.073	.107	.703**	.167
Number of Observations	6745		6745		6649		2274	
Model Chi-Square	140.08**		100.33**		106.77**		43.48**	
Degrees of Freedom	15		15		15		15	
D Statistic[a]	.022		.015		.016		.019	

Notes: a) The regression models were fit with the maximum likelihood procedure so the standard R-square statistic could not be computed. However, the quantity "D" which has an interpretation similar to R-square was computed (Harrell, (1980).

Symbols
+ Significant at the 10% level.
* Significant at the 5% level.
** Significant at the 1% level.

Table 24

Absolute Mortality Differentials and Relative Risk Ratios Associated with a Change from Breastfeeding to Non-Breastfeeding

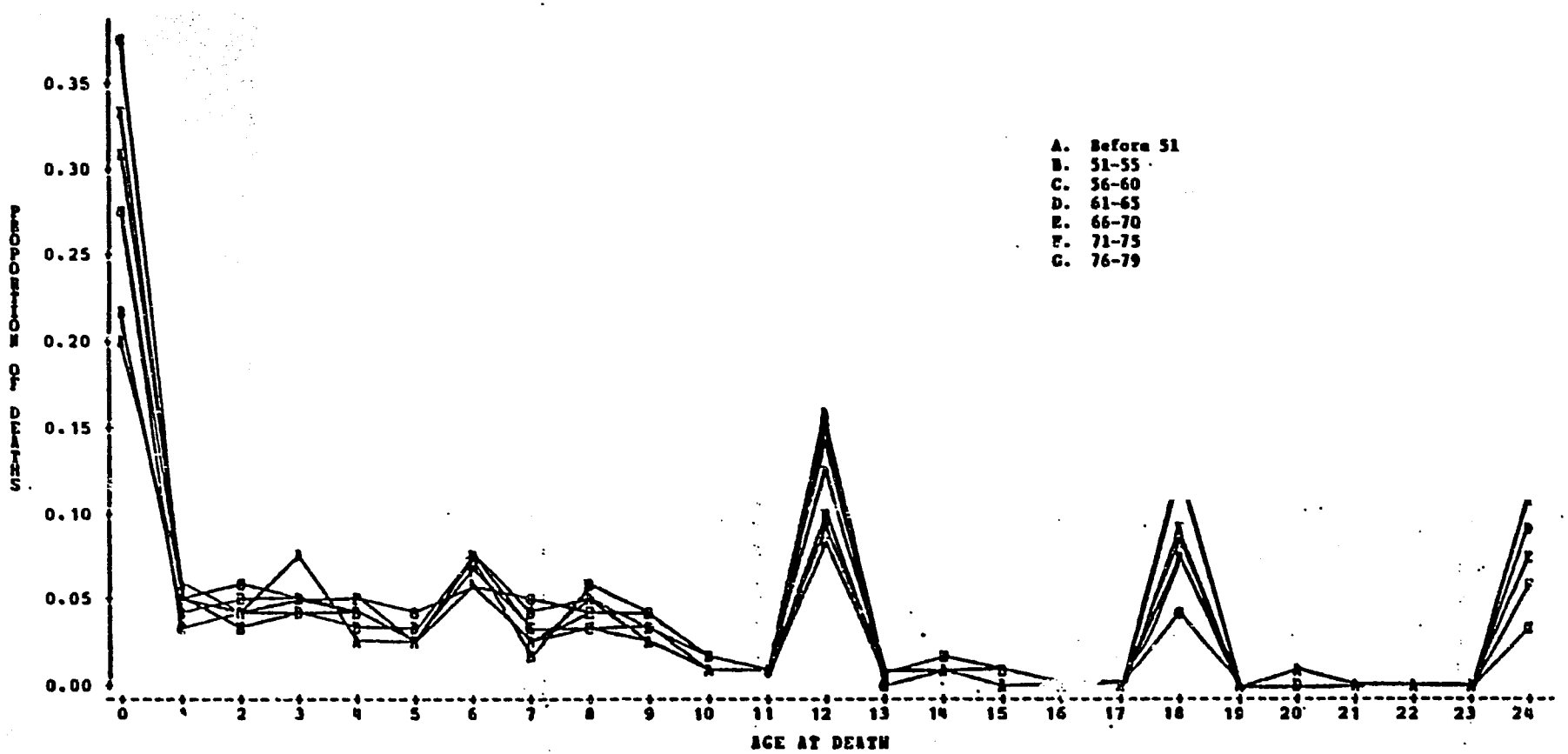
(The 1980 Egypt Fertility Survey)

