Cairo University - M.I.T. Technological Planning Program

INFANT MORTALITY, THE BIRTH RATE, AND DEVELOPMENT IN EGYPT

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M.I.T. - Cairo University Health Care Delivery Systems Project

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PREFACE

This monograph is a product of the M.I.T. - Cairo University Health Care Delivery Systems Project. Initiated in May 1977 as part of a broader program of research bringing scholars from the two universities together in support of the Egyptian government,* the project has examined the delivery of health services in Egypt in relation to malnutrition, early childhood mortality, and fertility. This study represents one aspect of the inquiry, the analysis of aggregate data derived from offical sources. Other monographs currently nearing completion present findings from the project's own "health system questionnaire" administered in a national sample of 132 rural health centers and units in Lower and Upper Egypt.

When the health project began, our intent was to learn as much as possible about health needs and problems in Egypt and also about the structure and functioning of the Ministry of Health, especially at its periphery where contact with the public takes place. It did not take long for us to discover a curiosity. On the one hand, many people knew a great deal, most notably our able counterparts in the Ministry itself.

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* Funded by the United States Agency for International Development, the Cairo University - M.I.T. Technological Planning Program consists of fourteen projects addressing such policy concerns as public housing, urban transportation, water resources, small-scale industries, labor migration, and economic planning in addition to health care.

Similarly, there was no dearth of facts and figures. In Egypt, as elsewhere, health care generates massive quantities of data.

On the other hand, knowledge and insight tend to be anecdotal. What is known is substantially a function of personal experience. Moreover, the data routinely processed in the Ministry turned out to be formal and not especially useful for the purposes we had in mind. Disaggregated data were difficult to obtain, and we learned that relationships among variables are rarely analyzed. Two things became clear. First, we ourselves would have to analyze existing data in order to establish critical relationships and causal patterns. Second, we would have to generate much new data in order to get at the realities of health care delivery in the countryside.

This monograph reflects the former undertaking. While our colleagues at Cairo University were compiling a monumental array of health statistics, we turned to a more limited body of data to see what could be learned from some simple relationships. Preliminary results from the 1976 household census had become available, and we found that a fair number of demographic and developmental variables reported in that census, if combined with data provided by the Ministry of Health, would enable us to probe at least some of the dynamics of health and health care delivery in which we were interested. Had good longitudinal data been available, we would have looked at health dynamics across time. This not being possible, we settled for what could be done cross-sectionally using data organized with the Egyptian governorates as units of analysis.

Our principal concern lay in exploring the way in which infant mortality and the birth rate are each affected by such attributes of Egyptian society as population density, literacy, urbanization, and the availability of purified drinking water. In effect, we sought to relate births and infant deaths to the socio-economic context in which they vary. Analysis of the patterns discerned comprise the core of this study. We also took the opportunity to examine the health system's own development in rural Egypt, focusing on how the expansion of health services relates to development generally, to popular utilization of rural health centers and units, and to the recorded incidence of infant births and deaths. These findings are presented in a separate paper.

While many of the results reported here are interesting, even provocative, they are hardly definitive. Some of the data employed are of questionable accuracy, and the governorate level of analysis is too crude and statistically confining for the results to be more than suggestive. Our findings, therefore, do not reveal the way things are but the way they might well be. What is written in this monograph is not the final word on the subject but, hopefully, an initial word, one among many to come. Our purpose in sharing this exploration is not to claim that we have discovered any iron-clad truths but to urge others, inside and outside of the Ministry of Health, to push this line of inquiry further so that whatever truths may exist can be learned, appreciated, and acted upon.

We would like to take this opportunity to express deep appreciation to our counterparts at Cairo University and in the Ministry of Health for their encouragement and support. Their names appear on the next page. The work that has brought us together has, in turn, benefitted immensely from the interaction involved. We salute our colleagues as professionals and friends even as we absolve them of responsibility for any errors of data handling or interpretation that may exist in these pages. Whatever credit this study deserves rightfully belongs to them as much as to us; any blame is ours alone.

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Cambridge, Massachusetts, U.S.A.
May 23, 1980

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INFANT MORTALITY, THE BIRTH RATE, AND DEVELOPMENT IN EGYPT

John Osgood Field and George Ropes[1]

While impressive in many ways, Egypt's economic progress since the Revolution in 1952 has had only limited effect on two major problems that are an increasing source of concern: high mortality among preschool-age children, infants especially, and a persistently high rate of population growth. This paper uses governorate data and simple analytical methods (Pearson correlation coefficients and step-wise regression equations) to identify features of the socio-economic environment that influence the incidence of infant mortality and fertility in Egyptian society.

According to official estimates, approximately 10% of the children born in Egypt die in their first year of life.[2] Subsequent mortality

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1 We are grateful to Richard S. Eckaus, Nazli Choucri, and Amr Mohie-Eldin for comments on an earlier draft.

2 It is widely believed that these estimates are low. We examine indirect evidence of significant under-recording of infant deaths in John Osgood Field and George Ropes, "The Influence of the Health System on the Recorded Incidence of Infant Mortality and Birth Rates in Rural Egypt," M.I.T. - Cairo University Health Care Delivery Systems Project, Monograph #2 (June 1980).

is also extensive in the preschool-age population.[3] Indeed, when all of the deaths occurring in a year are considered, most -- perhaps as many as three out of five -- are among the very young, not the very old.[4] Notwithstanding this attrition and quite possibly because of it, the crude birth rate remains in the high 30's and overall population growth continues substantially unabated.

The combination of high fertility and widespread mortality among the very young represents a veritable Achilles heel to Egyptian development. It also poses a major challenge to the Ministry of Health, which bears principal responsibility for addressing the afflictions of early childhood and for dispensing family planning services. Far from being on the fringes of development, the Ministry of Health could be vital to it. As this study will demonstrate, Egypt's ability to complete the demographic transition with reasonable speed will depend, in significant measure, on the Ministry's effectiveness in reaching both the urban poor and the fellahin with services which save children already born and which reduce the psychological incentive to have more.

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3 One official source estimates that close to another 10% die in their second year, although a more conventional figure is the 23.6 deaths per 1,000 children aged 1-4 years recorded by the Ministry of Health for 1972. On the one hand, see Ministry of Health, Arab Republic of Egypt, and Westinghouse Health Systems, Implementation Program: Strengthening Rural Health Project (February 23, 1979), pp. 106-7. On the other, see Ministry of Health, Arab Republic of Egypt, A Proposal for a Community Based Integrated Family Planning and Maternal and Child Health Project, Cairo (December 1977), Table 14, p. 32.

4 The official figure reported in the United Nations Demographic Yearbook, 1971, for the proportion of deaths among children under five to all deaths in Egypt is 53%. This, however, is an underestimate. Source: Population Bulletin, 29 (1974), p. 5. For an extended discussion see Institute of Medicine, National Academy of Sciences, Health in Egypt: Recommendations for U.S. Assistance, Washington, D.C. (January 1979), pp. 39-40.

What accounts for the high levels of infant and toddler mortality in Egypt? And why is the birth rate so high? Further research is needed to answer both of these questions definitively, but the available evidence suggests a dynamic that has been observed in many low income countries. Early childhood mortality reflects the interplay of malnutrition and infection, which in Egypt typically is triggered by acute bouts of gastroenteritis and then aggravated by respiratory ailments and by parasitic infestation. The main reason for the troublesome population growth found in Egypt, as in many other countries, is the prevailing belief in peasant societies that children, males especially, are economic assets and that one must have many of them because at least some are likely to die. If the goal is two surviving sons, it may take as many as eight pregnancies to ensure five survivors, of whom at least two will be male.[5] High fertility is a reflection of high mortality to a significant degree. We shall soon see that this is very much the case in Egypt. Moreover, children of higher birth order are more susceptible to malnutrition, morbidity, and mortality than are children of lower birth order, thereby producing a vicious cycle that perpetuates itself over time and

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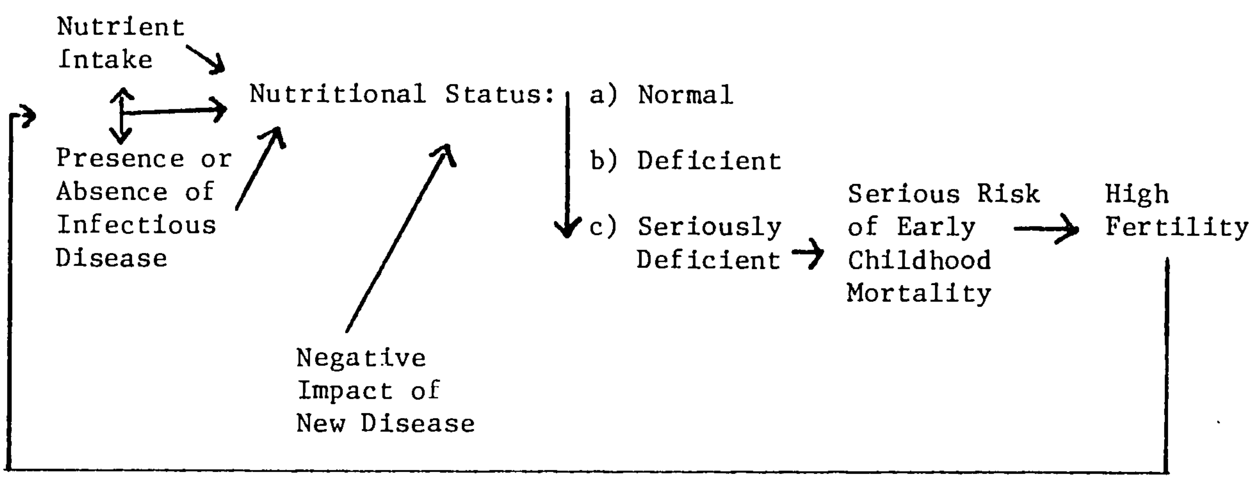
[5] A computer simulation based on mortality rates and sex ratios has shown that a couple in India must bear six or seven children in order to have 95% certainty that one son will survive to the father's sixty-fifth birthday. This is the number of children that rural families in India do have, on average. See Ronald G. Ridker, "Desired Family Size and the Efficacy of Current Family Planning Programs," Population Studies, 23 (1969), 279-284, and David A. May and David M. Heer, "Son Survivorship Motivation and Family Size in India: A Computer Simulation," Population Studies, 22 (1968), 199-210.

leaves peasant families unresponsive to family planning. The chain of causality suggested by a growing body of data from all over the world, Egypt included, is summarized in Figure 1.[6] One way of defining the challenge facing the Egyptian government -- and the Ministry of Health especially -- is to state that they must break this chain of causality and the self-sustaining cycle it contains.

Figure 1: The Malnutrition-Morbidity-Mortality-Fertility Dynamic Under Conditions of Low Socio-Economic Development: A General Model



What can be done? More specifically, now that the Egyptian economy is being reoriented to emphasize domestic construction, how much priority should be given to direct interventions against the dynamic highlighted in Figure 1 as opposed to reliance on secular processes of economic development

6 For an in-depth analysis of the dynamic identified in Figure 1 see Leonardo J. Mata, The Children of Santa María Cauqué: A Prospective Field Study of Health and Growth (Cambridge: The MIT Press, 1978).

and social change? Health interventions generally and nutrition and family planning interventions in particular are often ineffective when introduced into an otherwise unchanged environment. On the other hand, development is a long-term process of extraordinary complexity and cost whose benefits often fail to reach the poor within a desired time frame.

The result is a dilemma. To respond that both development and direct interventions are necessary is to state the obvious but not very helpfully. What kinds of intervention are called for, where, and for whom? How are they to be implemented, by whom, and at what price? Similarly, is development at large a viable means of achieving health and population goals in the short run, or must distinctions be made among different kinds of development? If the latter, what are these distinctions? That is, what forms of development and social change are most associated with lower levels of infant mortality and fertility, and are they the same in each case or different?

It is this latter set of questions that we seek to answer here. Our purpose in this paper is to identify critical relationships and causal patterns linking infant mortality to fertility and both to indicators of socio-economic status and change in Egyptian society. Figure 2 portrays the inquiry graphically, and Figure 3 indicates the variables that we have been able to include in the analysis.[7]

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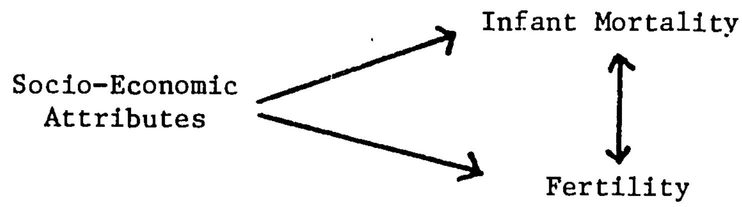
[7] Similar studies using village-level data are being sponsored by the Population and Family Planning Board (PFPB) of the Supreme Council for Population and Family Planning, A.R.E., under the direction of Dr. Assiz el Bindary. These studies promise a very much richer as well as more definitive assessment of the dynamics involved than is possible with governorate data. Two early papers based on the Board's analysis of

Figure 2: The Analysis Contained in This Paper



Analysis consists of Pearson correlation coefficients and step-wise regression equations utilizing as many as 30 variables (see Figure 3 and Appendix A).

Infant Mortality and the Birth Rate

In this analysis, as in many others, infant mortality serves as a proxy for the incidence and seriousness of protein-calorie malnutrition. While the representation is by no means perfect, the infant mortality rate does qualify as an outcome variable summarizing multiple health and nutritional afflictions of very young children. It also represents final testimony that something is terribly wrong with the physical

7 (continued)
international data are Nader Fergany, "The Relationship Between Fertility Level and Societal Development and Implications for Planning to Reduce Fertility: An Exercise in Macro-Statistical Modelling," PFPB, Cairo (January 1975), and Andre Piatier and Patrice Geraud, "Relationships Between Demography and Socio-Economic Development: An Attempt to Determine Some Variables for Planning Purposes," PFPB, Cairo (undated).

Figure 3: Available Governorate Data on Infant Mortality, Fertility, and Socio-Economic Attributes, Arab Republic of Egypt

Item	Source*
Infant Mortality	
o Infant mortality rate in 1973	MOH
o Infant mortality rate in 1972: urban and rural	CAPMAS
Fertility	
o Crude birth rate in 1973	MOH
o Crude birth rate in 1972: urban and rural	MOH
Socio-Economic Attributes	
o % literate in the population aged 10 and above; % female literacy	CAPMAS
o % urban	CAPMAS
o % households with electricity	CAPMAS
o % households without purified drinking water, with purified water in dwelling, and with purified water at least in building	CAPMAS
o % women aged 6 and older in the paid labor force	CAPMAS
o % households with annual incomes below LE 250 (urban and rural) and LE 400 (urban) in 1975	OTHER
o Per capita value of agricultural production in 1974	OTHER
o Rural per capita income derived from agriculture in 1974	OTHER
o Population density in 1976	OTHER

* CAPMAS = Central Agency for Public Mobilisation and Statistics, "The Preliminary Results of the General Population and Housing Census, 22/23 November 1976 in Egypt," mimeo, 1977, 56 pp. MOH = Ministry of Health, General Administration of Statistics and Evaluation. "OTHER" = scholarly sources identified in Appendix A.

health of society's newest and most vulnerable members.[8]

Infant mortality rates in Egypt are alarmingly high. Data from 1973 indicate a national average of 98 infant deaths per 1,000 live births, with several governorates (Red Sea, Aswan, Cairo, Kalyubia, and Menufia) showing rates in excess of 110. Comparable data from 1972 suggest even greater attrition: 116 deaths per 1,000 live births. Moreover, during the two decades prior to 1972 -- a period of major political and economic change in Egypt -- infant mortality rates declined only marginally overall.[9]

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For convincing evidence concerning the prominence of malnutrition as a cause of early childhood mortality, see Ruth R. Puffer and C.V. Serrano, Patterns of Mortality in Childhood, Report of the Inter-American Investigation of Mortality in Childhood, Scientific Publication No. 262 (Washington, D.C.: Pan American Health Organization, 1973). At the time of our analysis the national nutrition status survey conducted in Egypt was not yet available. Nor were the data on child growth generated by the M.I.T. - Cairo University Health Care Delivery Systems Project. We have subsequently correlated the latter set of nutrition indicators with the rates of infant mortality reported for the Egyptian governorates in 1972 and 1973, the most recent years for which officially sanctioned statistics exist. The Pearson correlation between infant mortality and the incidence of growth failure among children under five years of age according to the Gomez classification is .42 (sig. at .05), indicating that departures from normal growth are indeed significantly associated with rising mortality among the very young.

