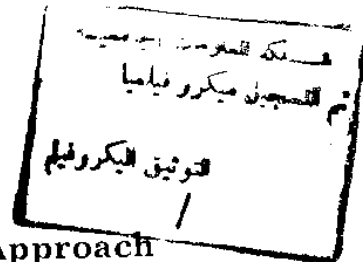


Cairo University
Faculty of Economics and Political Science
Department of Statistics



**A Parametric Hazards Model Approach
to the Study of the Determinants of
Infant Mortality in Egypt**

By
Sahar El Sheneity

Supervised by
Prof. Abdel Hamid Negm
Professor
Cairo University
Faculty of Economics and Political Science
Department of Statistics

A. Nigam

د. حجاز الطويل

Dr. Sahar El Tawila
Assistant Professor
Cairo University
Faculty of Economics and Political Science
Department of Statistics

*A thesis submitted in partial fulfillment of the
requirements for the M. Sc. degree in statistics*

1995



Abstract

The subject of infant mortality occupies a large volume in social and demographic research due to its importance as a measure of human development and welfare. From such a basis, there has been a special interest in studying infant mortality in developing countries where this rate is much higher than its correspondent in developed countries.

Egypt, as a developing country, has witnessed a noticeable decline in the level of infant mortality rate during the past decade which is encouraging to study the determinants underlying such a decline.

Unfortunately, the vital registration system in Egypt suffers from under-registration which hinders an accurate measurement of the level, trend and pattern of infant mortality.

The proposed study discusses the level, trend and pattern of infant mortality from the vital registration data during the past decade and compares the results with those obtained on using the 1991 Egypt Maternal and Child Health Survey (EMCHS) calculated using the life table technique. Thus trying to evaluate whether the trend of infant mortality during the past decade was really a declining one besides evaluating the development occurring in the vital registration system during the past decade.

Using the 1991 EMCHS data, the determinants underlying infant mortality rate are studied using survival analysis with three different choices of parameterization of the underlying hazard, namely: the hazard model. Three types of analyses were applied; the non-parametric Cox model, the semi-parametric piece-wise exponential model and the Weibull model as a parametric regression model. The effect of different ways of model parameterization on the determinants of infant mortality rate during the eighties are studied. Finally, some of the major characteristics of households pertaining lowest and highest infant mortality rate are discussed.

Contents

CHAPTER I	
LEVEL AND PATTERN OF INFANT MORTALITY IN EGYPT DURING THE EIGHTIES	1
1.1 INTRODUCTION	2
1.2 DATA SOURCE	4
1.3 VITAL REGISTRATION DATA	6
1.3.1 LEVEL OF INFANT MORTALITY	6
1.3.2 PATTERN OF INFANT MORTALITY	12
1.4 EGYPT MATERNAL AND CHILD HEALTH SURVEY DATA	25
1.4.1 LEVEL OF INFANT MORTALITY	25
1.4.2 PATTERN OF INFANT MORTALITY	35
 CHAPTER II	
METHODOLOGY OF ANALYSIS	36
2.1 SURVIVAL ANALYSIS	37
2.1.1 BASIC SURVIVAL FUNCTIONS	37
2.1.2 SURVIVAL TIME DATA	39
2.1.3 THE LIKELIHOOD FUNCTION	41
2.1.4 MANIPULATION OF SURVIVAL TIME DATA	42
2.2 GENERALIZED LINEAR MODELS (GLM)	42
2.2.1 THE POISSON DISTRIBUTION AS A SPECIAL CASE OF THE EXPONENTIAL FAMILY OF GLM	45
2.2.2 LOG-LINEAR MODELS FOR COUNT DATA	46
2.3 PROPORTIONAL HAZARDS (PH) MODEL	46
2.4 PARAMETRIC PROPORTIONAL HAZARDS MODEL	50
2.4.1 THE LIKELIHOOD FUNCTION	50
2.4.2 THE WEIBULL DISTRIBUTION	51
2.4.3 THE WEIBULL PROPORTIONAL HAZARDS MODEL	52
2.5 SEMI-PARAMETRIC PROPORTIONAL HAZARDS MODEL	53
2.6 NON-PARAMETRIC PROPORTIONAL HAZARDS MODEL	56
ADJUSTMENT FOR TIES	56