Variable	Absolute Mortality Differential	Relative Risk Ratio
1-5 Month Age Interval, Reference Mortality Rate: 3.3a		
From Breastfeeder to Non-Breastfeeder	+27.7	8.39
6-11 Month Age Interval, Reference Mortality Rate: 6.4[a]		
From Breastfeeder to Non-Breastfeeder	+30.6	5.78
1-11 Month Age Interval, Reference Mortality Rate: 10.3[a]		
From Breastfeeder to Non-Breastfeeder	+55.4	6.38
12-59 Month Age Interval, Reference Mortality Rate: 17.7[a]		
From Breastfeeder to Non-Breastfeeder	+17.4	1.98

Notes: a) For the calculation of reference mortality rates for a specific age interval, all variables in Table 23 were set at their mean values except the breastfeeding variable which was set at breastfeeding.

Figure 1

PROPORTION OF DEATHS UNDER 25 MONTHS BY AGE AT DEATH AND PERIOD



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Appendix A

As reported in the text for about 10 percent of the total deaths information on age at death was missing. Table A.1 shows the proportion of unknown deaths in different categories of characteristics used in the analysis of differentials. Tables A.2 and A.3 provide estimates of infant mortality rates by birth cohorts for the country and the major regions after making allowance for the unknown age deaths. In this respect it was assumed that the age distribution of the unknown ages deaths was similar to the age distribution of the deaths with known ages in the sample.

Table A.1

Percent of Unknown Deaths and Inflation Factor by Various Characteristics, 1970-1979

(The 1980 Egypt Fertility Survey)

Characteristics/ Category	Percent of Unknown Deaths
Age of Mother	
Under 20	6.3
20-24	7.7
25-29	9.1
30-34	9.6
35-39	7.9
40-44	6.1
45-49	0.0
Birth Order	
1	7.4
2	7.7
3-4	10.0
5-6	12.7
7+	8.1
Length of Preceding Birth Interval	
<24	8.6
24-35	12.2
36-9	9.6
60+	5.2
Survivorship of the Previous Birth	
Survived	9.7
Died	4.3
Inapplicable	7.4
Unknown	30.0
Mother's Education	
None	9.4
1-5	10.2
6+	3.6
Father's Education	
0-5	9.8
6-9	8.4
10+	3.7
Mother's Work Status	
Worked	10.0
Never worked	6.6

Table A.1 (con.)

Percent of Unknown Deaths and Inflation Factor
by Various Characteristics, 1970-1979

(The 1980 Egypt Fertility Survey)

Characteristics/ Category	Percent of Unknown Deaths
Father's Occupation	
Agriculture	10.6
Transitional	8.4
Blue collar	7.8
White collar	8.0
Religion	
Muslim	9.6
Christian	6.1

Table A.2

Infant and Child Mortality Rates by Sex and Birth Cohort[a]

(The 1980 Egypt Fertility Survey)