9
In 1952 the infant mortality rate in Egypt was recorded at 127 per 1,000 live births and in 1972 at 116 per 1,000 live births. Even though variation from year to year was occasionally quite marked during this period, the average infant mortality rate for the 1960's was 119, while at no time between 1952 and 1972 did it fall below 100. These, of course, are official estimates. Because many infant deaths are not recorded, the actual incidence of infant mortality is substantially higher than these figures indicate. See Ministry of Health, A Proposal, op. cit., See also Arab Republic of Egypt, The Supreme Council for Population and Family Planning, "Population and Family Planning: Some Characteristics for Egypt," mimeo, Figure 4.

The estimated birth rate is also quite high in Egypt, averaging between 36 and 39 live births per 1,000 population since the mid-1960's. This magnitude of fertility is fairly typical of low income countries generally, as is Egypt's rate of natural population increase (2.3% per annum during the same period). What makes the situation troublesome is that there is little evidence of significant or sustained reduction in these parameters since the Revolution. Fertility has actually been rising since 1972, and the population is expected to double in 30 years. Once again, this latter projection is hardly exceptional; but Egypt is one of a small number of countries where population size has already begun to press against ecological capacity, and the strains of continued growth are likely to be severe.[10]

As with infant mortality, fertility rates vary from one part of the country to another. In 1973, the last year for which reliable governorate data exist, the crude birth rate exceeded 40 in eight governorates, led by El Wadi-El Gedid (45/1,000) and followed by Beni-Suef and Fayoum (43/1,000), Kalyubia and Giza (42/1,000), and Minya and Assiut (41/1,000), with Menufia at 40/1,000. All other rural governorates had rates in the mid to high 30's, while the modern urban centers of Cairo and Alexandria showed much lower overall fertility at 27/1,000 and 29/1,000 respectively.[11]

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10 The figures cited in this paragraph are derived from several sources, including Population Reference Bureau, 1977 World Population Data Sheet (Washington, D.C.: March 1977), and The Supreme Council for Population and Family Planning, "Population and Family Planning," ibid.

11 The lowest fertility was recorded in Suez (2/1,000), Port Said (4/1,000), and Ismailia (17/1,000). These figures are statistical artifacts of the three governorates being in the war zone.

Egypt, therefore, reveals the classic pattern of high fertility and high early childhood mortality that characterizes most low income countries. Moreover, as existing theory would predict, Egypt's mortality and fertility rates co-vary sub-nationally. Governorates high in one are typically high in the other as well (e.g., Kalyubia, Menufia, Giza, and Beni-Suef). The reverse is also true. Governorates with a relatively low incidence of infant mortality tend to be among those with relatively low crude birth rates (e.g., Kafr-el-Sheik, Behera, and Dakahlia). There are anomalies, to be sure. Cairo, Alexandria, and Aswan are high mortality - low fertility governorates, while both Fayoum and Assiut are high in fertility but average in mortality. All in all, however, the correlation between infant mortality and the birth rate is .60 at the governorate level, a positive association that is highly significant statistically.[12]

Two other observations can be made about the mortality-fertility linkage in Egypt on the strength of the governorate data. First, the relationship is not an artifact of different levels of development. On the contrary, it would seem to be apparent at any level of development regardless of how development is defined. Holding urbanization, literacy acquisition, income distribution, and other influences constant -- singly and together -- leaves the relationship intact. The mortality-fertility linkage holds across the range of experience revealed in the data. It is not dependent on the type or degree of development attained.

Second, the relationship gives every sign of being interactive. High mortality is a factor disposing to high fertility, while high

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12 The coefficient pertains to infant mortality in 1972 in relation to the birth rate in 1973, omitting the Frontier governorates. Statistical significance exceeds .005, meaning that the association is likely to occur by chance less than five times out of a thousand. Mortality data for 1973 reveal a very similar pattern.

fertility -- in turn -- leads to greater mortality, later children born to a family being more vulnerable to death than earlier children. The situation is one of mutual causality, with changes in the birth rate accompanied by significant changes in the rate of infant mortality and changes in mortality accompanied by even more substantial changes in the birth rate.[13] This means that improvements in one will trigger improvements in the other; but it also means that, left unattended, each will make the other worse. The negative synergism of the problem provides a compelling rationale for an integrated M.C.H.-family planning program by way of solution, as the Ministry of Health has come to appreciate.[14]

In sum, the relationship between births and infant deaths is real; it is substantively as well as statistically significant; and it is strong. Infant mortality and the birth rate do more than "go together." They feed on each other, each accentuating the other and producing in the process a vicious spiral of deprivation affecting a large proportion of Egyptian society.

Dimensions of Development in Egypt

Having confirmed the existence of a strong interactive relationship between infant mortality rates and birth rates in the governorates, we

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13 These observations are based on regression analysis. Each variable significantly predicts variation in the other both when other influences are taken into account and when they are not. See Table 9 below, in particular.

14 See, for example, the citations in note #3.

turn now to the socio-economic environment in which this interplay occurs. Our objective is to identify the demographic and developmental features of Egyptian society that explain differences in mortality and fertility. We begin this inquiry by first giving structure to the socio-economic environment itself.

When the nine socio-economic attributes listed in Figure 3 are intercorrelated and then examined in relation to one another, it is possible to discern four dimensions of development as well as another distinctly demographic dimension pertaining to population density.

1. An "urban cluster" consisting of the proportion of a governorate's population that is urban, literate, has ready access to pure water, and whose homes are electrified.

2. Poverty, as indicated by the proportion of households whose annual income is below LE 250, a credible if strict demarcation of the poverty line in Egypt.

3. The incidence of women in the paid labor force.

4. Development in the rural sector, as portrayed by the monetary value of agricultural production per capita and by rural per capita income derived from agriculture.

5. Population density.

Most intriguing is the urban cluster. Each variable in it correlates with each other variable at .85 or better, as shown in Table 1. Literacy, pure water, and electricity are so closely linked to urbanization and to one another that they are all, in effect, measures of the same thing: the benefits of urban life. Even if one regards urban areas as diffusion centers from which rural people gain access to modernization, it is clear that how much is diffused depends on the size of the urban nucleus in a governorate. Literacy acquisition, the availability of purified water, and electrification of homes all reflect the dissemination of socio-economic benefits in society. In Egypt disseminated development, as measured, is very much an urban phenomenon.[15]

Table 1: Development in Egypt: The "Urban Cluster" Revealed in Governorate Data

Pearson Correlation Coefficients

	% Urban	% Literate	% Pure Water	% Electricity
% population that is urban		.85 (.001)	.93 (.001)	.91 (.001)
% population that is literate			.90 (.001)	.96 (.001)
% households with purified water in the building				.94 (.001)
% households with electricity				

Note: Statistical significance is indicated in parentheses.

15 The coefficients shown in Table 1 are reduced slightly when the four urban governorates are removed from the calculation. Even so, the urban cluster is apparent in the governorates with sizeable rural populations. The coefficients remain compelling and highly significant, implying that the concentration of development so pronounced in Egypt's metropolitan centers is replicated in the other governorates, albeit to a somewhat lesser extent. See Tables 2 and 3 below, plus the surrounding discussion, for more on this theme.

Poverty is a second dimension of development suggested by the data. The proportion of households with incomes below LE 250 is significantly related to the urban cluster but negatively and less strongly.[16] Poverty, as measured, is rather more a rural phenomenon, not because income disparities are greater in rural Egypt but because, proportionally, more rural than urban people are objectively poor.[17] The uneven nature of development is again apparent, although poverty is -- obviously -- very much more a shared attribute than are literacy, pure water, and electricity.

We identify the proportion of women who have entered the paid labor force as a third dimension of development because, while it is impressively, if inversely, correlated with poverty (-.74, sig. at .001), it is totally unrelated to the urban cluster. Contrary to what we would have assumed, the fact of women earning incomes on their own is not a feature of urbanization. On the contrary, it would appear to be almost as common in rural as in urban Egypt, a pattern which holds even when the four urban governorates are deleted from consideration. For its part, the negative association with poverty, while expected, is reassuring. It suggests that gainful female employment adds to overall family income enough to push a substantial number of families above the poverty line in both rural and urban sectors.

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[16] The coefficients are all in the -.4 to -.6 range (sig. at .05 to .01).

[17] The reason why this is so has to do with the relatively greater affluence found in the urban governorates, especially in Cairo and Alexandria. When only the governorates with rural populations are considered, the poverty-urbanization relationship collapses. In these governorates, urban-rural poverty distinctions evaporate, the proportion of rural poor being no greater than the proportion of urban poor. The differences found overall are really a function of metropolitanization, not urbanization.

A fourth dimension of development consists of two variables pertaining solely to the rural sector in the 17 non-urban governorates of the Nile system. The per capita value of agricultural produce and the per capita income derived from agriculture are highly correlated, as one would expect.[18] Productivity and income are two of the most prevalent ways of measuring development, and it is therefore of considerable interest that they bear no relation whatever to the proportion of households below the poverty line.[19] The difference between aggregate wealth and popular well-being is quite marked in Egypt, as it is elsewhere.[20]

Two other patterns stand out. First, agricultural income increases as women enter the paid labor force (r = .50, sig. at .05), confirming the contribution of female employment to family income in rural Egypt. By contrast, there is no association between agricultural income and the urban cluster of benefits. The two are totally separate, indicating that -- indeed -- the accouterments of urban life (literacy, pure water, electricity) have only begun to penetrate the countryside.

18
r = .76 (sig. at .001). The value of agricultural production in 1974 was greatest in Behera (LE 76.40 per capita) and lowest in Ismailia (LE 33.70 per capita) and Giza (LE 33.80 per capita). Rural income per person in 1974 was also highest in Behera (LE 104.30) and lowest in Ismailia (LE 63.70) followed by Kena (LE 64.50) and Damietta (LE 65.10).

19
r = .13 and r = .19 (both n.s.) respectively. The same holds when rural poverty is considered alone. It would appear that the generation of wealth is not the same process as the alleviation of poverty; indeed, income inequality actually increases with the level of income.

20
In comparison with other countries, particularly in the Arab world, Egypt's record of promoting popular well-being is quite good given the country's resource constraints. For an elaboration, see John Osgood Field and George Ropes, "Development in the Egyptian Governorates: A Modified Physical Quality of Life Index," L'Egypte Contemporaine, 372 (April 1978), 41-54.

Second, agricultural productivity is, at most, weakly related to the practice of women working for pay.[21] Apparently, the principal benefit of female employment lies in the added income derived by the family rather than in increments to production, although these are evident as well. Productivity appears to be more responsive to the availability of purified water in rural areas, and we may assume that this has less to do with the blessings of irrigation for land productivity than with the blessings of pure water from a health point of view for the productivity of people working in agriculture.[22]

Finally, there is population density. More a demographic variable than a measure of development, density relates to development in a mixed fashion. At one and the same time, it is unassociated with female employment and agricultural income, is a blind for urbanity with regard to poverty, is modestly associated with the urban cluster, and is negatively associated with the per capita value of agricultural production. Density is sufficiently independent of the four dimensions of development which we have identified that it stands apart from them, empirically as well as conceptually, as a possible influence on infant mortality and fertility.

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21 $r = .33$ (n.s.)

22 An alternative explanation is that people who produce more earn more and are more likely as a result to afford pure water. Whatever the causality, the Pearson correlation between agricultural production per capita and the availability of purified water in rural areas is a strong .61 (sig. at .005).

In certain respects, these five dimensions of development underline the skewed pattern of development being experienced in Egypt to date. The "urban cluster," in particular, implies a pronounced imbalance in literacy acquisition and in the extent to which families have access to such modern amenities as potable water and electricity. That the proportion of households below the poverty line is not affected by gains in agricultural productivity and income is also revealing. The former conveys the limited extent to which modernization has been extended from urban centers into the countryside.[23] The latter conveys the weakness of "trickle down" effects even within the rural sector. The message of both patterns is that development in Egypt remains spatially and socially confined to a considerable degree.

Table 2 documents this impression with actual figures derived from the governorate data. Literacy, modern amenities, income, and general well-being are all most advanced in the urban governorates, as one would expect. The fact that Lower Egypt enjoys a higher standard of living than Upper Egypt is also not surprising, although the differences between them are smaller than many might assume to be the case. What is striking in Table 2 is the disparity between the urban governorates and the rest. Development and its benefits give every sign of being quite concentrated,

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[23] In the case of literacy, a reverse flow is likely as people educated in the villages come to the cities in search of new opportunities. According to data analyzed by Brecke, literate people account for well over half (57%) of all rural-to-urban migration in Egypt. (Peter Brecke, "A Look at the Factors Underlying Internal Migration in Egypt," Technology Adaptation Program, Massachusetts Institute of Technology (January 1980), p.21.)

with Egypt's four metropolitan centers being uniquely advantaged relative to the rest of the country.

Table 2: Development in Egypt: Regional Patterns in the Distribution of Benefits, Governorate Data

Governorates	% Literate Total	% Literate Female	% Households with... Electricity	Pure Water#	Annual Incomes Below LE 250	PQLI*
Urban	64%	53%	84%	83%	30%	70
Lower Egypt	41	25	38	22	46	36
Upper Egypt	33	19	29	18	52	24
National average	43	29	45	34	45	39

either in the dwelling or in the building.

Notes: The PQLI* is a "physical quality of life index" averaging standardized scores for infant mortality, literacy, and access to purified water. Values range from 100 (high) to 0 (low). All values in this table are weighted by population.

Sources: Preliminary results of the population and housing census of November 1976 (CAPMAS), the Ministry of Health, and the Ministry of Labor.

The sectoral and regional patterns shown in Table 2 are pursued further in Table 3, where the primacy of the urban setting in Egyptian development is revealed even more clearly. Urban residents, on average, are very much better off than are rural residents no matter in what part of the country they live. Region is influential as well, with the Delta outpacing Upper Egypt in both urban and rural contexts. For each measure permitting these comparisons, the pattern is linear and the spread substantial.

Table 3: Development in Egypt: Sectoral and Regional Patterns in the Distribution of Benefits, Governorate Data

	% Households with Electricity	% Households with Pure Water#	% Households with Annual Incomes Below LE 250
Urban governorates	84%	83%	30%
Lower Egypt: urban	73	60	33
Upper Egypt: urban	64	51	36
Lower Egypt: rural	23	7	50
Upper Egypt: rural	13	4	60
National average	45	34	45

either in the dwelling or in the building.

Note: All values are weighted by population.

Source: Preliminary results of the population and housing census of November 1976 (CAPMAS).

Two points stand out as we turn to the socio-economic parameters of infant mortality and birth rates in Egypt. First, Egyptian development is characterized by pronounced sectoral and social biases implying that many people, particularly in rural areas, remain substantially unaffected by the gains made. Second, the five dimensions of development to which we have alluded and on which much of our remaining analysis will rest themselves reflect the imbalances that exist.[24]

24 References in the text to the skewed distribution of benefits in Egyptian development are subject to possible misinterpretation. Benefits are always skewed, and in comparison with other low income countries income distribution in Egypt is believed to be relatively equitable. Moreover, making dynamic inferences from static data is hazardous. Strictly speaking, the set of configurations that we are able to observe at an end-point (1976) does not enable us to say how the configurations have changed over time. Despite our lack of longitudinal data, we observe outcomes, infer trends, and even impute the nature of development being pursued. Economists, no doubt, would be more circumspect.

24 (continued)

Nevertheless, the summaries shown in Tables 2 and 3, as well as the inferences drawn from them, are consistent with the findings of other scholars. Several studies offering detailed analysis of the available evidence assert the "urban bias of growth policies" and the "marginal nature of distributional changes" in Egypt since the Revolution (Ibrahim H. El- Issawy, "Interconnections Between Income Distribution and Economic Growth in the Context of Egypt's Economic Development," discussion paper, Princeton-Egypt Income Distribution Project Conference, Lisbon, October 31 - November 3, 1979, p. 61 and p. 73 respectively; see also Samir Radwan, "The Impact of Agrarian Reform on Rural Egypt (1952-1975)," International Labour Office, Geneva (January 1977)). Data examined in a massive social accounting matrix reveal that government subsidies in 1976 favored the urban sector over the rural and the relatively more affluent in each sector over the relatively less affluent. Indeed, even with taxes and other government transfers taken into account, the net flow of resources was from the poor to the government rather than the reverse. Granted that the value of government services was not included in the matrix, the net effect of government participation in the economy is that everybody pays the government. (Richard S. Eckaus and Amr Mohie-Eldin, "Report on the Project on Improved Methods of Macroeconomic and Sectoral Planning," paper prepared for the Conference of the Cairo University - M.I.T. Technological Planning Program, Cairo, Egypt, January 12-15, 1980.)