CHAPTER III	
DETERMINANTS UNDERLYING INFANT MORTALITY RATE IN EGYPT DURING THE EIGHTIES	59
3.1 INTRODUCTION	60
3.2 THEORETICAL FRAMEWORK FOR STUDYING THE DETERMINANTS OF INFANT AND CHILD MORTALITY	61
THE PROXIMATE DETERMINANTS	62
SOCIOECONOMIC DETERMINANTS	64
3.3. CONSTRUCTION OF THE INDEX OF SOCIOECONOMIC LEVEL OF THE HOUSEHOLD	70
3.4 THE HAZARD FUNCTION	77
3.5 MULTIVARIATE ANALYSIS	78
3.6 PATTERN OF INFANT MORTALITY	92
3.7 THE PROPORTIONALITY ASSUMPTION	94
3.8 EFFECT OF MODEL PARAMETERIZATION	95
3.9 MAIN CHARACTERISTICS OF BEST AND WORST CATEGORIES	96
CHAPTER IV	
CONCLUSION AND POLICY IMPLICATION	102
REFERENCES	106
ANNEX A	
ANALYTICAL TABLES	114



List of Tables

TABLE (1)	
INFANT MORTALITY RATE (1980-90)	30
TABLE (2)	
DEFINITION OF VARIABLES CATEGORIES FOR HOUSEHOLD INDEX	72
TABLE (3)	
RESULTS OF FACTOR ANALYSIS	76
TABLE (4)	
DEFINITION OF VARIABLE CATEGORIES	79
TABLE (5)	
RESULTS OF MAIN EFFECTS MODELS	82
TABLE (6)	
LIKELIHOOD RATIO TESTS (SATURATED MODEL = MODEL FOUR)	91
TABLE (7)	
LIKELIHOOD RATIO TESTS	
(SATURATED MODEL = CORRESPONDING MODEL WITH	
TIME-INTERACTION TERMS)	95
TABLE (8)	
RELATIVE DISTRIBUTION OF MAIN HOUSING UNIT CHARACTERISTICS	
ACCORDING TO HOUSEHOLD FACTOR ONE	98
TABLE (9)	
RELATIVE DISTRIBUTION OF MAIN HOUSING UNIT CHARACTERISTICS	
ACCORDING TO HOUSEHOLD FACTOR TWO	100
TABLE (A1)	
INFANT MORTALITY RATE BY SEX (1980-89)	107
TABLE (A2)	
INFANT MORTALITY RATE BY SEX AND REGION (1980-89)	108
TABLE (A3)	
INFANT MORTALITY DURING FIRST MONTH BY SEX AND REGION (1980)	109

TABLE (A4)	
INFANT MORTALITY DURING FIRST MONTH BY SEX AND REGION (1981)	110
TABLE (A5)	
INFANT MORTALITY DURING FIRST MONTH BY SEX AND REGION (1982)	111
TABLE (A6)	
INFANT MORTALITY DURING FIRST MONTH BY SEX AND REGION (1983)	112
TABLE (A7)	
INFANT MORTALITY DURING FIRST MONTH BY SEX AND REGION (1984)	113
TABLE (A8)	
INFANT MORTALITY DURING FIRST MONTH BY SEX AND REGION (1985)	114
TABLE (A9)	
INFANT MORTALITY DURING FIRST MONTH BY SEX AND REGION (1986)	115
TABLE (A10)	
INFANT MORTALITY DURING FIRST MONTH BY SEX AND REGION (1987)	116
TABLE (A11)	
INFANT MORTALITY DURING FIRST MONTH BY SEX AND REGION (1988)	117
TABLE (A12)	
INFANT MORTALITY DURING FIRST MONTH BY SEX AND REGION (1989)	118
TABLE (A13)	
INFANT MORTALITY DURING FIRST YEAR BY SEX AND REGION (1980)	119
TABLE (A14)	
INFANT MORTALITY DURING FIRST YEAR BY SEX AND REGION (1981)	120
TABLE (A15)	
INFANT MORTALITY DURING FIRST YEAR BY SEX AND REGION (1982)	121
TABLE (A16)	
INFANT MORTALITY DURING FIRST YEAR BY SEX AND REGION (1983)	122
TABLE (A17)	
INFANT MORTALITY DURING FIRST YEAR BY SEX AND REGION (1984)	123
TABLE (A18)	
INFANT MORTALITY DURING FIRST YEAR BY SEX AND REGION (1985)	124

TABLE (A19)	
INFANT MORTALITY DURING FIRST YEAR BY SEX AND REGION (1986)	125
TABLE (A20)	
INFANT MORTALITY DURING FIRST YEAR BY SEX AND REGION (1987)	126
TABLE (A21)	
INFANT MORTALITY DURING FIRST YEAR BY SEX AND REGION (1988)	127
TABLE (A22)	
INFANT MORTALITY DURING FIRST YEAR BY SEX AND REGION (1989)	128
TABLE (A23)	
RELATIVE DISTRIBUTION OF CHILDREN ACCORDING TO SOME MAJOR CHARACTERISTICS	129