Birth Cohort	Mortality Rates				Persons Exposed	
	Neonatal Mortality	Post-Neonatal	Infant Mortality	Child Mortality	Infant Mortality	Child Mortality
			BOTH SEXES			
1976-79[b]	64.7	83.7	148.4	-	5935	-
1971-75	67.5	92.3	159.7	-	8238	-
1966-70	68.4	97.8	166.3	84.5	7379	6152
1961-65	65.7	110.0	175.7	103.0	6256	5157
			MALES			
1976-79[b]	72.3	75.6	147.9	-	3097	-
1971-75	75.8	88.8	164.6	-	4246	-
1966-70	74.4	88.2	162.6	72.3	3832	3209
1961-65	77.8	97.1	174.9	94.3	3225	2661
			FEMALES			
1976-79[b]	56.4	92.7	149.0	-	2838	-
1971-75	58.6	95.9	154.6	-	3992	3375
1966-70	62.0	108.3	170.3	97.9	3547	2943
1961-65	52.8	123.7	176.5	112.2	3031	2496

Notes: a) Results are based on data which are adjusted for unknown ages of death and for heaping at 12 months in the reporting of age at death. Rates are per 1000.

b) Excludes births occurring within one year of the interview date.

Table A.3

Adjusted Infant Mortality Rates by Region and Birth Cohort

(The 1980 Egypt Fertility Survey)

Region	Birth Cohort			
	76-79	71-75	66-70	61-65
Rate				
Cairo and Alexandria	119.4	126.5	130.1	131.2
Lower Egypt	127.5	129.4	137.2	133.9
Urban	109.6	122.7	139.5	120.3
Rural	132.7	130.8	136.5	138.5
Upper Egypt	193.3	218.8	228.0	258.5
Urban	175.8	173.2	184.8	258.3
Rural	198.4	230.5	240.0	258.6
Number of Births				
Cairo and Alexandria	1181	1557	1560	1395
Lower Egypt	2721	3810	3332	2734
Urban	611	823	731	690
Rural	2110	2997	2601	2044
Upper Egypt	2033	2861	2487	2127
Urban	455	583	541	480
Rural	1578	2278	1946	1647

Notes: a) Rates are ajusted for heaping at 12 months in the reporting of age at death as well as for the deaths with unknown ages.

APPENDIX IV

Last Live Birth Questionnaire*

(Ask to all women aged 15-50)

LAST LIVE BIRTH

A1	A2	A3	A4	A5	A6	A7	A8	A9	A10		
				FOR THE LAST LIVE BIRTH							
Line Number of Women in Household Listing	Have you ever had a live birth? (a birth showing any sign of life) 1. No 2. Yes → A5	Have you ever been pregnant? 1. No 2. Yes, still pregnant 3. Yes, miscarriage 4. Yes, abortion 5. Yes, stillbirth (STOP)	Were there any signs of life? 1. No → STOP 2. Yes, breathing 3. Yes, crying	Date of the birth? DA MON YR	Was the birth after the Lebaran before last? (4 Sept. 1978) 1. Yes 2. No	Type of birth? 1. Single 2. Twin 3. Triplet	Sex of birth? 1. Male 2. Female	Is the child still alive? 1. Yes 2. No	If the child died, AGE AT DEATH? HRS if less than 24	DAYS if less than 30	MONTHS if more than 30 days

PENULTIMATE PREGNANCY

B1	B2	B3	B4	B5	B6	B7	B8	B9	B10		
		FOR THE PENULTIMATE PREGNANCY									
Line Number of Women in Household Listing	Were you pregnant before the pregnancy of the LLB? 1. No → C1 2. Yes → B3	Pregnancy Outcome? 1. Miscarriage → C1 2. Abortion → C1 3. Stillbirth → B4 4. Live birth → B5	Were there any signs of life? 1. No → C1 2. Yes, breathing 3. Yes, crying	Date of the birth? DA MON YR	Was the birth after the Lebaran before last? (4 Sept. 1978) 1. Yes 2. No	Type of birth? 1. Single 2. Twin 3. Triplet	Sex of birth? 1. Male 2. Female	Is the child still alive? 1. Yes 2. No	If the child died, AGE AT DEATH? HRS if less than 24	DAYS if less than 30	MONTHS if more than 30 days