In sum, whether longitudinal or cross-sectional, the evidence suggests that Egyptian development is characterized by pronounced sectoral and status biases that, if anything, have become even more accentuated since "the opening" (Al-Infitah) to the West. What all this means for the future is a matter of scholarly conjecture. For a pessimistic view see Lance Taylor, "The Political Economy of Egypt: An Opening to What?," Department of Economics, Massachusetts Institute of Technology (December 1977). A more optimistic view appears in Nazli Choucri and Richard S. Eckaus, "Interactions of Economic and Political Change: The Egyptian Case," World Development, 7 (August-September 1979), 783-797.

Development and Infant Mortality

Table 4 indicates how infant mortality rates in the Egyptian governorates vary with the demographic characteristics and indicators of socio-economic change which comprise our five dimensions of development. Four observations emerge clearly from the table, to which we can add several others by way of elaboration.

First, the incidence of infant mortality is astonishingly independent of modernization. For the country as a whole (minus the Frontier governorates) no relationship exists between infant mortality and such prominent changes in Egyptian society as increasing urbanity and the acquisition of literacy. Nor at first glance does mortality appear to be related at all to electrification or to provision of purified water. Indeed, the entire "urban cluster" is thoroughly anemic insofar as infant mortality is concerned.

It might be thought that these patterns reflect the fact that infant mortality is high in two urban governorates (Cairo and Alexandria) and low in the two others (Port Said and Suez), thereby washing out the associations. This is so, in part. With the urban governorates removed from the calculations, the suggestion of a relationship does emerge; but as indicated in the table, it is weak. It is also somewhat counter-intuitive. Urbanization in the rural governorates is associated with slightly higher, not lower, rates of infant mortality. The more urban the population of such a governorate, the higher its infant mortality is likely to be; and while the association is not a strong one,[25] it serves

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[25] r = .30 (n.s.) for infant mortality in 1973; r = .22 (n.s.) for infant mortality in 1972.

Table 4: Infant Mortality in Demographic and Developmental Context: Pearson Correlation Coefficients, Governorate Data, Arab Republic of Egypt

Demographic and Developmental Context	INFANT MORTALITY IN 1973 Governorates: Urban, Lower Egypt, Upper Egypt r (sig.)	INFANT MORTALITY IN 1973 Governorates: Lower Egypt, Upper Egypt r (sig.)	INFANT MORTALITY IN 1972 Governorates: Urban, Lower Egypt, Upper Egypt r (sig.)	INFANT MORTALITY IN 1972 Governorates: Lower Egypt, Upper Egypt r (sig.)
1. Urban Cluster				
o Urbanization	-.08 (n.s.)	.30 (n.s.)	-.09 (n.s.)	.22 (n.s.)
o Total Literacy	.08 (n.s.)	.27 (n.s.)	-.04 (n.s.)	.03 (n.s.)
o Female Literacy	-.06 (n.s.)	.07 (n.s.)	-.17 (n.s.)	-.19 (n.s.)
o Purified Water[a]	-.14 (n.s.)	-.07 (n.s.)	-.18 (n.s.)	-.25 (n.s.)
o Electrification	-.02 (n.s.)	.28 (n.s.)	-.08 (n.s.)	.13 (n.s.)
o Cluster[b]	-.04 (n.s.)	.23 (n.s.)	-.10 (n.s.)	.04 (n.s.)
2. Rural Development				
o Production		-.28 (n.s.)		-.15 (n.s.)
o Per Capita Income		-.08 (n.s.)		.04 (n.s.)
3. Female Employment[c]	-.21 (n.s.)	-.40 (n.s.)	-.20 (n.s.)	-.38 (n.s.)
4. Poverty[d]	.36 (n.s.)	.62 (.01)	.37 (n.s.)	.64 (.005)
5. Population Density	.42 (.05)	.51 (.05)	.41 (.05)	.60 (.005)

[a] The percentage of households with a pure water tap in the building where they live. Alternative measures of the availability of purified water yield very similar associations with infant mortality.

[b] An aggregate measure combining normalized governorate scores for urbanization, literacy acquisition (among males as well as females), the availability of purified water in the buildings where people live, and electrification of homes.

[c] The percentage of women in the paid labor force.

[d] The percentage of families, urban and rural, with annual incomes below LE 250. Raising the urban poverty line to LE 400 has almost no effect.

Note: A complete matrix of Pearson coefficients for infant mortality in relation to all demographic and development variables may be found in Appendix B.

as a reminder that not all forms of development can be counted on to bring infant mortality rates down. Indeed, even though some of the association may be due to more accurate recording of infant deaths in urban Egypt, the direction of the relationship conforms to patterns observed elsewhere in which urban centers manifest greater malnutrition and early childhood mortality than does the rural periphery.[26] This happens to be very much the case in Egypt as well. Of the 17 governorates having both rural and urban sectors, in 14 mortality is greater in the urban sector, and the differences are often considerable.[27] This comparison and the correlation between urbanization and infant mortality explain why mortality appears to increase, however marginally, with other indices of modernization such as literacy acquisition and electrification in the non-urban governorates. Indices like these are so closely tied to urbanization that they merely reflect the prevailing urban pattern.

On the other hand, if urbanization and the cluster of amenities and benefits accompanying it reveal no positive impact on overall infant mortality rates and might even appear to aggravate them on occasion, the same cannot be said when urban Egypt is considered alone. Isolating the dynamics of infant mortality in urban areas has the merit of removing the influence of urbanization on the other changes that cohere so strongly with it in the country at large, even as it permits analysis of what is happening

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[26] See, for example, Pensri Khanjanasthiti and Joe D. Wray, "Early Protein-Calorie Malnutrition (PCM) in Slum Areas of Bangkok Municipality, 1970-71," National Research Council of Thailand, 1972; also Samir S. Basta, "Nutrition and Health in Low Income Urban Areas of the Third World," Ecology of Food and Nutrition, 6 (1977), 113-124.

[27] See Appendix A.

within the rapidly expanding urban sector.

When this is done -- and it can be done only partially with the data at hand -- urban infant mortality gives evidence of being responsive to expanding services. Improvements in the availability of pure water and the electrification of urban homes are both associated with lessened mortality. The coefficients are statistically significant in each case, as shown in Table 5. Moreover, the relationships hold both when the urban governorates are included in the calculations and when they are not, suggesting that the results are not biased by the presence of the four metropolitan centers with their relatively advanced water and electrical infrastructures. It would appear that even the lower levels of development characteristic of urban Souhag and Kena can contribute to reduced infant mortality.[28]

A striking feature of Table 5 is that no such patterns emerge in rural Egypt. Rural infant mortality does not appear to be meaningfully influenced by water purification or electrification, perhaps because there is a critical threshold of change which has yet to be attained in most of the countryside. Two-thirds of the people living in Egypt's cities and towns have access to pure water, compared with only 6% of village residents. Although the disparity is less severe with regard to electrification, it is still considerable; 77% of urban households have electricity as against 19% of rural households. Clearly, the greater availability of these (and, no doubt, other) modern amenities in urban society is responsible for a

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28 Half (51%) of the urban population in Souhag and 41% in Kena had reasonable access to purified water in 1976, as compared with 81% of the population in Cairo and 91% in Alexandria. The contrasts for electricity are similar. Unfortunately, urban-rural distinctions for literacy are not available.

Table 5: The Incidence of Infant Mortality in Relation to the Availability of Pure Water and the Electrification of Homes in Urban and Rural Areas: Pearson Correlation Coefficients, Governorate Data, Arab Republic of Egypt

URBAN INFANT MORTALITY

	Governorates Urban Lower Egypt Upper Egypt		Governorates Lower Egypt Upper Egypt	
	r	(sig.)	r	(sig.)
Availability of Pure Water in Urban Areas	-.54	(.01)	-.67	(.005)
Electrification of Urban Homes	-.53	(.01)	-.56	(.01)

RURAL INFANT MORTALITY

	Governorates Lower Egypt Upper Egypt	
	r	(sig.)
Availability of Pure Water in Rural Areas	-.19	(n.s.)
Electrification of Rural Homes	.32	(n.s.)

dynamic influencing infant mortality that one does not observe in the villages to date, if only because relatively few rural people are affected by the limited penetration that has occurred.

All in all, the data pose several ironies. Urbanization, literacy acquisition, water purification, and electrification -- singly and together as an "urban cluster" -- may not represent a cure for infant mortality in the country as a whole, but the dissemination of such benefits as these within urban Egypt will help. Urban Egypt differs from rural Egypt in this respect, presumably because the rural poor are much less touched by modernizing change. On the other hand, the country's two principal metropolitan centers -- Cairo and Alexandria -- reveal high levels of infant mortality in tandem with the most advanced urban infrastructure. We may assume that this anomaly has something to do with Cairo and Alexandria's both being strong magnets for rural-to-urban migration. More difficult to explain is why, given the urban dynamic discerned, urban mortality typically exceeds rural mortality in the same governorate. Migration is again a possible reason, and better recording of infant deaths in urban areas is another. The latter explanation implies that many, perhaps most, of the urban poor -- whether recently migrant or well established -- are themselves untouched by the benefits of the urban cluster. Both explanations are probably correct.[29]

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[29] We have documented evidence of serious reporting bias in Egypt's infant mortality data in another paper but not with reference to urbanity, for which the necessary data are lacking. To suggest that the urban poor remain largely unreached by such amenities of urban life as purified water and electricity is to imply that the correlations in Table 5, while statistically significant, are not yet substantively significant. Regression analysis qualifies this interpretation by pointing to the significance of water availability as a predictor of urban mortality. Nevertheless, for most of the cities and larger towns in Egypt the coefficients in Table 5 probably represent the potential implied by as yet very limited experience. If this

The second observation based on Table 4 is more straightforward. Infant mortality rates are not meaningfully correlated with rural development defined in terms of productivity and income. Nor is this because urban mortality is confusing the picture. When rural infant mortality is isolated and then matched against rural development, the results are the same.[30]

In sum, infant mortality gives every appearance of being remarkably impervious to some of the principal ways of describing socio-economic development in Egypt. Neither urbanization and its concomitants nor rural development is significantly related to the overall incidence of infant mortality in the governorates. Moreover, the reason would seem to be the same in each case: the maldistribution of benefits that accompanies many of the overt signs of progress. Inasmuch as infant mortality is a core ingredient of the "physical quality of life index"[31] now being used all over the world, the hiatus between wealth and well-being is particularly well illustrated in rural Egypt; and the sad thing is that

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29 (continued)
interpretation is valid, the urban poor, like their counterparts in the countryside, are largely unaffected by the kinds of improvement in living conditions that promise to reduce the incidence of infant mortality. The higher mortality found in urban areas then reflects both the failure of modernization to penetrate to the lower levels of urban society and the added insults that the urban environment bestows upon the poor: the lack of home-produced food, often higher prices, intermittent employment, and the multiple dislocations of being migrant or transient and unsettled, to say nothing of the crowded and unsanitary conditions of slum communities.

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The coefficients are -.09 (n.s.) for agricultural production and .12 (n.s.) for per capita income derived from agriculture.

31
See Morris David Morris, Measuring the Condition of the World's Poor: The Physical Quality of Life Index (New York: Pergamon, 1979).

urbanization to date offers little, if any, respite. Planners preoccupied with production functions and hopeful that aggregate economic growth, wealth generation, and demographic modernization will eventually do away with problems like extensive infant mortality may have to re-examine their assumptions. So long as the benefits of development remain concentrated, spatially and socially, infant mortality rates will remain high.

Third, from a developmental point of view the essential context of infant mortality is poverty. If this borders on being a trite statement, it is nonetheless a basic truth which emerges clearly in the data.[32] It also warrants emphasis given the prevailing mode of development in Egypt, which -- by and large -- has been inattentive to the distributional effects of economic growth in recent years.

A clue to the importance of poverty, as measured by family income, is provided by our findings concerning female employment. The incidence of women working in the paid labor force is associated with lessened infant mortality rates. The larger the proportion of women who are gainfully employed in a governorate, the lower the infant mortality is likely to be in that governorate. To be sure, the coefficients are weak to moderate at best and consistently fail to achieve statistical significance. Substantively, however, this pattern is of interest because it suggests that in Egypt the benefits of added income to the family tend to offset

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[32] For an insightful analysis of the economic roots of malnutrition, see Shlomo Reutlinger and Marcelo Selowsky, Malnutrition and Poverty: Magnitude and Policy Options, World Bank Staff Occasional Papers, No. 23 (Baltimore: The Johns Hopkins University Press, 1976), especially Chapter 2.

any negative effects of decreased maternal child care. This may be because there are compensating social supports available to the families involved, an interpretation which receives some endorsement from the fact that the associations are strongest when the urban governorates are removed from consideration.[33] Were it possible to delete the urban parts of the remaining governorates as well, thereby confining the analysis to rural Egypt only, one might see a significant relationship given the importance of family ties in village communities and the ready availability of family assistance, when needed, in them.

The development variable most closely linked to infant mortality is poverty itself as conveyed by the proportion of families with annual incomes below LE 250. The larger the proportion of households living below this poverty line, the greater the mortality observed. Moreover, once again the association is strengthened by removing the urban governorates, with statistical significance being attained when this is done.[34] Indeed, the best association (r = .68, sig. at <.005) comes when rural poverty is related to rural mortality alone. The message is clear: infant mortality in Egypt is powerfully conditioned by income distribution, particularly in the countryside, where the overall incidence of poverty is especially

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33 r = -.40 (just insignificant at .057) for infant mortality in 1973; r = -.38 (n.s. at .066) for infant mortality in 1972.

34 It is worth recalling that urbanization is negatively correlated with poverty (r = -.41, sig. at .05). We may assume that this has less to do with the number of urban poor than with the relatively greater proportion of people above the poverty line in urban as against rural Egypt.

high.[35]

Fourth, the demographic variable most closely linked to the incidence of infant mortality in Egypt is population density. The more densely populated a governorate, the worse its infant mortality is likely to be. The coefficients are consistently significant and are especially so in the rural governorates, implying that density is not merely another way of talking about urbanization.[36] Rather, density reflects population size in relation to land area in rural Egypt. The evidence is that increased population density in rural areas disposes to higher rates of infant mortality in those areas, as might be expected given Egypt's extremely tight man-land ratio in arable parts of the country. Rural density conspires against child survival; and while migration to urban centers relieves the pressure somewhat, in fact it only moves the problem to a new setting without in any way alleviating it.

The patterns observed in the correlations are confirmed by regression analysis. The strongest influences on infant mortality are poverty and population density in the rural governorates. As Table 6 indicates, a 1% decrease in the proportion of families living below the poverty line may be expected to result in a .65% decline in the infant mortality rate

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35 The average proportion of rural population that is below the poverty line in Egypt is 49%, as against 30% of the urban population. In only two governorates, Kafr-el-Sheik and Souhag, is the incidence of urban poverty greater than the incidence of rural poverty. We might note, parenthetically, that for Egypt as a whole the correlation between poverty and a "physical quality of life index" consisting of infant mortality, literacy, and access to purified water is a strong -.72 (sig. at .001). Given a non-socialist mode of development, constructs like the PQLI and our PQLI* (See Table 2) may simply be cumbersome ways of referring to income distribution.

36 This is confirmed by controlling for urbanization in the rural governorates, which leaves the coefficients stronger, not weaker.

Table 6: Explaining Infant Mortality: Step-Wise Regression Analysis, Governorate Data, Arab Republic of Egypt

Dependent Variable	Variables in Best Model: Beta and (Significance)	Statistical Significance of Model	% of Variation in Infant Mortality Explained (Adjusted R^2 x 100)	Variables Not Entering Model Significantly
Infant mortality in 1973	+ .65 Poverty (.005) + .52 Population density (.01)	.005 (F = 11.9)	59%	Urban cluster Female employment Birth rate
Infant mortality in 1972	+ .68 Poverty (.001) + .60 Population density (.001)	.001 (F = 21.9)	74%	Urban cluster Female employment Birth rate

Note: These equations pertain to the rural governorates of the Nile system minus Ismailia, for which data were missing.

for 1973, assuming no change in density. Virtually the same relationship holds for infant mortality in 1972. On the other hand, as the man-land ratio worsens in these governorates as a consequence of population growth, the incidence of infant mortality will also worsen and by approximately the same degree. No other demographic or development measure examined is significantly influential once the effects of poverty and population density are established. Moreover, these two variables alone account for a remarkable 59% and 74% of the total variation in infant mortality from one governorate to another for 1973 and 1972 respectively. Such power from such parsimony is rare.[37]

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[37] This discussion and Table 6 are based on data pertaining to the rural governorates of Upper and Lower Egypt minus Ismailia, for which missing values necessitated removal. The merit of confining the presentation of regression findings to these 16 governorates is that the findings are not biased by any anomalies in the rates of infant mortality reported for the Suez Canal zone (Port Said, Suez, and Ismailia), especially during the 1973 war. With Cairo and Alexandria added to the core 16 governorates, the regression results remain much the same. Density enters ahead of poverty as the two significant influences on mortality in 1972 and is replaced by the urban cluster, with which it is highly correlated (r = .76), as an unfavorable influence, with poverty, on mortality in 1973. The reasons are obvious. Cairo and Alexandria are the two most densely populated governorates in Egypt by far, and they are also the most developed governorates in terms of the urban cluster while also having notably high rates of infant mortality. When all 21 governorates of the Nile system are included, the poverty variable is a casualty because of missing values. In its place the birth rate enters first, followed by density, for both 1972 and 1973. The reason is again obvious. The birth rate is closely correlated with both poverty (r = .57) and the urban cluster (r = -.70). It simply squeaks in ahead of the latter. That it does so, of course, confirms the importance of the birth rate as a predictor of infant mortality for Egypt as a whole. The more children who are born, the greater the percentage of them that will die in their first year.