PREGNANCY AFTER THE LAST LIVE BIRTH

C1	C2	C3	C4	C5	C6	C7	C8	C9	C10

Best Available Document

C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
		FOR THE PREGNANCY AFTER THE LLB							
Line Number of Women in Household Listing	Did you become pregnant since the LLB? 1. No ⟶ STOP 2. Yes, still pregnant ⟶ STOP 3. Yes, pregnancy terminated	Pregnancy Outcome? 1. Miscarriage ⟶ STOP 2. Abortion ⟶ STOP 3. Stillbirth ⟶ C6 4. Live birth ⟶ C5	Were there any signs of life? 1. No ⟶ STOP 2. Yes, breathing 3. Yes, crying	Date of the birth? DA MON YR	Was the birth after the Lebaran before last? (4 Sept. 1978) 1. Yes 2. No	Type of birth? 1. Single 2. Twin 3. Triplet	Sex of birth? 1. Male 2. Female	Is the child still alive? 1. Yes 2. No	If the child died, AGE AT DEATH? HRS if less than 24 / DAYS if less than 30 / MONTHS if more than 30 days

*Adapted from a questionnaire developed by the Central Bureau of Statistics, Republic of Indonesia and POPLAB

NOTES:

1. Line Number of Women in Household Listing is obtained from an earlier section of the questionnaire.

2. If the questions of Panel C detect the occurrence of a live birth subsequent to the reported LLB, the interviewer records the relevant information (C2-C8) without modifying the answers to previous questions (A2-A8). Thus, the interviewer is not burdened with making corrections. Indeed, for methodological reasons, it is desirable that incorrect replies to the questions about the LLB (A2-A8) not be corrected in the field.

3. Questions A7, B7, and C7 are asked to detect multiple births. When such events are detected, data pertaining to each live birth are recorded on consecutive lines of the questionnaire. Thus, if the last live birth was a multiple event, data pertaining to two or three births to the same woman would be recorded in Panel A.

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APPENDIX V

CENTRAL AGENCY FOR PUBLIC MOBILISATION AND STATISTICS

الجهاز المركزي للتعبئة العامة والاحصاء

August 4, 1983

A STATEMENT ON THE POPULATION OF THE ARAB REPUBLIC OF EGYPT

The Population of the Arab Republic of Egypt in Now 46 Million(1)

The Population has increased by one million in about ten months

First : Population Increase :

1 - Total Population of the Republic :

The total population of Egypt is estimated on August 4, 1983 to be 46 million (23337 thousand males and 22663 thousand females). These figures are based on the extensive studies carried out by the demographic experts in the Central Agency for Public Mobilisation and Statistics, using the annual statistical reports of births and deaths(2) and the general population and housing census of 1976.

The total population has increased by one million persons in about ten months (9.7 months) which is equivalent to about 1254 thousand persons annually, or about 105 thousand persons per month or 3436 persons per day or about one person per 25.1 seconds.

(1) Includes Egyptians Abroad.
(2) Preliminary Data.

What is meant here, by the population increase is the natural increase and not merely the births, i.e. the difference between the number of births and number of deaths. The reference to the increase per second is aimed at visualizing the intensity of the problem to the common minds. Thus, it is not correct to say that the Republic receives one birth every 25.1 seconds, but to say that the Republic increases, on the average, one person every 25.1 seconds.

With regard to the births and deaths, we find that the Republic receives - on the average - one birth every 18.5 seconds, and one death occurs, on the average, every 70.0 seconds. Thus the Republic increases by one person every 25.1 seconds as mentioned earlier.

2 - Population of Cairo Governorate :

Cairo Governorate population, according to its administrative boundaries, amounted to 5.892 million persons on August 4, 1983, the increase amounted to 89 thousand persons or 1.53 percent in about ten months. Its population represents about 13.0 % of the total population of the Republic excluding those who are commuting daily to the Capital from the adjacent regions.

As a result of such increase, the population of Cairo Governorate has increased on the average by 112 thousand persons per year or by 933 persons per month, or about 307 persons per day.

- Greater Cairo :

On August 4, 1983 the population of the " Greater Cairo Province" amounted to 9.512 million persons, with an increase that amounted to 197 thousand persons in about ten months and to 244 thousand persons annually.