In sum, infant mortality in Egypt varies with and is most influenced by population pressures on the land, including urban crowdedness, and by the proportion of households living below the poverty line.[38] Female employment is important to the incidence of infant mortality indirectly. It adds to family income and would seem to push quite a few families over the poverty line, thereby helping to alleviate the problem.[39] Rural development is unrelated to infant mortality, presumably because aggregate gains in productivity and income are unevenly distributed. Urbanization, on its own and as a cluster of changes, is equally impotent overall, although urban mortality does appear responsive to an expanding urban infrastructure (electricity and water) outside the metropolitan centers of Cairo and Alexandria. In the main, however, urban development to date has been no more successful than rural development in reducing infant mortality and quite possibly for the same reason, namely that the benefits of development have simply not penetrated deeply enough in the social system to materially affect the poor.

These findings have a number of implications for policy. One message is that government in Egypt has its work cut out for it in any serious attempt to reduce infant mortality. The demographics of the situation are awesome. Population density, already severe, is guaranteed to worsen as a result of continued population growth. Other things being equal, if the

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[38] These are not two ways of saying the same thing. In the rural governorates the correlation coefficient for the relationship between poverty and density is a mere -.07 (n.s.).

[39] The coefficient between the proportion of women in the paid labor force and the proportion of households below the poverty line is -.74 (sig. at .001) both with and without Cairo and Alexandria included in the calculations.

patterns discerned here are projected forward, infant mortality rates will climb inexorably notwithstanding extensive food importation and subsidization. The density factor alone assures this. Moreover, greater density probably means greater overall poverty as ever more people compete for scarce resources. The reverse is certainly true. Greater poverty means greater density, for population growth rates are highest among the poor, as is infant mortality, and we have already noted the close interaction of mortality and fertility. Stated bluntly, Egypt does indeed face a demographic nightmare, the stakes of which go far beyond child survival. The nightmare is also ecological given population pressures on land, water, sanitation, and employment. High infant mortality is simply one of the consequences.

While the range of options available to government for confronting infant mortality and all that lies behind it is considerable, the options would seem to coalesce into three general approaches. First, government can tackle the density factor, which translates principally into an invigorated population policy featuring active promotion of family planning. Unfortunately, it is one thing to have a population policy; it is quite another to make it effective in a largely peasant society.[40]

Second, government can pursue a development strategy that stimulates productivity and raises the resource base of society. However appropriate, the lesson of the governorate data is that such a strategy, even if successful, will have little impact on infant mortality unless the gains

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[40] This view is strongly endorsed by doctors in the rural health service, who are responsible for implementing family planning goals in the countryside and who report very low levels of popular receptivity. See Robert Burkhardt, John Osgood Field, and George Ropes, "Family Planning in Rural Egypt: A View from the Health System," M.I.T. - Cairo University Health Care Delivery Systems Project, Monograph #6 (June 1980), especially Table A.

achieved reach the poor. Development is a legitimate response to the problem only through its effect on poverty, and the evidence to date is that most development in Egypt remains spatially and socially confined.[41]

Third, government can adopt direct interventions to address infant mortality and its health-related determinants, malnutrition and morbidity. The merit of doing so is suggested by the relative intractability of the density problem, the uncertain prospects of the new family planning program (although alleviating mortality is bound to help it in turn), and -- most of all -- by the pattern of development occurring in Egypt. Not only are the indirect routes chancy and costly; they entail an uncomfortably long time-frame for their effects to be felt. The case for direct health interventions is strengthened by two further considerations: Egypt's extraordinary importation of food to insure suitable aggregate availability combined with one of the world's most ambitious programs of consumer subsidies designed to promote effective access to food by the less privileged, and the fact that Egypt has an unusually well disseminated public health system.[42] The

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41 Although the influence is indiscernible in our data, development can make a contribution to reduced infant mortality through its effects on the birth rate.

42 Between 1971 and 1975, food imports ranged from 18% to 37% of total imports while accounting for more than a third of domestic food consumption. The direct cost of food subsidization in 1978 amounted to about LE 680 million, or roughly a quarter of current government expenditures. Sources: General Accounting Office, "Egypt's Capacity to Absorb and Use Economic Assistance Effectively," report of the Comptroller General of the United States, September 15, 1977, Appendix III, note 7; Lance Taylor, "Food Subsidies in Egypt," paper prepared for the conference on "Interface Problems between Nutrition Policy and its Implementation," Massachusetts Institute of Technology, November 5-8, 1979, p. 2.

former represents a substantial investment in nutrition, the benefits of which are being compromised and all-too-often overwhelmed by poor health status among small children. The latter represents an opportunity rarely found in low income countries to reach the vulnerable groups and give focused attention to their pressing health needs.

Development and the Birth Rate

The birth rate in Egypt may be typical of low income countries generally, but it does vary from governorate to governorate and much of the variation is explainable by the demographic and developmental measures at our disposal. Four summary observations emerge from our analysis of the data.

1. Variation in the birth rate across the governorates is very much less than variation in the infant mortality rate. However, the differences are not so small that they frustrate statistical inquiry as to why they exist.[43]
2. Even though mortality and fertility are interactive, to a considerable extent they appear to be responsive to different social and environmental influences.
3. Like infant mortality, the birth rate is unaffected by much that qualifies as development.

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[43] Rural birth rates in 1972 varied from a high of 41 per 1,000 population in Kalyubia to a low of only 31 in Kena. Urban birth rates in 1972 were more diverse, from a high of 63 per 1,000 population in Kena to a low of 2 in Suez. Combined figures for 1973 reveal a spread of 16 births per 1,000 population outside the Suez Canal zone (an anomaly in 1973), with Beni-Suef and Fayoum high (43/1,000) and Cairo low (27/1,000). See Appendix A for the birth rates recorded for all governorates in 1972 and 1973.

4. The effects of socio-economic change on fertility appear to be powerfully conditioned by residential context (rural, urban, metropolitan).

For the country as a whole, the strongest correlations and best regressions are those which link fertility rates to the modernization variables of the urban cluster. All of the key ingredients of this cluster -- urbanization itself, the acquisition of literacy (especially by females), the extension of purified water, and electrification of homes -- are related to the birth rate in highly significant fashion (.001 in each case), while the entire cluster yields a coefficient of -.80 (also sig. at .001) and enters first in regression analysis. From the High Dam to the Mediterranean, modernization along the lines of the urban cluster would appear to be a potent force for fertility reduction.[44]

To leave it at that -- modernization entails declining fertility -- would not only be akin to reinventing the wheel; it would mean reinventing it badly. For the data suggest that the dynamic is more complex than such a simple statement, however true, would allow.

The first evidence that more than a linear progression may be involved comes when the four urban governorates are deleted from the calculations.

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44 With infant mortality (1972) also in the equation, a 1% increase in a governorate's aggregate modernity -- as measured by the urban cluster -- may be expected to produce a .65% decline in the birth rate. Moreover, as indicated in Table 9 below, the cluster and infant mortality alone account for an impressive 75% of the total variation in the birth rate across the governorates. (We might note, parenthetically, that the results are virtually identical when infant mortality rates in 1973 are employed. However, the 1972 mortality data are more esthetically pleasing because it is more cogent to suggest that the incidence of infant deaths in 1972 might influence the incidence of births in 1973 -- a suitable lag effect -- rather than have both figures for the same year. Empirically it makes no difference either way.)

What happens is that the coefficients drop dramatically and, with one exception, become statistically insignificant.[45] In other words, outside of Cairo, Alexandria, Port Said, and Suez, the modernization dynamic appears to weaken considerably in its effect on the birth rate. That this is indeed the case is confirmed by regression analysis. Whereas the urban cluster enters the regression equations predicting change in fertility first and powerfully when all 21 governorates are considered, it does not enter at all when the rural governorates are examined alone.[46] The impressive coefficients and regression model discerned initially would seem to reflect the influence of the urban governorates.

Moreover, proceeding to the next step of separating out rural birth rates produces a genuine surprise. Modernization in rural Egypt appears to stimulate fertility! The signs are reversed in the correlations, even for female literacy, and the coefficients linking rural fertility to measures of rural change (in this instance, the availability of purified water and electrification) attain significance. Table 7 documents this

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[45] The exception concerns female literacy in relation to the birth rate, the coefficient for which is reduced only modestly, from .70 (sig. at .001) to .57 (sig. at .01). In the rural governorates, as for the country as a whole, the acquisition of literacy by women appears to have a distinctive bearing on fertility. This prompted us to test the strength of female literacy as the sole entry representing the urban cluster in regression analysis against poverty, population density, women in the paid labor force, and infant mortality. It failed to load significantly, implying more coincidence than causality to the coefficient.

[46] See Table 9 below.

extraordinary decline and then reversal in the principal coefficients. Table 8 specifies the patterns in rural areas and reveals, in the process, how different the rural dynamic is from the urban dynamic. Table 9 presents the pertinent regression findings.[47]

The data, in sum, suggest three contexts of relevance to fertility: Egypt's metropolitan centers, other urban areas, and the rural hinterlands.[48] In the urban governorates, where modernization (as measured by the urban cluster) is most advanced, we may infer that the birth rate is highly responsive to still further improvements in the availability of pure water, electrification of homes, and literacy. In other urban communities, less modernized overall than the big cities, the effects of modernization are weaker. The birth rate responds to continued change but much less impressively. In the villages of rural Egypt, where electricity, pure water, and literacy are lowest, any increase in these ingredients of modernization

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Why modernization in rural Egypt appears to be associated with greater rather than lesser fertility is a matter of speculation. Just as reduced infant mortality leads initially to there being more children around, perhaps incipient modernization is itself an incentive for peasant families to have more children. When the benefits of modern life are newly available but in scarce supply, rural people may be encouraged to have more children rather than less as they look ahead to better days within a traditional perspective featuring an already high norm of desired family size. If so, migration to the cities, which is part of the pursuit of opportunity and the good things in life, has the effect of dampening the celebration. Rural life is conducive to having more children; urban life is conducive to having fewer children; and the difference, in Egypt at least, cannot be explained by the incidence of infant mortality, which is much the same in the two contexts.

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In all likelihood, the key urban variable is city size rather than location. The largest cities of the rural governorates (Assiut, for example) may resemble the four metropolitan centers more than the smaller cities of these governorates. Unfortunately, this possibility cannot be investigated with the data at hand.

Table 7: The Birth Rate in Relation to the Urban Cluster of Modernization Variables: Pearson Correlation Coefficients, Governorate Data, Arab Republic of Egypt

	THE OVERALL BIRTH RATE (1973)				THE RURAL BIRTH RATE (1972)	
	Governorates Urban Lower Egypt Upper Egypt		Governorates Lower Egypt Upper Egypt		Governorates Lower Egypt Upper Egypt	
THE URBAN CLUSTER	r	(sig.)	r	(sig.)	r	(sig.)
Urbanization	-.76	(.001)	-.33	(n.s.)	.07	(n.s.)
Total literacy	-.63	(.001)	-.38	(n.s.)	.40	(n.s.)
Female literacy	-.70	(.001)	-.57	(.01)	.42	(n.s. at .053)
Water purification	-.68	(.001)	-.26	(n.s.)	.15	(n.s.)
Electrification	-.65	(.001)	-.15	(n.s.)	.37	(n.s.)
Aggregate cluster*	-.70	(.001)	-.31	(n.s.)	.32	(n.s.)

* See Table 4 for the components of this measure.

Table 8: The Urban Birth Rate and the Rural Birth Rate in Relation to Intra-Sectoral Modernization: Pearson Correlation Coefficients, Governorate Data, Arab Republic of Egypt

THE URBAN BIRTH RATE

	Governorates Urban Lower Egypt Upper Egypt		Governorates Lower Egypt Upper Egypt	
	r	(sig.)	r	(sig.)
Availability of Pure Water in Urban Areas*	-.65	(.001)	-.53	(.05)
Electrification of Urban Homes	-.74	(.001)	-.66	(.005)

THE RURAL BIRTH RATE

	Governorates Lower Egypt Upper Egypt	
	r	(sig.)
Availability of Pure Water in Rural Areas*	.32	(n.s.)
Electrification of Rural Homes	.46	(.05)

* The coefficients shown refer to the percentage of urban and rural households, respectively, that have tap water inside the buildings where they live. Estimates were made in the 1976 CAPMAS survey of the proportion of households without any effective access to purified water. For this measure in relation to the birth rate, the coefficients are .65 (.001) for all of urban Egypt, .39 (n.s.) for the urban areas of rural governorates, and -.46 (.05) for rural Egypt.

Table 9: Explaining the Birth Rate: Step-Wise Regression Analysis, Governorate Data, Arab Republic of Egypt

Context	Dependent Variable	Variables in Best Model: Beta and (sig.)	Statistical Significance of Model	% of Variation in Dependent Variable Explained (Adjusted R^2 x 100)	Variables Not Entering Model Significantly
All 21 governorates	Overall birth rate	-.65 Urban cluster (.001) +.54 Infant mortality in 1972 (.001)	.001 (F=31.5)	75%	Female employment Population density
Lower Egypt* Upper Egypt Cairo Alexandria	Overall birth rate	-.69 Urban cluster (.005)	.005 (F=14.6)	44%	Poverty Female employment Population density Infant mortality (1972)
Lower Egypt* Upper Egypt	Overall birth rate	+.51 Infant mortality in 1972 (.05)	.05 (F=4.8)	20%	Urban cluster Poverty Female employment Population density
Lower Egypt* Upper Egypt	Rural birth rate	+.51 Rural infant mortality in 1972 (.05)	.05 (F=5.0)	21%	Urban cluster Poverty Female employment Population density
Lower Egypt* Upper Egypt Urban governorates	Urban birth rate	-.65 Urban cluster (.001) +.33 Urban infant mortality in 1972 (.05)	.001 (F=24.3)	71%	Female employment Population density
Lower Egypt* Upper Egypt Cairo Alexandria	Urban birth rate	-.78 Urban cluster (.01)	.01 (F=24.2)	58%	Urban poverty Female employment Population density Urban infant mortality (1972)
Lower Egypt* Upper Egypt	Urban birth rate	-.91 Urban cluster (.001) +.54 Population density (.01)	.001 (F=15.5)	66%	Urban poverty Female employment Urban infant mortality (1972)

* minus Ismailia because of missing values.

is likely to result in <u>higher</u> birth rates, at least in the short run.[49]

If this interpretation of the data is correct, two inferences follow. First, both the way in which and the degree to which fertility change relates to the modernizing influences of the urban cluster depend on the penetration of those influences in society. The more people who are affected by the cluster, the more beneficial the impact on fertility (which is to say, the lower the overall birth rate is likely to be).[50] Unless the patterns observed are a function of urbanity alone, which is improbable given the findings shown in Table 8, what stands out is the importance of extending educational opportunities, access to pure water, and electricity (among other benefits of modernization). For development in Egypt to contribute to fertility reduction, it must reach the common man and woman, engage them, and alter their beliefs and behaviors with respect to having children. Only then will family planning interventions work as intended. The key, once again, is dissemination spatially and

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[49] Very similar results are obtained when the birth rate is related to our modified "physical quality of life index" consisting of each governorate's infant mortality rate, level of literacy, and availability of purified water. For Egypt as a whole the Pearson coefficient is -.82 (sig. at .001). The greater popular well-being is, as measured by this index, the lower the birth rate. Indeed, the PQLI* predicts 50% of the total variation in the birth rate across the governorates in regression analysis. However, two things happen when the urban governorates are removed: the coefficient is reduced to -.52 (sig. at .05) and the PQLI* fails to load. The reason is that the rural birth rate does not co-vary with the rural PQLI* at all (r = .09, n.s.).

[50] What holds for the public at large may hold even more strongly for individual families. The more that a family in Egypt enjoys the benefits of the urban cluster, even if it is not itself urban, the fewer children it is likely to have.

socially. Modernization must extend outward from the urban centers and downward to the less affluent if the country's overall birth rate is to be meaningfully lowered.

Second, the data imply the existence of thresholds in the modernization-fertility relationship. Rural Egypt, in the aggregate, remains below the threshold at which modernization begins to induce lessened fertility. In the rural context the birth rate is actually stimulated by modernization. Urban Egypt features another threshold having to do with acceleration. In smaller cities the relationship is in the predicted (and desired) direction, but it is weak. By contrast, in the metropolitan centers of Cairo, Alexandria, Port Said, and Suez the dynamic would appear to be quite strong. What is an inverse relationship overall in urban Egypt is an accelerating relationship as well. It begins weakly (and insignificantly) in the urban context and becomes stronger, developing momentum and attaining significance at some point when there is enough dissemination of benefits to begin making a clear difference in the birth rate.[51]

In short, not only is fertility lowest in the most modern parts of Egypt and highest in the least modern parts, the relationship between modernization and fertility is itself a function of modernization.[52] We

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As this discussion implies, themes of extension, dissemination, and penetration, on the one hand, and inferences concerning thresholds, on the other, are really two ways of saying the same thing.

52
This dynamic internal to Egypt is consistent with what has been observed when the relationship between development and fertility is compared across 85 countries. See Abdel R. Omran and M. Nabil El-Khorazaty, "The Development Level Needed to Enhance Family Planning Programs," paper presented at the Annual Meeting of the Population Association of America, St. Louis, Missouri, April 21-23, 1977.

have suggested the presence of two thresholds, one dividing rural and urban areas and the other dividing smaller cities and the metropolitan centers in the manner of Figure 4. Obviously, there may be other thresholds as well that are not discernible in governorate data.

Figure 4: Inferred Threshold Effects in the Modernization-Fertility Dynamic, by Context: Governorate Data, Arab Republic of Egypt

Rural Sector	Urban Centers of Mixed Rural-Urban Governorates	Metropolitan Centers
Literacy acquisition Availability of pure water Electrification of homes	Urbanization Literary acquisition Availability of pure water Electrification of homes	Literacy acquisition Availability of pure water Electrification of homes
↓	↓	↓
NEGATIVE The more modernization, the higher the birth rate.	MILDLY POSITIVE The more modernization (especially female literacy), the lower the birth rate.	STRONGLY POSITIVE The more modernization, the lower the birth rate.

Assuming that governorate data faithfully capture the general pattern, the policy paradox for Egypt is that fertility will be most responsive to manipulation, through development, where it is already lowest and most resistent where it is highest. Another way of stating the paradox is that gains in fertility reduction will be easiest where they are least needed and most difficult where they are most needed. Clearly, if the government wishes to bring birth rates down significantly and fast, it will have to allocate resources in a manner that is consistent with such a goal. Among other things, this means de-urbanizing the urban cluster, stimulating modernization both in the countryside and among the rural refugees who have come to the cities, and -- in general -- absorbing people in the process of change.

The need for people to be participants in progress as against mere bystanders or cogs in the wheel is underlined by the patterns for rural development. Just as increases in rural wealth, as measured by the value of agricultural production and by per capita income derived from agriculture, are no answer to the problem of infant mortality, they make no contribution to reducing the birth rate either. The modest (and positive) coefficients for the population as a whole are reduced to almost zero when the rural birth rate is considered alone, as shown in Table 10. This is a sobering finding given the marked differences in both productivity and income characterizing the rural governorates.[53] It confirms yet again our hypothesis that benefits must first reach the poor and make a difference in their lives before such outcome phenomena as fertility and infant mortality are likely to be altered significantly.

Table 10: The Birth Rate in Relation to Rural Development: Pearson Correlation Coefficients, Governorate Data, Arab Republic of Egypt

	THE OVERALL BIRTH RATE (1973)		THE RURAL BIRTH RATE (1972)	
	r	(sig.)	r	(sig.)
RURAL DEVELOPMENT				
o Per Capita Value of Agricultural Production	.35	(n.s.)	.06	(n.s.)
o Rural Per Capita Income from Agriculture	.26	(n.s.)	.12	(n.s.)

Note: These coefficients pertain to the rural governorates only.

[53] The per capita value of agricultural production ranged from a high of LE 76.40 for Behera in 1976 to a low of LE 33.80 in Beni-Suef. (Giza was actually lower, but Giza has a sizeable urban population diluting its per capita figure.) Rural incomes in 1976 ranged from LE 104.30 per capita in Giza to LE 57.40 in Souhag. In each case, the high is virtually double the low.

Two things can be said about the relationship between poverty and fertility when poverty is measured in terms of the proportion of families living below a certain level of income (in Egypt LE 250 per year). First, there is a clear association. Just as poor people typically have more children than do more affluent people -- an observation which comes close to being a generic truth -- so in Egypt governorates with greater proportions of their population below the poverty line are governorates with higher-than-usual birth rates. As Table 11 indicates, the coefficients are consistently positive, reasonably strong, and statistically quite significant in urban areas and for the country as a whole.[54]

Second, the correlations may be deceptive insofar as they imply substantial gains in fertility reduction as a result of successful income generation among the poor. Regression analysis refutes such an inference and does so repeatedly regardless of context, as shown previously in Table 9. Neither urban nor rural birth rates -- nor both combined at the governorate level -- are significantly influenced by shifts in the proportion of people living below the poverty line (LE 250). Poverty defined in terms of income may be a key factor in determining infant mortality rates, but it has little direct bearing on birth rates as these vary across the governorates.[55] Fertility in Egypt would seem to be influenced much more

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[54] With regard to our measures of poverty, "the country as a whole" does not include the Suez Canal zone (Port Said, Ismailia, and Suez) because of missing values. In the urban context Table 11 shows two poverty lines, one at LE 250 (the same as for rural Egypt) and the other at LE 400. The latter may be a more appropriate cut-off point assuming a higher cost of living in urban areas for families whose incomes are quite low to begin with. That the coefficients are weaker when the poverty line is set at LE 400 is interesting. It suggests that fertility reduction begins with modest improvements in income even well down the overall income ladder.

[55] We have tried, unsuccessfully, to learn why this is so. Whatever the reason, it is not multi-collinearity.

Table 11: The Birth Rate in Relation to Poverty: Pearson Correlation Coefficients, Governorate Data, Arab Republic of Egypt

	THE OVERALL BIRTH RATE (1973)				THE RURAL BIRTH RATE (1972)	
	Governorates: Urban, Lower Egypt, Upper Egypt		Governorates: Lower Egypt, Upper Egypt		Governorates: Lower Egypt, Upper Egypt	
	r	(sig.)	r	(sig.)	r	(sig.)
% of all families with incomes below LE 250/year	.50	(.05)*	.30	(n.s.)		
% of rural families with incomes below LE 250/year					.38	(n.s.)

	THE URBAN BIRTH RATE (1972)			
	Governorates: Urban, Lower Egypt, Upper Egypt		Governorates: Lower Egypt, Upper Egypt	
	r	(sig.)	r	(sig.)
% of urban families with incomes below LE 250/year	.60	(.005)	.60	(.01)
% of urban families with incomes below LE 400/year	.53	(.05)	.45	(.05)

* really .015.

Note: Port Said, Ismailia, and Suez are excluded from these calculations because of missing values for poverty. The only urban governorates considered, therefore, are Cairo and Alexandria.

by living conditions generally, as reflected in the urban cluster, and by infant mortality as well than by an income threshold as such.[56]

These are the principal patterns concerning the birth rate that emerge from the governorate data. Hardly definitive given the crudities involved, they are nevertheless revealing and, at the very least, suggestive of the way things are. We may summarize the findings as follows.

- The birth rate in Egypt is particularly sensitive to a cluster of modernization variables associated with urbanity: literacy acquisition, availability of purified water, electrification, and -- in the rural governorates -- urbanization itself.

- The modernization - fertility dynamic is not linear. In rural Egypt modernization is likely to accelerate the birth rate, at least initially. In urban Egypt it will have the opposite effect, especially in the larger cities. The influence of modernization on fertility is itself a function of modernization, with thresholds distinguishing rural, small urban, and large urban areas.

- Infant mortality has an important influence on the birth rate that is independent of modernization. The more infant mortality there is, the higher the birth rate is likely to be. Moreover, this is a pattern that holds regardless of context. The "child survival hypothesis" shows every sign of being relevant throughout Egypt.

- The birth rate is only weakly associated (if associated at all) with agricultural productivity and the income derived from it. Similarly, it is only weakly associated (if associated at all) with the proportion of families living below the poverty line, with the employment of women, and with population density.

When these patterns are considered in toto, two insights emerge which are not always appreciated. First, even though infant mortality

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56 The problem with a poverty line or threshold, of course, is that it collapses considerable diversity into two heterogeneous categories. A more sensitive measure of income might yield better causal results. If so, it is not apparent in our measure of women in the paid labor force, which is a continuous variable. Female employment and fertility are almost totally uncorrelated in our data, itself a surprise quite apart from the contribution of female employment to family income.

rates and birth rates are closely related, indeed interactive, each -- in turn -- is responsive to quite different conditions in the socio-economic environment. Mortality is most influenced by poverty and population density, fertility by aspects of modernization that indicate how much people have been reached by and have benefitted from change.

Second, much in the realm of development has little bearing on fertility (or on infant mortality, for that matter). Clearly, it is necessary to disaggregate the concept of development in order to locate the principal dynamics involved; and it is also necessary to be mindful of context, for the dynamics may vary.

The mode of development that appears to be especially significant to fertility reduction in Egypt is one which emphasizes dissemination over growth. What counts is not so much the gross national product, rates of return on investment, or even per capita income. Rather, it is the extent to which the average citizen is sharing in the opportunities afforded by development and is deriving tangible benefits from development. This is why potable water, electricity, literacy, and infant mortality emerge as such important influences in our data; individually and together, they get at the human condition at the base of society.

Conclusion

Although hardly conclusive, our findings contain two clear messages for the government of Egypt.

One message is that it would be a mistake to view development as a panacea for stubborn problems like high infant and early childhood mortality and high birth rates, at least in the short-to-medium run. Development takes many forms; and the effects of development are quite varied, as the governorate data convey so well. Indeed, much that qualifies as development simply has no impact on mortality and fertility; and it is important to appreciate that the aggregate growth of the Egyptian economy, so essential in so many ways, will contribute little to the alleviation of the country's demographic and ecological pressures if the effects of growth remain spatially and socially confined. Infant mortality and the birth rate may respond to different kinds of change, but in each case progress requires a significant dispersion of benefits.

Secondly, our findings point to the vital role of the health sector in responding to the mortality-fertility dynamic. One reason is that the socio-economic environment, relevant as it is, poses constraints as much as it identifies opportunities. Problems of poverty and population density, two principal factors underlying high infant mortality in Egypt, are not subject to rapid amelioration. Nor are residential patterns and access to modern amenities, both important determinants of fertility. Inescapably, if sadly, even the best development policies will take time to have desired effects on Egypt's demographic dilemma. The need for direct interventions against the entire syndrome of malnutrition, morbidity, mortality, and fertility is apparent both as a stop-gap measure and as part of a broader, multi-sectoral plan of attack.

This need is underlined by the close interaction between births and childhood deaths. The more childhood deaths there are in Egypt, the more births there will be. By the same token, the higher the birth rate, the higher the rate of infant mortality. To address one, it helps to address the other. Policies and programs intended to reduce childhood mortality, in particular, are not merely commendable in their own right; they are an essential component of any serious family planning effort. That Egypt needs an invigorated health policy to lessen mortality in the earliest age cohorts is the lesson of theory, much international experience, and the data examined in this paper.

In short, the Ministry of Health has an important, even critical, role to play in support of Egyptian development. Far from being irrelevant or only marginally relevant to development, the Ministry may, in fact, be one of the foremost participants in helping the process along. For the Ministry of Health is uniquely positioned to impact both elements of the demographic transition: births and deaths. As the best conveyor belt for disseminating family planning information and technology throughout Egyptian society, the Ministry is directly involved in the implementation of population policy. More to the point, as the agency most immediately responsible for public health, the Ministry is the necessary cornerstone of any focused attempt to reduce infant and early childhood mortality rates. Health interventions, if effectively targeted to the very young, can have important social and developmental consequences: keeping small children alive, curbing population growth, and enabling Egyptian society to derive full advantage from other policies of the government (especially the food subsidies) which promote popular well-being.

In sum, the case for a strategy emphasizing interventions is three-fold.

- o Development is too complex, costly, and slow to be relied upon solely. Moreover, the mode of development experienced by Egypt to date offers little hope of early and meaningful impact on the problems of high mortality and high fertility in Egyptian society.
- o Fertility preferences and behavior are likely to follow upon experience with and expectations about childhood mortality. Addressing the latter is a direct route to dealing with the former.
- o Reducing infant and early childhood mortality requires health interventions that succeed in reaching small children, monitoring their growth performance, and responding effectively to the range of health insults that underlie mortality statistics.

On the other hand, if there is a persuasive rationale for health interventions in Egypt, it is also true that what the health system is able to accomplish will itself be conditioned by the socio-economic context in which interventions are introduced. Receptivity to family planning, in particular, is not likely to improve appreciably in the absence of the kinds of modernization that convert large families into an unwelcome economic liability. Infant mortality is also influenced by the macro environment, although in ways that are difficult to manipulate, much less change quickly.

The alternative, therefore, is not development or interventions. There is need for both. The real issue is what forms of development and how effective the interventions. In each respect Egypt is entering a period of creative experimentation. The challenge facing the Ministry of Health is to design assertive programs targeting on the special needs of small children and then, where possible, to link health care delivery to positive changes occurring at the local level. A concerted attempt to make community medicine work, in combination with broader community development efforts, offers the best prospect for breaking the pattern of high childhood mortality and high fertility that persists in Egypt to this day.

Appendix A

Raw Values, Governorate Data

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Appendix A: Raw Data

Governorate	MORT73[a]	MORT72[b]	RURIMR72[d]	URBIMR72[c]
Cairo	128	152	---	152
Alexandria	103	125	---	125
Port Said	48	49	---	49
Suez	60	66	---	66
Damietta	85	85	85	84
Dakahlia	79	84	82	90
Sharkia	89	103	101	110
Kal. .bia	118	144	142	149
Kaf -el-Sheik	55	67	62	86
Gharbia	99	111	114	105
Menufia	115	137	138	127
Behera	71	82	78	98
Ismailia	74	69	71	61
Giza	109	139	126	150
Beni-Suef	106	128	116	167
Fayoum	97	128	122	146
Minya	103	127	122	145
Assiut	98	119	110	144
Souhag	88	101	87	143
Kena	75	98	82	151
Aswan	132	140	129	164
Red Sea	180	190	---	---
El Wadi-El Gedid	107	117	---	---
Matrouh	39	57	---	---
Sinai	11	57	---	---
Egypt (weighted mean)	98	116	103	133

a. Infant mortality rate, 1973
Source: Ministry of Health, General Administration of Statistics and Evaluation.

b. Infant mortality rate, 1972
Source: CAPMAS, Births and Deaths Statistics, 1972, cited in El-Rafei and Nasser, "Vital Statistics," Table 5, p. 9.

c. Urban infant mortality rate, 1972
Source: CAPMAS, Births and Deaths Statistics, 1972, cited in Nasser and El-Rafei, "Malnutrition in the Egyptian Child," Table 2, p. 10.

d. Rural infant mortality rate, 1972
Source: CAPMAS, Births and Deaths Statistics, 1972, cited in Nasser and El-Rafei, "Malnutrition in the Egyptian Child," Table 2, p. 10.

Appendix A: Raw Data

Governorate	BIRTH[a]	RURCBR72[b]	URBCBR72[c]
Cairo	27.4	----	27.4
Alexandria	29.2	----	29.2
Port Said	3.8	----	3.8
Suez	2.1	----	2.1
Damietta	39.2	39.9	37.2
Dakahlia	37.0	35.0	43.3
Sharkia	38.1	37.7	39.7
Kalyubia	42.3	40.6	44.8
Kafr-el-Sheik	35.0	33.9	39.2
Gharbia	34.5	34.3	34.9
Menufia	40.1	36.8	53.6
Behera	37.4	35.2	43.4
Ismailia	16.5	----	----
Giza	41.8	33.6	48.0
Beni-Suef	43.4	37.6	60.9
Fayoum	43.2	37.9	59.8
Minya	40.8	37.2	54.4
Assiut	41.1	35.7	55.2
Souhag	38.4	32.3	61.3
Kena	38.4	31.0	63.3
Aswan	33.9	38.8	25.6
Red Sea	34.2	----	----
El Wadi-El Gedid	44.5	----	----
Matrouh	37.4	----	----
Sinai	----	----	----
Egypt (weighted mean)	36.0	35.7	36.9

a. Crude birth rate, 1973
Source: Ministry of Health, General Administration of Statistics and Evaluation.

b. Rural crude birth rate, 1972
Source: Ministry of Health, General Administration of Statistics and Evaluation.

c. Estimated urban crude birth rate, 1972
Source: Computed from urban, rural, and total population data (CAPMAS) and rural and total birth rates (MOH).