The population of the "Cairo metropolitan" amounted to 8.070 million persons, with an increase of about 161 thousand in about ten months or 199 thousand annually. Thus, the "Cairo metropolitan" comprised 18% of the total population of the Republic, while the population of the Province amounted to 21% of the population of the Republic. Cairo metropolitan includes all the Kisms of Cairo City and Giza City, Bandar Shobra El-Kheima, and all the villages of Markaz El Giza.

The Constituents of the " Greater Cairo Province " are as follows :

- All the Kisms of Cairo City.
- All the Kisms of Giza City.
- Shobra El-Kheima City.
- Shebein El Kanater City.
- El-Badrashein City.
- El Hawandia City.
- All the villages of Markaz El Giza.
- All the villages of Markaz El Khanka.
- All the villages of Markaz Kalyub.

The population of El Giza Governorate reached 2.970 million persons compared with 2.417 million persons in the latest census undertaken on 23 November 1976.

6 - Excess of Males Over Females :

The excess of males over females in the Republic as a whole amounted to 674 thousand males. The number of males exceeds that of females in all the Governorates except Aswan and Kafr El Sheikh Governorates where the number of females is higher than that of males.

7 - Population Estimates in the Year 2000 :

If the population increase in Egypt continuted at the same rate, as in the last intercensal period, the population number would reach about 67 million in the year 2000 and the population of Greater Cairo province would be about 15 million.

Table 1. Population in Each Governorate by Sex as on August 4, 1983

Governorates	Population (in thousands)			% of Total Pop.	% of males to Population.
	Males	Females	Total		
Cairo	3005	2887	5892	12.81	51.0
Alexandria	1375	1338	2713	5.90	50.7
Port-Said (1)	190	175	365	0.79	52.1
Suez	125	116	241	0.52	51.9
Damietta	350	341	691	1.50	50.7
Dakahlia	1657	1630	3287	7.15	50.4
Sharkia	1619	1554	3173	6.90	51.0
Kalyubia	1068	1010	2078	4.52	51.4
Kafr-El-Sheikh	848	851	1699	3.69	49.9
Gharbia	1368	1352	2720	5.91	50.3
Manoufia	1043	1010	2053	4.46	50.8
Behera	1499	1482	2981	6.48	50.3
Ismailia	226	222	448	0.98	50.4
Giza	1521	1449	2970	6.46	51.2
Beni-Suef	677	667	1344	2.92	50.4
Fayoum	722	691	1413	3.07	51.1
Minya	1273	1249	2522	5.48	50.5
Assyout	1058	1005	2063	4.49	51.3
Souhag	1175	1145	2320	5.04	50.6
Kena	1042	1028	2070	4.50	50.3
Aswan	371	374	745	1.62	49.8
Red Sea	36	32	68	0.15	52.9
El-Wadi El-Gedid	54	52	106	0.23	50.9
Matrouh	78	78	156	0.34	50.0
North Sinai (2)	72	71	143	0.31	50.3
South Sinai (2)	14	9	23	0.05	60.9
Total Pop. Present	22466	21818	44284	96.27	50.7
Total Pop. Abroad	871	845	1716	3.73	50.7
Total Pop. Present and Abroad	23337	22663	46000	100.00	50.7

(1) Estimates are based on 1980 Port-Said Population Census.

(2) Estimates are based on 1982 Sinai Population Census.

- Other Governorates Population Estimates are based on 1976 Population Census.

Table 2. Percentage of Population of Cairo Governorate to the Total Population in the Period 1927 - 1983 .

Years	1927	1937	1947	1960	1966	1976	Aug. 1978	Jan. 1979	June 1979	April 1980	Jan. 1981	Nov. 1981	Oct. 1982	Aug. 1983
%	8.2	8.2	10.9	12.9	14.0	13.3	13.2	13.0	13.2	13.1	13.1	13.0	12.9	12.8

Percentages for the years 1978 to 1983 are based on estimated figures, as for the others, they are based on the results of different population censuses.

Second : The Population Density :

1 - The Population Density in the Republic :

The total area of the A. R. E. is about one million square Kilometres (1.002 million Km^2) of which 5.5 % only is populated.

Within the populated area of 55039 square Kilometers, live 46 million persons, thus the population density amounts 836 persons per square Kilometer, compared with 46.1 persons per Km^2 for the total area. The government tries to increase the populated area in order to decrease population density, and to make use of unpopulated areas. Therefore, the government has added new areas to the governorates of Alexandria, Suez, Ismailia, Behera and Giza where it works activity for their rehabilitation.

Despite these Additions to the populated area, the successive population increase has led to a rise in the population density from 466 persons / Km^2 in 1937 to 836 persons/Km^2

in Aug. 4 , 1983, i. e. the density has increased by more than 79 % in about 46 years.

2 - Population Density in Cairo :

Following the trend of the population density in Cairo, we find that it is remarkably increasing, where it was less than 7000 persons / Km^2 in 1927 then jumped to about 27.5 thousand persons / Km^2 in 1983 in a period of 56 years. Population Censuses indicate that between 1927 and 1966 the density increased by about 13 thousand persons, and between 1966 and 1976 by 4 thousand persons. Population density in Cairo City has exceeded the density in the Republic in all the years from 1927 to 1983.

Study of population density in Cairo Kisms (districts) reveals that it varies greatly between 7 thousand persons per square Kilometer in Kism Kasr - El - Nil, to more than 114 persons per square Kilometer in Kism Bab - El - Sharia. The next to Kism Bab - El - Sharia with respect to population density is Kism Rod - El - Farag with a density of more than 113 thousand persons per square Kilometer, and the next are Kisms of El Mouski, Shoubra and Saida Zeinab (109,91 and 80 thousand persons / Km^2 respectively).

Next are Kisms of El Sahel, Boulak, Zaytoun, Abdin, Helwan and Darb El-Ahmar, as the population density varies from 78 thousand (in El-Sahel) to about 60 thousand (in Darb El-Ahmar) per square Kilometer. Then, next are Kisms of El - Zaher, Gamalia, Asbakia, Wayli, Mesr El-Kadima and Khalifa with less population densities ranging between 58 thousand persons in El-Zaher and 25 thousand persons per square Kilometer (in Khalifa).

Finally, the lowest population densities are found in Kisms of Maadi, Heliopolis, Mataria and Kasr El Nil in which population density varies from about 13 thousand (in Maadi) to 7 thousand (in Kasr El Nil) per square Kilometer.

Thus, it is evident that the Kisms with the highest densities are the old ones, in which migrants from rural areas are concentrated. This may be due to the low costs of living and the simplicity of life in those Kisms. The in-migrant from rural areas calls upon his relatives in these areas, until he resides in them.

In-migrants from rural areas are also concentrated in population agglomerations at the outskirts of the Capital because of the similarity of its environment with their habitat. Those in-migrants continue to live in the City for long durations, with their rural views, values and customs, which makes some Kisms of the City acquire the rural fashion of life.

The ratio of the population of Cairo to the total population of the Republic is continuously increasing. It has increased from 8.2% in 1937, to 10.9% in 1947, to 12.9% in 1960, and to 14.0% in 1966, than decreased to 13.5% in 1983.

A. R. E.	Populated Area	:	55039 Km^2.
	Population	:	46 Million persons.
	Density	:	836 Persons per square Kilometer.
Cairo	Area	:	214.2 Km^2.
	Population	:	5892 thousand persons.
	Density	:	27507 persons per square Kilometer.