Appendix A: Raw Data

Governorate	CLUSTER[a]	URBAN[b]	TOTILLIT[c]	FEMILLIT[d]
Cairo	1.8	100.0	34.6	45.6
Alexandria	1.9	100.0	37.4	48.2
Port Said	1.8	100.0	39.9	44.7
Suez	1.4	100.0	44.4	57.7
Damietta	0.4	25.6	49.4	57.9
Dakahlia	-0.3	24.0	56.3	72.4
Sharkia	-0.6	20.2	62.6	79.1
Kalyubia	0.1	40.9	53.7	72.8
Kafr-el-Sheik	-0.8	20.8	70.1	84.1
Gharbia	-0.1	33.4	54.9	72.1
Menufia	-0.4	19.7	56.9	75.5
Behera	-0.5	26.8	66.2	80.9
Ismailia	0.2	47.1	50.8	54.7
Giza	0.5	57.0	53.0	67.7
Beni-Suef	-0.8	24.9	68.0	83.7
Fayoum	-0.9	24.2	73.6	85.0
Minya	-0.9	21.0	70.9	84.9
Assiut	-0.7	27.7	68.5	84.1
Souhag	-1.0	21.1	72.8	87.4
Kena	-0.9	22.9	71.2	85.9
Aswan	-0.2	37.0	56.0	72.2
Red Sea	-0.3	84.9	43.4	58.1
El Wadi-El Gedid	-1.0	22.9	52.7	71.8
Matrouh	-1.3	45.3	73.3	87.3
Sinai	----	100.0	65.4	93.3
Egypt (weighted mean)	0.0	43.9	56.9	71.2

a. Composite development index (average of the following normalized variables: TOTILLIT, URBAN, WATRBLDG, and ELEC)
Source: Computed from literacy, urban, water, and electricity data (CAPMAS).

b. Percent urban population, 1976
Source: Derived from CAPMAS, Preliminary Results, Table 12, pp. 36-38.

c. Percent illiteracy (persons 10 years and over), 1976
Source: CAPMAS, Preliminary Results, Tables 19, 20, pp. 48, 49.

d. Percent illiteracy (females 10 years and over), 1976
Source: CAPMAS, Preliminary Results, Table 19, p. 48.

Appendix A: Raw Data

Governorate	WATRDWEL[a]	WATRBLDG[b]	NOWATER[c]
Cairo	70.1	80.7	1.6
Alexandria	77.8	89.6	1.2
Port Said	83.8	86.9	2.0
Suez	59.4	64.9	1.3
Damietta	45.1	49.6	2.4
Dakahlia	25.1	28.8	16.6
Sharkia	14.5	16.2	30.4
Kalyubia	16.2	19.8	38.5
Kafr-el-Sheik	14.1	16.9	23.2
Gharbia	24.2	28.5	21.3
Menufia	9.8	12.5	41.3
Behera	17.5	20.0	25.0
Ismailia	27.2	29.9	44.5
Giza	33.8	39.7	41.6
Beni-Suef	9.6	11.6	26.8
Fayoum	9.6	12.2	8.0
Minya	9.0	11.4	40.4
Assiut	13.0	16.8	37.3
Souhag	10.0	13.7	47.3
Kena	9.9	12.3	51.8
Aswan	20.0	21.8	32.9
Red Sea	----	----	----
El Wadi-El Gedid	----	----	----
Matrouh	----	----	----
Sinai	----	----	----
Egypt (weighted mean)	29.3	34.1	25.2

a. Percent households with water tap inside dwelling, 1976
Source: CAPMAS, Preliminary Results, Table 25, p. 54.

b. Percent households with water tap inside dwelling or building, 1976
Source: CAPMAS, Preliminary Results, Table 25, p. 54.

c. Percent households without any source of purified drinking water, 1976
Source: CAPMAS, Preliminary Results, Table 25, p. 54.

Appendix A: Raw Data

Governorate	a RURWATER	b URBWATER	c RURNOWAT	d URBNOWAT
Cairo	----	80.7	----	1.6
Alexandria	----	89.6	----	1.2
Port Said	----	86.9	----	2.0
Suez	----	64.9	----	1.3
Damietta	36.9	84.0	3.0	0.8
Dakahlia	11.0	78.1	19.0	9.9
Sharkia	2.7	64.5	33.9	17.7
Kalyubia	6.9	36.8	43.6	31.7
Kafr-el-Sheik	4.0	58.9	25.4	16.3
Gharbia	4.3	71.2	25.7	13.7
Menufia	4.3	44.3	41.3	41.2
Behera	5.8	54.1	26.6	21.3
Ismailia	6.2	53.6	68.6	20.4
Giza	11.1	58.5	65.4	25.9
Beni-Suef	1.2	43.8	28.6	21.1
Fayoum	2.0	43.4	10.0	1.8
Minya	2.0	46.9	42.3	33.2
Assiut	3.1	50.7	40.8	28.5
Souhag	3.7	51.2	51.4	32.0
Kena	3.8	41.3	57.0	34.0
Aswan	7.2	47.8	39.3	21.6
Red Sea	----	----	----	----
El Wadi-El Gedid	----	----	----	----
Matrouh	----	----	----	----
Sinai	----	----	----	----
Egypt (weighted mean)	5.6	69.2	35.6	12.4

a. Percent rural households with water tap inside dwelling or building, 1976
Source: CAPMAS, Preliminary Results, Table 25, p. 54.

b. Percent urban households with water tap inside dwelling or building, 1976
Source: CAPMAS, Preliminary Results, Table 25, p. 54.

c. Percent rural households without any source of purified drinking water, 1976
Source: CAPMAS, Preliminary Results, Table 25, p. 54.

d. Percent urban households without any source of purified drinking water, 1976
Source: CAPMAS, Preliminary Results, Table 25, p. 54.

Appendix A: Raw Data

Governorate	ELEC[a]	RURELEC[b]	URBELEC[c]
Cairo	82.1	----	82.1
Alexandria	89.6	----	89.6
Port Said	89.3	----	89.3
Suez	78.6	----	78.6
Damietta	60.8	52.2	84.1
Dakahlia	34.0	19.4	74.4
Sharkia	30.6	18.9	72.9
Kalyubia	55.5	38.0	78.6
Kafr-el-Sheik	23.2	10.9	63.3
Gharbia	43.7	24.3	77.9
Menufia	39.0	32.4	64.5
Behera	33.3	17.4	71.1
Ismailia	44.3	13.3	75.4
Giza	63.1	38.4	79.4
Beni-Suef	21.0	9.4	56.8
Fayoum	21.5	10.1	56.2
Minya	19.8	9.2	60.0
Assiut	23.2	9.8	56.6
Souhag	16.0	6.1	52.4
Kena	20.2	10.7	52.7
Aswan	38.6	25.3	62.6
Red Sea	----	----	----
El Wadi-El Gedid	----	----	----
Matrouh	----	----	----
Sinai	----	----	----
		----	----
Egypt (weighted mean)	44.8	18.8	76.8

a. Percent households with dwellings lit by electricity, 1976
Source: CAPMAS, Preliminary Results, Table 23, p. 52.

b. Percent rural households with dwellings lit by electricity, 1976
Source: CAPMAS, Preliminary Results, Table 23, p. 52.

c. Percent urban households with dwellings lit by electricity, 1976
Source: CAPMAS, Preliminary Results, Table 23, p. 52.

Appendix A: Raw Data

Governorate	FOODPOP[a]	AGINCOME[b]	PDLABOR[c]
Cairo	----	----	11.0
Alexandria	----	----	10.7
Port Said	----	----	10.5
Suez	----	----	5.8
Damietta	48.4	65.1	7.4
Dakahlia	61.1	80.4	9.7
Sharkia	65.0	81.5	5.5
Kalyubia	52.0	88.0	10.2
Kafr-el-Sheik	72.8	91.9	18.3
Gharbia	57.9	86.9	9.2
Menufia	70.2	87.4	9.7
Behera	76.4	104.3	13.0
Ismailia	33.7	63.7	8.7
Giza	33.8	78.6	10.4
Beni-Suef	58.2	77.5	7.4
Fayoum	66.1	87.3	6.1
Minya	52.7	66.7	5.8
Assiut	59.2	82.0	6.2
Souhag	45.3	57.4	10.3
Kena	49.6	64.4	3.2
Aswan	43.8	69.6	6.3
Red Sea	----	----	3.0
El Wadi-El Gedid	----	----	1.9
Matrouh	----	----	2.2
Sinai	----	----	1.8
Egypt (weighted mean)	57.5	80.3	9.2

a. LE value of agricultural production, 1974, divided by total population, 1976
Source: Derived from Nasser and El-Refei, "Malnutrition and Health Delivery System in Egypt," Table 2, p. 5, and CAPMAS, Preliminary Results, Table 12, pp. 36-47.

b. Rural per capita income (LE) from agriculture, 1974
Source: Nasser and El-Rafei, "Malnutrition and Health Delivery System in Egypt," Table 2, p. 5.

c. Percent economically active female population (6 years and over), 1976
Source: CAPMAS, Preliminary Results, Table 18, p. 47.

Appendix A: Raw Data

Governorate	POVERTY[a]	RURY 250[b]	URBY 250[c]	URBY 400[d]
Cairo	29.6	----	29.6	60.8
Alexandria	32.4	----	32.4	62.3
Port Said	----	----	----	----
Suez	----	----	----	----
Damietta	29.6	34.0	16.8	49.4
Dakahlia	51.8	58.5	30.7	66.6
Sharkia	60.2	65.1	40.7	72.8
Kalyubia	52.8	65.6	34.4	75.3
Kafr-el-Sheik	23.2	22.1	27.5	65.6
Gharbia	41.4	45.9	32.3	61.7
Menufia	52.2	55.3	39.7	69.0
Behera	35.6	37.1	31.6	65.6
Ismailia	----	----	----	----
Giza	41.4	58.7	28.4	60.4
Beni-Suef	63.9	69.3	47.8	75.2
Fayoum	62.4	71.2	35.0	65.7
Minya	54.8	60.7	32.8	67.7
Assiut	53.6	60.1	36.6	71.1
Souhag	39.6	37.2	48.4	79.7
Kena	57.6	61.6	44.3	83.2
Aswan	69.1	89.0	35.1	73.8
Red Sea	----	----	----	----
El Wadi-El Gedid	----	----	----	----
Matrouh	----	----	----	----
Sinai	----	----	----	----
Egypt (weighted mean)	44.9	54.4	32.5	64.8

a. Percent total households with income less than LE 250 per year, 1975
Source: Computed from household income data (MOL) and population data (CAPMAS).

b. Percent total households with income less than LE 250 per year, 1975
Source: Ministry of Labor, Labor Force Survey.

c. Percent urban households with income less than LE 250 per year, 1975
Source: Ministry of Labor, Labor Force Survey.

d. Percent urban households with income less than LE 400 per year, 1975
Source: Ministry of Labor, Labor Force Survey.

Appendix A: Raw Data

Governorate	DENSITY[a]	PQLI[b]
Cairo	23,735	65
Alexandria	8,010	77
Port Said	662	95
Suez	632	78
Damietta	930	57
Dakahlia	789	45
Sharkia	555	30
Kalyubia	1,774	28
Kafr-el-Sheik	402	38
Gharbia	1,150	38
Menufia	1,130	23
Behera	554	36
Ismailia	425	51
Giza	2,243	40
Beni-Suef	845	18
Fayoum	636	15
Minya	904	15
Assiut	1,091	22
Souhag	1,250	21
Kena	942	27
Aswan	703	21
Red Sea	----	--
El Wadi-El Gedid	----	--
Matrouh	----	--
Sinai	----	--
Egypt (weighted mean)	4,629	39

a. Population density, 1976
Source: Computed from population and area data (CAPMAS).

b. Modified Physical Quality of Life Index
Source: Computed from infant mortality, literacy, and water data (Ministry of Health and CAPMAS).

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Appendix B

Pearson Correlation Coefficients

Table of Contents

Note: See Appendix A for descriptions and sources of the variables shown. The correlations presented here incorporate all available data, with pair-wise deletion of missing values.

Appendix B: Correlations

I. Demographic Variables

- - - - - - - - - - - - - - P E A R S O N   C O R R E L A T I O N   C O E F F I C I E N T S - - - - -

	MORT73	MORT72	RURIMR72	URBIMR72	BIRTH	RURCBR72	URBCBR72
MORT73	1.0000 (0) S=0.001	0.9634 (24) S=0.001	0.9380 (17) S=0.001	0.7961 (21) S=0.001	0.3599 (24) S=0.042	0.2401 (20) S=0.154	0.2944 (20) S=0.104
MORT72	0.9634 (24) S=0.001	1.0000 (0) S=0.001	0.9729 (17) S=0.001	0.8820 (21) S=0.001	0.4708 (24) S=0.010	0.2400 (20) S=0.154	0.4194 (20) S=0.033
RURIMR72	0.9380 (17) S=0.001	0.9729 (17) S=0.001	1.0000 (0) S=0.001	0.6931 (17) S=0.001	0.5071 (17) S=0.019	0.5130 (16) S=0.021	0.0420 (16) S=0.439
URBIMR72	0.7961 (21) S=0.001	0.8820 (21) S=0.001	0.6931 (17) S=0.001	1.0000 (0) S=0.001	0.6989 (21) S=0.001	0.3699 (20) S=0.054	0.6505 (20) S=0.001
BIRTH	0.3599 (24) S=0.042	0.4708 (24) S=0.010	0.5071 (17) S=0.019	0.6989 (21) S=0.001	1.0000 (0) S=0.001	0.8320 (20) S=0.001	0.8871 (20) S=0.001
RURCBR72	0.2401 (20) S=0.154	0.2400 (20) S=0.154	0.5130 (16) S=0.021	0.3699 (20) S=0.054	0.8320 (20) S=0.001	1.0000 (0) S=0.001	0.7151 (20) S=0.001
URBCBR72	0.2944 (20) S=0.104	0.4194 (20) S=0.033	0.0420 (16) S=0.439	0.6505 (20) S=0.001	0.8871 (20) S=0.001	0.7151 (20) S=0.001	1.0000 (0) S=0.001

(COEFFICIENT / (CASES) / SIGNIFICANCE)

Appendix B: Correlations

Demographic Variables: Lower and Upper Egypt Only

- - - - - - - - - P E A R S O N   C O R R E L A T I O N   C O E F F I C I E N T S - - - - - - - - -

	MORT73	MORT72	RURIMR72	URBIMR72	BIRTH	RURCBR72	URBCBR72
MORT73	1.0000 (0) S=0.001	0.9320 (17) S=0.001	0.9380 (17) S=0.001	0.6927 (17) S=0.001	0.3619 (17) S=0.077	0.5211 (16) S=0.019	-0.0961 (16) S=0.362
MORT72	0.9320 (17) S=0.001	1.0000 (0) S=0.001	0.9729 (17) S=0.001	0.8336 (17) S=0.001	0.5765 (17) S=0.008	0.4000 (16) S=0.062	0.1579 (16) S=0.280
RURIMR72	0.9380 (17) S=0.001	0.9729 (17) S=0.001	1.0000 (0) S=0.001	0.6931 (17) S=0.001	0.5071 (17) S=0.019	0.5130 (16) S=0.021	0.0420 (16) S=0.439
URBIMR72	0.6927 (17) S=0.001	0.8336 (17) S=0.001	0.6931 (17) S=0.001	1.0000 (0) S=0.001	0.6505 (17) S=0.002	0.0620 (16) S=0.410	0.4692 (16) S=0.033
BIRTH	0.3619 (17) S=0.077	0.5765 (17) S=0.008	0.5071 (17) S=0.019	0.6505 (17) S=0.002	1.0000 (0) S=0.001	0.2919 (16) S=0.136	0.6878 (16) S=0.002
RURCBR72	0.5211 (16) S=0.019	0.4000 (16) S=0.062	0.5130 (16) S=0.021	0.0620 (16) S=0.410	0.2919 (16) S=0.136	1.0000 (0) S=0.001	-0.3525 (16) S=0.090
URBCBR72	-0.0961 (16) S=0.362	0.1579 (16) S=0.280	0.0420 (16) S=0.439	0.4692 (16) S=0.033	0.6878 (16) S=0.002	-0.3525 (16) S=0.090	1.0000 (0) S=0.001