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4 - Population Densities in Other Governorates :

The Population density varies among the other governorates, it also varies within the same governorate in different censuses, while damietta, Port-Said and Suez Governorates were in the third, fourth and fifth order next to Cairo and Alexandria in 1937 with repect to population density, we find Suez and Alexandria in lower order in 1983 due to changes in the boundaries of some governorates. Port-Said, Giza and Kalyubia governorates became next in order to Cairo that year due to the same reason. The close location of the governorates of Giza and Kalyubia to Cairo may be the main reason of the high densities recorded in these two governorates. Governorates of Souhag and Assyout have recorded the highest population density (after Giza governorate) in Upper Egypt Governorates. Whereas governorates of Gharbia and Menoufia have recorded the highest population density (after Kalyubia governorate) in lower Egypt governorates. The lower population density was found in Behera and Kafr - El Sheikh governorates in lower Egypt and in Fayoum and Beni-Suef in Upper Egypt. Generally, the end of the year 1983 has recorded the wide disparity in population densities in Cairo City (about 27.5 thousand persons / Km^2) and " Cairo metropolitan " (more than 20 thousand persons / Km^2) on the one hand and the rest of the governorates on the other, since the highest population density after Cairo did not reach yet 6 thousand persons / Km^2 , which indicates the big size of continuous migration streams from other governorates to Cairo, and the high population concentration in it.

Table 3. Population Densities in the Period 1937 - 1983

(Based on Populated Area)

Governorate	1937	1947	1960	1966	1976	Aug. 1978	Jan. 1979	June 1979	April 1980	Jan. 1981	Nov. 1981	Oct. 1982	Aug. 1983
Cairo	7957	11704	15634	19594	23737	24701	25000	25275	25733	26148	26611	27092	27501
Alexandria	9407	12910	5237	6221	865	901	912	921	938	954	974	994	1013
Port-Said	1539	707	617	712	3642	3773	3816	3870	3939	4787	4868	4965	5062
Suez	1062	319	662	860	11	11	12	12	12	12	13	13	[illegible]
Damietta	7535	24829	648	722	946	991	1004	1017	1078	1098	1122	1147	117[illegible]
Dakahlia	463	538	582	658	787	826	836	848	869	885	906	927	[illegible]
Sharkia	222	272	387	452	627	658	665	675	691	705	722	740	75[illegible]
Kalyubia	650	735	1047	1283	1673	1759	1786	1806	1871	1911	1962	2019	207[illegible]
Kafr-El-Sheikh	*	*	279	321	408	429	434	440	453	463	472	482	[illegible]
Gharbia	280	331	860	949	1181	1234	1248	1265	1291	1314	1344	1374	1[illegible]
Menoufia	728	734	890	969	1117	1170	1185	1198	1229	1253	1261	1310	13[illegible]
Behera	236	269	367	431	249	261	264	268	271	277	283	289	2[illegible]
Ismailia	*	*	343	416	244	258	263	266	276	283	292	300	3[illegible]
Giza	675	796	1228	1526	2396	2523	2555	2585	2671	2730	2793	2874	294[illegible]
Beni-Suef	514	572	655	711	339	882	895	905	930	948	973	994	101[illegible]
Fayoum	342	377	468	519	624	658	668	676	698	714	733	753	7[illegible]
Minya	467	520	686	749	909	957	973	987	1016	1039	1066	1087	11[illegible]
Assyout	593	674	856	912	1108	1163	1180	1196	1230	1236	1267	1297	13[illegible]
Souhag	726	833	1025	1094	1244	1306	1323	1342	1375	1403	1438	1467	14[illegible]
Kena	569	607	746	812	922	962	975	989	1017	1036	1063	1090	11[illegible]
Aswan	365	331	437	591	914	957	970	982	1004	1023	1045	1067	10[illegible]
Total	466	546	733	845	695	727	736	745	763	781	799	818	8[illegible]

* Before 1960 Census, Kafr-El-Sheikh Governorate was a Part of Gharbia Governorate, and Ismailia Governorate was a Part of El-Canal Governorate.

- From 1978 the area of Giza does not include El-Baharia Oasis.
- Pop. Density in Alexandria Governorate excluding Kism El- Amria (8629 per./Km^2).
- Pop. density in Suez Governorate excluding Kism Ataka 785 per./Km^2).
- Pop. density in El- Behera Governorate excluding Markaz Wadi-El-Natroun (650 Per./Km^2
- Large variations in densities are due the change in boundries of governorates.

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Table 4. Total Population and Population Density in Each Kism of Cairo Governorate on August 4, 1983.

Kisms	Population (000)	% of Kism to Governorate	Density * (Person / Km^2)
Mataria	648.9	11	9571
Sharabia...	510.0	8.7	-
El- Shahel.	504.5	8.6	77615
Hadayek El-Kubba	365.2	6.2	-
Helwan	334.5	5.7	60453 (1)
Masr El Kadima..	314.5	5.3	31139
Maadi.	314.0	5.3	12510
Zaytoun	313.8	5.3	74714
Rod El-Farag	307.4	5.2	113852
Saida Zeinab	281.4	4.8	80400
Khalifa	213.7	3.6	24849
Boulak	200.3	3.4	74185
Gamalia	198.7	3.4	41396
Darb El-Ahmar...	167.7	2.9	59893 (2)
Wayli.	166.9	2.8	32248 (3)
Shoubra	147.3	2.5	91292 (4)
Heliopolis.	144.8	2.5	10344
Bab El-Sharia...	125.9	2.1	114455
Nozha.	117.0	2.0	-
El-Zaher...	116.6	2.0	58300
Abdin.	96.7	1.6	60438
Nasr City..	72.3	1.2	-
Azbakia	67.6	1.1	39765
Mousky	65.2	1.1	108667
El-Tebien..	52.4	0.9	-
Kasr El-Nil	44.7	0.8	7450
Total	5892.0	100.0	27507

* The densities of the following Kisms are given together, as the respective areas are not available seperately.

(1) Kism Helwan includes Kism El-Tebein.
(2) Kism Wayli includes Kism Hadick El-Kubba.
(3) Kism Shoubra includes Kism Sharabia.
(4) Kism Heliopolis includes Kisms Nozha and Nasr City.

- Kisms are distributed according o 1976 Population Census.

- Egyptians abroad are excluded.

Table 5. Total Population and Population Densities in Cairo from 1927 - 1983

Item	1927	1937	1947	1960	1966	1976	Aug. 1978	Jan. 1979	June 1979	April 1980	Jan. 1981	Nov. 1981	Oct. 1982	Aug. 1983
Total Population of Cairo (in thousands).	1071	1310	2076	3349	4220	5084	5291	5355	5414	5512	5601	5700	5803	5892
Pop.Density in Cairo (Per/Km2)	6584	7957	11704	15634	19594	23737	24701	25000	25275	25733	26148	26611	27092	27507
Pop.Density in the Republic (Per/Km2) (For Populated Area).	410	466	546	733	845	695	727	736	745	763	781	799	818	836

Table 6. Total Population and Population Density in Each Kism of Alexandria Governorate on August 4, 1983

Kisms	Population (000)	% of Kism Pop. to total governorate Pop.	Density (Person/Km^2)
El-Raml	524.7	19.3	52313
Mouharam Bey	380.9	14.0	99193
El-Mountazah	373.1	13.8	3436
Mina El-Bassal	274.8	10.1	16386
Bab Sharki	269.9	9.9	28296(1)
Karmous	243.0	9.0	73636
Goumrok	161.4	5.9	150841
Sedy Gaber	148.6	5.5	-
El-Labban	86.4	3.2	49655
Attarien	83.5	3.1	41337
El-Ameria	58.9	2.2	25
El-Deikhila	56.5	2.1	1948
El-Manshyia	50.8	1.9	89123
Minaa Alex.	0.5(2)	-	-
Total	2713.0	100.0	1013

(1) The density is for Kism Bab Sharki and Kism Sedy Gaber, as data on respective areas are not available separately.

(2) Foreigners on board of ships at anchor.

- Kisms are distributed according to 1976 Population Census.
- Egyptians abroad are excluded.