(COEFFICIENT / (CASES) / SIGNIFICANCE)

- - - - - - - - - - - - P E A R S O N   C O R R E L A T I O N   C O E F F I C I E N T S - - - - - - - - - - - -

	CLUSTER	URBAN	TOTILLIT	FEMILLIT	WATRBLDG	WATRDWEL	NOWATER	ELEC	FOODPOP	AGINCOME
CLUSTER	1.0000 (0) S=0.001	0.8570 (24) S=0.001	-0.8737 (24) S=0.001	-0.9029 (24) S=0.001	0.9740 (21) S=0.001	0.9716 (21) S=0.001	-0.6657 (21) S=0.001	0.9844 (21) S=0.001	-0.5148 (17) S=0.017	-0.0342 (17) S=0.448
URBAN	0.8570 (24) S=0.001	1.0000 (0) S=0.001	-0.8004 (24) S=0.001	-0.8246 (24) S=0.001	0.9306 (21) S=0.001	0.9272 (21) S=0.001	-0.6056 (21) S=0.002	0.9112 (21) S=0.001	-0.6881 (17) S=0.001	-0.0576 (17) S=0.413
TOTILLIT	-0.8737 (24) S=0.001	-0.8004 (24) S=0.001	1.0000 (0) S=0.001	0.9650 (24) S=0.001	-0.8965 (21) S=0.001	-0.8938 (21) S=0.001	0.5916 (21) S=0.002	-0.9559 (21) S=0.001	0.4182 (17) S=0.047	0.0401 (17) S=0.439
FEMILLIT	-0.9029 (24) S=0.001	-0.8246 (24) S=0.001	0.9650 (24) S=0.001	1.0000 (0) S=0.001	-0.9212 (21) S=0.001	-0.9254 (21) S=0.001	0.6167 (21) S=0.001	-0.9359 (21) S=0.001	0.5185 (17) S=0.016	0.1955 (17) S=0.226
WATRBLDG	0.9740 (21) S=0.001	0.9306 (21) S=0.001	-0.8965 (21) S=0.001	-0.9212 (21) S=0.001	1.0000 (0) S=0.001	0.9975 (21) S=0.001	-0.7361 (21) S=0.001	0.9416 (21) S=0.001	-0.4564 (17) S=0.033	-0.1476 (17) S=0.286
WATRDWEL	0.9716 (21) S=0.001	0.9272 (21) S=0.001	-0.8938 (21) S=0.001	-0.9254 (21) S=0.001	0.9975 (21) S=0.001	1.0000 (0) S=0.001	-0.7397 (21) S=0.001	0.9406 (21) S=0.001	-0.4476 (17) S=0.036	-0.1545 (17) S=0.277
NOWATER	-0.6657 (21) S=0.001	-0.6056 (21) S=0.002	0.5916 (21) S=0.002	0.6167 (21) S=0.001	-0.7361 (21) S=0.001	-0.7397 (21) S=0.001	1.0000 (0) S=0.001	-0.6424 (21) S=0.001	-0.4109 (17) S=0.051	-0.3525 (17) S=0.083
ELEC	0.9844 (21) S=0.001	0.9112 (21) S=0.001	-0.9559 (21) S=0.001	-0.9359 (21) S=0.001	0.9416 (21) S=0.001	0.9406 (21) S=0.001	-0.6424 (21) S=0.001	1.0000 (0) S=0.001	-0.4077 (17) S=0.052	0.0731 (17) S=0.390
FOODPOP	-0.5148 (17) S=0.017	-0.6881 (17) S=0.001	0.4182 (17) S=0.047	0.5185 (17) S=0.016	-0.4564 (17) S=0.033	-0.4476 (17) S=0.036	-0.4109 (17) S=0.051	-0.4077 (17) S=0.052	1.0000 (0) S=0.001	0.7602 (17) S=0.001
AGINCOME	-0.0342 (17) S=0.448	-0.0576 (17) S=0.413	0.0401 (17) S=0.439	0.1955 (17) S=0.226	-0.1476 (17) S=0.286	-0.1545 (17) S=0.277	-0.3525 (17) S=0.083	0.0731 (17) S=0.390	0.7602 (17) S=0.001	1.0000 (0) S=0.001
PDLABOR	0.3083 (24) S=0.071	0.0495 (24) S=0.409	-0.1041 (24) S=0.314	-0.1376 (24) S=0.261	0.1823 (21) S=0.215	0.1720 (21) S=0.228	-0.1702 (21) S=0.230	0.1761 (21) S=0.223	0.3265 (17) S=0.100	0.5047 (17) S=0.019
POVERTY	-0.4921 (18) S=0.019	-0.4110 (18) S=0.045	0.4108 (18) S=0.045	0.4842 (18) S=0.021	-0.5795 (18) S=0.006	-0.5749 (18) S=0.006	0.4253 (18) S=0.039	-0.4919 (18) S=0.019	-0.1345 (16) S=0.310	-0.1895 (16) S=0.241
DENSITY	0.5529 (21) S=0.005	0.5543 (21) S=0.005	-0.5445 (21) S=0.005	-0.5061 (21) S=0.010	0.5553 (21) S=0.004	0.5160 (21) S=0.008	-0.3762 (21) S=0.046	0.4851 (21) S=0.013	-0.4385 (17) S=0.039	-0.0573 (17) S=0.414
PQLI	0.9106 (21) S=0.001	0.8563 (21) S=0.001	-0.8451 (21) S=0.001	-0.8948 (21) S=0.001	0.9351 (21) S=0.001	0.9479 (21) S=0.001	-0.6986 (21) S=0.001	0.8867 (21) S=0.001	-0.2233 (17) S=0.194	-0.0210 (17) S=0.468

(COEFFICIENT / (CASES) / SIGNIFICANCE)

Appendix B: Correlations

II. Development Variables (Continued)

- - - - P E A R S O N   C O R R E L A T I O N   C O E F F I C I E N T S - - - -

	PDLABOR	POVERTY	DENSITY	PQLI
CLUSTER	0.3083 (24) S=0.071	-0.4921 (18) S=0.019	0.5529 (21) S=0.005	0.9106 (21) S=0.001
URBAN	0.0495 (24) S=0.409	-0.4110 (18) S=0.045	0.5543 (21) S=0.005	0.8563 (21) S=0.001
TOTILLIT	-0.1041 (24) S=0.314	0.4108 (18) S=0.045	-0.5445 (21) S=0.005	-0.8451 (21) S=0.001
FEMILLIT	-0.1376 (24) S=0.261	0.4842 (18) S=0.021	-0.5061 (21) S=0.010	-0.8948 (21) S=0.001
WATRBLDG	0.1823 (21) S=0.215	-0.5795 (18) S=0.006	0.5553 (21) S=0.004	0.9351 (21) S=0.001
WATRDWEL	0.1720 (21) S=0.228	-0.5749 (18) S=0.006	0.5160 (21) S=0.008	0.9479 (21) S=0.001
NOWATER	-0.1702 (21) S=0.230	0.4253 (18) S=0.039	-0.3762 (21) S=0.046	-0.6986 (21) S=0.001
ELEC	0.1761 (21) S=0.223	-0.4919 (18) S=0.019	0.4851 (21) S=0.013	0.8867 (21) S=0.001
FOODPOP	0.3265 (17) S=0.100	-0.1345 (16) S=0.310	-0.4385 (17) S=0.039	-0.2233 (17) S=0.194
AGINCOME	0.5047 (17) S=0.019	-0.1895 (16) S=0.241	-0.0573 (17) S=0.414	-0.0210 (17) S=0.468
PDLABOR	1.0000 (0) S=0.001	-0.7411 (18) S=0.001	0.1872 (21) S=0.208	0.2427 (21) S=0.145
POVERTY	-0.7411 (18) S=0.001	1.0000 (0) S=0.001	-0.4027 (18) S=0.049	-0.7170 (18) S=0.001
DENSITY	0.1872 (21) S=0.208	-0.4027 (18) S=0.049	1.0000 (0) S=0.001	0.3390 (21) S=0.066
PQLI	0.2427 (21) S=0.145	-0.7170 (18) S=0.001	0.3390 (21) S=0.066	1.0000 (0) S=0.001

(COEFFICIENT / (CASES) / SIGNIFICANCE)

Appendix B: Correlations

Development Variables: Lower and Upper Egypt Only

- - - - - - - - - - - - - - P E A R S O N   C O R R E L A T I O N   C O E F F I C I E N T S - - - - - - - - - - - - - -

	CLUSTER	URBAN	TOTILLIT	FEMILLIT	WATRBLDG	WATRDWEL	NOWATER	ELEC	PDLABOR	POVERTY
CLUSTER	1.0000 (0) S=0.001	0.7618 (17) S=0.001	-0.9509 (17) S=0.001	-0.9140 (17) S=0.001	0.8751 (17) S=0.001	0.8731 (17) S=0.001	-0.1426 (17) S=0.292	0.9727 (17) S=0.001	0.1105 (17) S=0.336	-0.2541 (16) S=0.171
URBAN	0.7618 (17) S=0.001	1.0000 (0) S=0.001	-0.6190 (17) S=0.004	-0.6229 (17) S=0.004	0.5433 (17) S=0.012	0.5276 (17) S=0.015	0.2326 (17) S=0.184	0.7031 (17) S=0.001	0.0742 (17) S=0.389	-0.0136 (16) S=0.480
TOTILLIT	-0.9509 (17) S=0.001	-0.6190 (17) S=0.004	1.0000 (0) S=0.001	0.9273 (17) S=0.001	-0.7784 (17) S=0.001	-0.7881 (17) S=0.001	0.1330 (17) S=0.305	-0.9123 (17) S=0.001	-0.0653 (17) S=0.402	0.1397 (16) S=0.303
FEMILLIT	-0.9140 (17) S=0.001	-0.6229 (17) S=0.004	0.9273 (17) S=0.001	1.0000 (0) S=0.001	-0.8362 (17) S=0.001	-0.8544 (17) S=0.001	0.1802 (17) S=0.244	-0.8401 (17) S=0.001	-0.0350 (17) S=0.447	0.2490 (16) S=0.176
WATRBLDG	0.8751 (17) S=0.001	0.5433 (17) S=0.012	-0.7784 (17) S=0.001	-0.8362 (17) S=0.001	1.0000 (0) S=0.001	0.9969 (17) S=0.001	-0.3816 (17) S=0.065	0.8251 (17) S=0.001	0.1255 (17) S=0.316	-0.4789 (16) S=0.030
WATRDWEL	0.8731 (17) S=0.001	0.5276 (17) S=0.015	-0.7881 (17) S=0.001	-0.8544 (17) S=0.001	0.9969 (17) S=0.001	1.0000 (0) S=0.001	-0.3990 (17) S=0.056	0.8190 (17) S=0.001	0.1088 (17) S=0.339	-0.4574 (16) S=0.037
NOWATER	-0.1426 (17) S=0.292	0.2326 (17) S=0.184	0.1330 (17) S=0.305	0.1802 (17) S=0.244	-0.3816 (17) S=0.065	-0.3990 (17) S=0.056	1.0000 (0) S=0.001	-0.1647 (17) S=0.264	-0.1463 (17) S=0.288	0.2327 (16) S=0.193
ELEC	0.9727 (17) S=0.001	0.7031 (17) S=0.001	-0.9123 (17) S=0.001	-0.8401 (17) S=0.001	0.8251 (17) S=0.001	0.8190 (17) S=0.001	-0.1647 (17) S=0.264	1.0000 (0) S=0.001	0.1392 (17) S=0.297	-0.2772 (16) S=0.149
PDLABOR	0.1105 (17) S=0.336	0.0742 (17) S=0.389	-0.0653 (17) S=0.402	-0.0350 (17) S=0.447	0.1255 (17) S=0.316	0.1088 (17) S=0.339	-0.1463 (17) S=0.288	0.1392 (17) S=0.297	1.0000 (0) S=0.001	-0.7401 (16) S=0.001
POVERTY	-0.2541 (16) S=0.171	-0.0136 (16) S=0.480	0.1397 (16) S=0.303	0.2490 (16) S=0.176	-0.4789 (16) S=0.030	-0.4574 (16) S=0.037	0.2327 (16) S=0.193	-0.2772 (16) S=0.149	-0.7401 (16) S=0.001	1.0000 (0) S=0.001
DENSITY	0.4334 (17) S=0.041	0.5336 (17) S=0.014	-0.2973 (17) S=0.123	-0.1139 (17) S=0.332	0.2718 (17) S=0.146	0.2116 (17) S=0.207	0.3316 (17) S=0.097	0.5085 (17) S=0.019	-0.0101 (17) S=0.485	-0.0674 (16) S=0.402
PQLI	0.7135 (17) S=0.001	0.3544 (17) S=0.081	-0.6836 (17) S=0.001	-0.7834 (17) S=0.001	0.8477 (17) S=0.001	0.8574 (17) S=0.001	-0.3191 (17) S=0.106	0.6459 (17) S=0.003	0.3387 (17) S=0.092	-0.6787 (16) S=0.002

(COEFFICIENT / (CASES) / SIGNIFICANCE)

Appendix B: Correlations

Development Variables: Lower and Upper Egypt Only (Continued)

---- P E A R S O N   C O R R E L A T I O N   C O E F F I C I E N T S ----

	DENSITY	PQLI
CLUSTER	0.4334 (17) S=0.041	0.7135 (17) S=0.001
URBAN	0.5336 (17) S=0.014	0.3544 (17) S=0.081
TOTILLIT	-0.2973 (17) S=0.123	-0.6836 (17) S=0.001
FEMILLIT	-0.1139 (17) S=0.332	-0.7834 (17) S=0.001
WATRBLDG	0.2718 (17) S=0.146	0.8477 (17) S=0.001
WATRDWEL	0.2116 (17) S=0.207	0.8574 (17) S=0.001
NOWATER	0.3316 (17) S=0.097	-0.3191 (17) S=0.106
ELEC	0.5085 (17) S=0.019	0.6459 (17) S=0.003
PDLABOR	-0.0101 (17) S=0.485	0.3387 (17) S=0.092
POVERTY	-0.0674 (16) S=0.402	-0.6787 (16) S=0.002
DENSITY	1.0000 (0) S=0.001	-0.0438 (17) S=0.434
PQLI	-0.0438 (17) S=0.434	1.0000 (0) S=0.001

(COEFFICIENT / (CASES) / SIGNIFICANCE)

- - - - - - - - - - - - P E A R S O N   C O R R E L A T I O N   C O E F F I C I E N T S - - - - - - - - - - - -

	CLUSTER	URBAN	TOTILLIT	FEMILLIT	WATRBLDG	WATRDWEL	NOWATER	ELEC	FOODPOP	AGINCOME
MORT73	0.0179 (24) S=0.467	0.1057 (24) S=0.312	-0.3059 (24) S=0.073	-0.1669 (24) S=0.218	-0.1358 (21) S=0.279	-0.1742 (21) S=0.225	0.1990 (21) S=0.194	-0.0182 (21) S=0.469	-0.2786 (17) S=0.139	-0.0791 (17) S=0.381
MORT72	-0.0341 (24) S=0.437	0.0626 (24) S=0.386	-0.1810 (24) S=0.199	-0.0366 (24) S=0.433	-0.1830 (21) S=0.214	-0.2266 (21) S=0.162	0.2278 (21) S=0.160	-0.0759 (21) S=0.372	-0.1521 (17) S=0.280	0.0413 (17) S=0.437
RURIMR72	0.1378 (17) S=0.299	0.2331 (17) S=0.184	-0.1577 (17) S=0.273	0.0639 (17) S=0.404	-0.1811 (17) S=0.243	-0.2010 (17) S=0.220	0.1330 (17) S=0.305	0.2340 (17) S=0.183	-0.0905 (17) S=0.365	0.1245 (17) S=0.317
URBIMR72	-0.3619 (21) S=0.053	-0.2784 (21) S=0.111	0.3665 (21) S=0.051	0.4670 (21) S=0.016	-0.3906 (21) S=0.040	-0.4285 (21) S=0.026	0.4081 (21) S=0.033	-0.3648 (21) S=0.052	-0.1519 (17) S=0.280	-0.1373 (17) S=0.300
BIRTH	-0.7041 (24) S=0.001	-0.7248 (24) S=0.001	0.5692 (24) S=0.002	0.6710 (24) S=0.001	-0.6839 (21) S=0.001	-0.7154 (21) S=0.001	0.4568 (21) S=0.019	-0.6467 (21) S=0.001	0.3484 (17) S=0.085	0.2574 (17) S=0.159
RURCBR72	-0.8714 (20) S=0.001	-0.9432 (20) S=0.001	0.7424 (20) S=0.001	0.7941 (20) S=0.001	-0.8964 (20) S=0.001	-0.8931 (20) S=0.001	0.6347 (20) S=0.001	-0.7943 (20) S=0.001	0.0551 (16) S=0.420	0.1238 (16) S=0.324
URBCBR72	-0.8042 (20) S=0.001	-0.7723 (20) S=0.001	0.7801 (20) S=0.001	0.7953 (20) S=0.001	-0.7736 (20) S=0.001	-0.7987 (20) S=0.001	0.6841 (20) S=0.001	-0.7908 (20) S=0.001	-0.0018 (16) S=0.497	-0.2325 (16) S=0.193

(COEFFICIENT / (CASES) / SIGNIFICANCE)

Appendix B: Correlations

III. Demographic Variables by Development Variables (Continued)

- - - - P E A R S O N   C O R R E L A T I O N   C O E F F I C I E N T S - - - -

	PDLABOR	POVERTY	DENSITY	PQLI
MORT73	-0.2060	0.3552	0.4209	-0.4311
	(24)	(18)	(21)	(21)
	S=0.167	S=0.074	S=0.029	S=0.026
MORT72	-0.1912	0.3743	0.4167	-0.4895
	(24)	(18)	(21)	(21)
	S=0.185	S=0.063	S=0.030	S=0.012
RURIMR72	-0.3396	0.5855	0.5611	-0.5586
	(17)	(16)	(17)	(17)
	S=0.091	S=0.009	S=0.010	S=0.010
URBIMR72	-0.2835	0.5589	0.2496	-0.6683
	(21)	(18)	(21)	(21)
	S=0.107	S=0.008	S=0.138	S=0.001
BIRTH	-0.1328	0.5099	-0.1054	-0.8169
	(24)	(18)	(21)	(21)
	S=0.268	S=0.015	S=0.325	S=0.001
RURCBR72	-0.1293	0.4856	-0.5595	-0.8593
	(20)	(18)	(20)	(20)
	S=0.293	S=0.021	S=0.005	S=0.001
URBCBR72	-0.1627	0.3977	-0.2083	-0.8392
	(20)	(18)	(20)	(20)
	S=0.247	S=0.051	S=0.189	S=0.001

(COEFFICIENT / (CASES) / SIGNIFICANCE)

Appendix B: Correlations

Demographic Variables by Development Variables: Lower and Upper Egypt Only

- - - - - - - - - - - - - P E A R S O N   C O R R E L A T I O N   C O E F F I C I E N T S - - - - - - - - - - - -

	CLUSTER	URBAN	TOTILLIT	FEMILLIT	WATRBLDG	WATRDWEL	NOWATER	ELEC	PDLABOR	POVERTY
MORT73	0.2319 (17) S=0.185	0.3048 (17) S=0.117	-0.2716 (17) S=0.146	-0.0653 (17) S=0.402	-0.0695 (17) S=0.395	-0.0786 (17) S=0.382	0.1677 (17) S=0.260	0.2776 (17) S=0.140	-0.3979 (17) S=0.057	0.6163 (16) S=0.006
MORT72	0.0414 (17) S=0.437	0.2278 (17) S=0.190	-0.0276 (17) S=0.458	0.1852 (17) S=0.238	-0.2465 (17) S=0.170	-0.2701 (17) S=0.147	0.2229 (17) S=0.195	0.1320 (17) S=0.307	-0.3795 (17) S=0.066	0.6443 (16) S=0.004
RURIMR72	0.1378 (17) S=0.299	0.2331 (17) S=0.184	-0.1577 (17) S=0.273	0.0639 (17) S=0.404	-0.1811 (17) S=0.243	-0.2010 (17) S=0.220	0.1330 (17) S=0.305	0.2340 (17) S=0.183	-0.3395 (17) S=0.091	0.5855 (16) S=0.009
URBIMR72	-0.3291 (17) S=0.099	0.0183 (17) S=0.472	0.3883 (17) S=0.062	0.5377 (17) S=0.013	-0.4765 (17) S=0.027	-0.4992 (17) S=0.021	0.3524 (17) S=0.083	-0.2613 (17) S=0.155	-0.4357 (17) S=0.040	0.6999 (16) S=0.001
BIRTH	-0.3058 (17) S=0.116	-0.3339 (17) S=0.095	0.3796 (17) S=0.066	0.5663 (17) S=0.009	-0.2563 (17) S=0.160	-0.2906 (17) S=0.129	-0.1783 (17) S=0.247	-0.1453 (17) S=0.289	-0.1438 (17) S=0.291	0.2982 (16) S=0.131
RURCBR72	0.3186 (16) S=0.115	0.0681 (16) S=0.401	-0.4049 (16) S=0.060	-0.4192 (16) S=0.053	0.1494 (16) S=0.290	0.1841 (16) S=0.247	-0.4343 (16) S=0.046	0.3733 (16) S=0.077	-0.1884 (16) S=0.242	0.3043 (16) S=0.126
URBCBR72	-0.5950 (16) S=0.008	-0.2952 (16) S=0.134	0.6568 (16) S=0.003	0.6387 (16) S=0.004	-0.5354 (16) S=0.016	-0.5697 (16) S=0.011	0.3967 (16) S=0.064	-0.5446 (16) S=0.015	-0.2819 (16) S=0.145	0.2211 (16) S=0.205

(COEFFICIENT / (CASES) / SIGNIFICANCE)

Appendix B: Correlations

Demographic Variables by Development Variables: Lower and Upper Egypt Only (Continued)

----PEARSON CORRELATION COEFFICIENTS----

	DENSITY	PQLI
MORT73	0.5131 (17) S=0.018	-0.4889 (17) S=0.023
MORT72	0.6004 (17) S=0.005	-0.6505 (17) S=0.002
RURIMR72	0.5611 (17) S=0.010	-0.5586 (17) S=0.010
URBIMR72	0.4609 (17) S=0.031	-0.8158 (17) S=0.001
BIRTH	0.4392 (17) S=0.039	-0.5207 (17) S=0.016
RURCBR72	-0.0695 (16) S=0.399	-0.0489 (16) S=0.429
URBCBR72	0.1518 (16) S=0.287	-0.5345 (16) S=0.016

(COEFFICIENT / (CASES) / SIGNIFICANCE)

Appendix B: Correlations

IV. Nonredundant Correlations: All Egypt (minus Frontier)

- - - - - - - - P E A R S O N   C O R R E L A T I O N   C O E F F I C I E N T S - - - - - - - -

	MORT73	MORT72	BIRTH	CLUSTER	URBAN	TOTILLIT	FEMILLIT	PDLABOR
MORT73	1.0000 (0) S=0.001	0.9599 (21) S=0.001	0.5239 (21) S=0.007	-0.0386 (21) S=0.434	-0.0752 (21) S=0.373	-0.0799 (21) S=0.365	0.0577 (21) S=0.402	-0.2097 (21) S=0.181
MORT72	0.9599 (21) S=0.001	1.0000 (0) S=0.001	0.6016 (21) S=0.002	-0.1000 (21) S=0.333	-0.0915 (21) S=0.347	0.0364 (21) S=0.438	0.1743 (21) S=0.225	-0.1980 (21) S=0.195
BIRTH	0.5239 (21) S=0.007	0.6016 (21) S=0.002	1.0000 (0) S=0.001	-0.7016 (21) S=0.001	-0.7568 (21) S=0.001	0.6275 (21) S=0.001	0.7044 (21) S=0.001	-0.0469 (21) S=0.420
CLUSTER	-0.0386 (21) S=0.434	-0.1000 (21) S=0.333	-0.7016 (21) S=0.001	1.0000 (0) S=0.001	0.9540 (21) S=0.001	-0.9567 (21) S=0.001	-0.9511 (21) S=0.001	0.1629 (21) S=0.240
URBAN	-0.0752 (21) S=0.373	-0.0915 (21) S=0.347	-0.7568 (21) S=0.001	0.9540 (21) S=0.001	1.0000 (0) S=0.001	-0.8495 (21) S=0.001	-0.8559 (21) S=0.001	0.1195 (21) S=0.303
TOTILLIT	-0.0799 (21) S=0.365	0.0364 (21) S=0.438	0.6275 (21) S=0.001	-0.9567 (21) S=0.001	-0.8495 (21) S=0.001	1.0000 (0) S=0.001	0.9671 (21) S=0.001	-0.1526 (21) S=0.255
FEMILLIT	0.0577 (21) S=0.402	0.1743 (21) S=0.225	0.7044 (21) S=0.001	-0.9511 (21) S=0.001	-0.8559 (21) S=0.001	0.9671 (21) S=0.001	1.0000 (0) S=0.001	-0.1456 (21) S=0.264
PDLABOR	-0.2097 (21) S=0.181	-0.1980 (21) S=0.195	-0.0469 (21) S=0.420	0.1629 (21) S=0.240	0.1195 (21) S=0.303	-0.1526 (21) S=0.255	-0.1456 (21) S=0.264	1.0000 (0) S=0.001

(COEFFICIENT / (CASES) / SIGNIFICANCE)

Appendix B: Correlations

V. Rural Variables

- - - - - - - - - - - - - - P E A R S O N   C O R R E L A T I O N   C O E F F I C I E N T S - - - - - - - -

	RURIMR72	RURCBR72	RURWATER	RURNOWAT	RURELEC	RURY<250	FOODPOP	AGINCOME
RURIMR72	1.0000	0.5130	-0.1939	0.0812	0.3167	0.6844	-0.0905	0.1245
	(0)	(16)	(17)	(17)	(17)	(16)	(17)	(17)
	S=0.001	S=0.021	S=0.228	S=0.378	S=0.108	S=0.002	S=0.365	S=0.317
RURCBR72	0.5130	1.0000	0.3197	-0.4576	0.4671	0.3799	0.0551	0.1238
	(16)	(0)	(16)	(16)	(16)	(16)	(16)	(16)
	S=0.021	S=0.001	S=0.114	S=0.037	S=0.034	S=0.073	S=0.420	S=0.324
RURWATER	-0.1939	0.3197	1.0000	-0.3738	0.7583	-0.3111	-0.2683	-0.2403
	(17)	(16)	(0)	(17)	(17)	(16)	(17)	(17)
	S=0.228	S=0.114	S=0.001	S=0.070	S=0.001	S=0.120	S=0.149	S=0.176
RURNOWAT	0.0312	-0.4576	-0.3738	1.0000	-0.1657	0.2268	-0.6106	-0.3807
	(17)	(16)	(17)	(0)	(17)	(16)	(17)	(17)
	S=0.378	S=0.037	S=0.070	S=0.001	S=0.262	S=0.199	S=0.005	S=0.066
RURELEC	0.3167	0.4671	0.7583	-0.1657	1.0000	-0.0560	-0.2232	0.0720
	(17)	(16)	(17)	(17)	(0)	(16)	(17)	(17)
	S=0.108	S=0.034	S=0.001	S=0.262	S=0.001	S=0.418	S=0.195	S=0.392
RURY<250	0.6844	0.3799	-0.3111	0.2268	-0.0560	1.0000	-0.3017	-0.1662
	(16)	(16)	(16)	(16)	(16)	(0)	(16)	(16)
	S=0.002	S=0.073	S=0.120	S=0.199	S=0.418	S=0.001	S=0.128	S=0.269
FOODPOP	-0.0905	0.0551	-0.2683	-0.6106	-0.2232	-0.3017	1.0000	0.7602
	(17)	(16)	(17)	(17)	(17)	(16)	(0)	(17)
	S=0.365	S=0.420	S=0.149	S=0.005	S=0.195	S=0.128	S=0.001	S=0.001
AGINCOME	0.1245	0.1238	-0.2403	-0.3807	0.0720	-0.1662	0.7602	1.0000
	(17)	(16)	(17)	(17)	(17)	(16)	(17)	(0)
	S=0.317	S=0.324	S=0.176	S=0.066	S=0.392	S=0.269	S=0.001	S=0.001

(COEFFICIENT / (CASES) / SIGNIFICANCE)

Appendix B: Correlations

VI. Urban Variables

- - - - - - - - - - - - - - P E A R S O N   C O R R E L A T I O N   C O E F F I C I E N T S - - - - -

	URBIMR72	URBCBR72	URBWATER	URBNOWAT	URBELEC	URBY<250	URBY<400
URBIMR72	1.0000 (0) S=0.001	0.6505 (20) S=0.001	-0.5383 (21) S=0.006	0.4644 (21) S=0.017	-0.5329 (21) S=0.006	0.5531 (18) S=0.009	0.5221 (18) S=0.013
URBCBR72	0.6505 (20) S=0.001	1.0000 (0) S=0.001	-0.6506 (20) S=0.001	0.6468 (20) S=0.001	-0.7378 (20) S=0.001	0.5963 (18) S=0.005	0.5262 (18) S=0.012
URBWATER	-0.5383 (21) S=0.006	-0.6506 (20) S=0.001	1.0000 (0) S=0.001	-0.7637 (21) S=0.001	0.7765 (21) S=0.001	-0.5812 (18) S=0.006	-0.7035 (18) S=0.001
URBNOWAT	0.4644 (21) S=0.017	0.6468 (20) S=0.001	-0.7637 (21) S=0.001	1.0000 (0) S=0.001	-0.6031 (21) S=0.002	0.5487 (18) S=0.009	0.6592 (18) S=0.001
URBELEC	-0.5329 (21) S=0.006	-0.7378 (20) S=0.001	0.7765 (21) S=0.001	-0.6031 (21) S=0.002	1.0000 (0) S=0.001	-0.6679 (18) S=0.001	-0.7003 (18) S=0.001
URBY<250	0.5531 (18) S=0.009	0.5963 (18) S=0.005	-0.5812 (18) S=0.006	0.5487 (18) S=0.009	-0.6679 (18) S=0.001	1.0000 (0) S=0.001	0.8814 (18) S=0.001
URBY<400	0.5221 (18) S=0.013	0.5262 (18) S=0.012	-0.7035 (18) S=0.001	0.6592 (18) S=0.001	-0.7003 (18) S=0.001	0.8814 (18) S=0.001	1.0000 (0) S=0.001

(COEFFICIENT / (CASES) / SIGNIFICANCE)

Appendix B: Correlations

Urban Variables: Lower and Upper Egypt Only

---- P E A R S O N C O R R E L A T I O N C O E F F I C I E N T S ----

	URBIMR72	URBCBR72	URBWATER	URBNOWAT	URBELEC	URBY<250	URBY<400
URBIMR72	1.0000 (0) S=0.001	0.4692 (16) S=0.033	-0.6663 (17) S=0.002	0.4492 (17) S=0.035	-0.5608 (17) S=0.010	0.6071 (16) S=0.006	0.6020 (16) S=0.007
URBCBR72	0.4692 (16) S=0.033	1.0000 (0) S=0.001	-0.5334 (16) S=0.017	0.3923 (16) S=0.066	-0.6607 (16) S=0.003	0.6003 (16) S=0.007	0.4547 (16) S=0.038
URBWATER	-0.6663 (17) S=0.002	-0.5334 (16) S=0.017	1.0000 (0) S=0.001	-0.6448 (17) S=0.003	0.6180 (17) S=0.004	-0.6200 (16) S=0.005	-0.6978 (16) S=0.001
URBNOWAT	0.4492 (17) S=0.035	0.3923 (16) S=0.066	-0.6448 (17) S=0.003	1.0000 (0) S=0.001	-0.3686 (17) S=0.073	0.5460 (16) S=0.014	0.6190 (16) S=0.005
URBELEC	-0.5608 (17) S=0.010	-0.6607 (16) S=0.003	0.6180 (17) S=0.004	-0.3686 (17) S=0.073	1.0000 (0) S=0.001	-0.7063 (16) S=0.001	-0.6811 (16) S=0.002
URBY<250	0.6071 (16) S=0.006	0.6003 (16) S=0.007	-0.6200 (16) S=0.005	0.5460 (16) S=0.014	-0.7063 (16) S=0.001	1.0000 (0) S=0.001	0.8826 (16) S=0.001
URBY<400	0.6020 (16) S=0.007	0.4547 (16) S=0.038	-0.6978 (16) S=0.001	0.6190 (16) S=0.005	-0.6811 (16) S=0.002	0.8826 (16) S=0.001	1.0000 (0) S=0.001

(COEFFICIENT / (CASES) / SIGNIFICANCE)