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A STUDY OF INFANT AND CHILD MORTALITY IN JORDAN

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I. Preface

Mortality parameters can be used to assess health status in a country. Meanwhile, infant and childhood mortality rates are considered as an indicator of socio-economic status of any country and reflects the interaction between the health services and socio-economic factors.

It is certain that infant and child deaths occupied an important position in any study of mortality, as it is a sensitive indicator of mortality situation. This study reflects the health status in the early age groups and shows the main causes of death in this stage. So it is very valuable for good health planning either in primary health care services or curative services.

II. Objectives and Scope of the Study

This study attempts to show some basic features of infant and child mortality pattern in Jordan comparing with previous patterns. The study also deals with the major causes of infant and child deaths.

The main objectives of this study are the following:

1. Verifying the measures of infant and child mortality as:

1.1. Infant mortality rate
1.2. Probability of dying between the age 2, 3, and 5.

2. Comparing the levels, trends and differentials of infant and child mortality from previous surveys with that of 1983, JFFHS.

3. Justifying the expected infant mortality trend up to the year 2000.

4. Infant and child mortality rates in Jordan and selected countries in the world.

5. Discussion and description of the major group of causes of death in infant and childhood stage.

6. General assessment and findings.

III. Methodology

The study is introduced by a short review about data limitations and sources. The following issues are involved in this study:

1. Infant and Child Mortality Levels, Trends and Differentials
   - Explaining the actual infant and child deaths component and comparing it with previous ones.
   - Testing infant and child deaths indices to be sure of its accuracy by using comparative analysis and *Chi* square test.

- Justifying the expected infant mortality trend according to the previous and actual trend.
- Infant and child mortality rates in Jordan and selected countries in the world.

2. The Main Causes of Infant and Child Deaths

- Background literature
- Reviewing the main causes of infant and child deaths from the following sources:
  a) 1983 JFFHS
  b) 1978 to 1980 Notifications of death
  c) 1976 Morbidity Statistics in Hospitals
- Reviewing the causes of death by symptoms soon before death and during illness.

3. General Assessment, Findings and Recommendations

Data Limitations

A study of mortality situation in any country needs a good statistics data on population characteristics and different causes of death.

Death registration in Jordan suffers from serious deficiencies arising from incomplete coverage, delayed registration and the mis-statements of age, cause of death and other characteristics. The available information is not tabulated in sufficient details.

Registration of infant and child deaths is more incomplete than that of total deaths . Infants who die within the first few weeks are often missed in the registration.

The death registration coverage is about 35%, while for infant and childhood deaths is about 20%. The coverage is better in urban areas than in rural areas.

Improvement of vital registration is expected in Jordan in the near future after civil registration department had achieved a good progress through the period since its establishment.

Sources of the Study

This study is based mainly on 1983 Jordan Fertility and Family Health Survey which was conducted by the Department of Statistics in Jordan in collaboration with the Division of Reproductive Health, Centre for Disease Control, Atlanta, U.S.A.

Survey design, methodology and survey limitations were explained in section 2 pages 12-16. (see 1983 JFFHS - Principal Report).

The other sources of this study are the following:

1. Infant Mortality Study in Jordan - Directorate of Planning, Training and Research, Ministry of Health, October 1982.

   This study was prepared by the Health Planning Unit for purposes of reviewing all previous infant mortality studies and estimating the actual and expected level and trend of infant mortality up to the year 2000.

2. Morbidity Statistics in Hospitals, 1976 - Department of Statistics, Amman.

   It is a report that presents information on patients hospitalized in Jordan in 1976, it includes causes of death and other morbidity indicators.

3. Statistical Year Book 1978 - 1980, Department of Statistics.

   This series of yearbook contains registered deaths by age, sex and cause of death.

4. World Development Report, 1984 - the World Bank.

   Part II of the report focuses on population change and its link with development and world development indicators.

IV. Analysis of Infant and Child Mortality Levels, Trends and Differentials

1. Levels:

The direct estimate of infant mortality rate of 1983 Survey was 26 (per 1,000 live births) while the IMR based on vital registration was about 11. Death rate for age group 1-4 ($4Q_1$) was 0.013 while for age groups 0-5 ($5Q_0$) was 0.039.

In fact these estimates are too low, this is due to the fact that child deaths were seriously under reported in both the survey and registration.

The indirect estimate of infant and child mortality of 1983 Survey was based on Brass method and Trussel multipliers. We haven't had a chance to examine these estimates because the report didn't include living children or proportion of dead children by age of mother.

Infant mortality rate of 1983 sruvey was 60 based on the indirect estimate. It seems to me that IMR estimate is quite good and accurate. This estimate is consistent with previous estimates starting from 1961 census. This means that there is a consistency of continuous decline of infant and child mortality.

The probability of dying before age 2 was 0.047, while before age 3 was 0.040 and before age 5 was 0.047. (see table number 1).

2. Trends:

The following table shows the trends of infant and child mortality rates through the period 1961 - 1983 in Jordan:

Table No. 1

Probability of Dying Before Age

Year and Source	1	2	3	5
1983 (JFFHS)	0.060	0.047	0.040	0.047
1981 (JDS)	0.064	0.073	0.077	0.083
1976 (JFS)	0.071	0.085	0.088	0.096
1972 (NFS)	0.086	0.105	0.115	0.121
1961 (Census)	0.151	0.209	0.235	0.257

We can notice from the above table that a reasonable drop has occured in infant mortality rate. All infant rates are reasonable during the above period (1961 - 1983), while the other child death rates $2Q_0$, $3Q_0$, $5Q_0$, showed reliability during the period 1961-1981. But, these rates are very low in 1983. (see figures No. 1 and 2).

The possible explanation of this variation is due to the nature and method of questions about live births and living children of 1983 JFFHS that differ completely from that of 1981 and 1976 surveys. This is due to the different approach that was used in those surveys, beside this the type of technique which was used and whether adjustment for smoothing of l_x value was applied for 1983 survey or not. Chi square test showed that child mortality differentials by sex and mother's education is under suspicions.

We found that there is a consistency between the previous and actual trend of infant mortality and the expected one which was projected in 1982 (see Infant Mortality Study in Jordan, November 1982) done by the Planning Directorate, Ministry of Health.

The two trends are shown as follows:

Table No. 2

Actual and Expected IMR Trend

Previous and Actual Trend		Expected Trend*	
Year	IMR	Year	IMR
1961	0.151	1985	0.053 ∓ .003
1972	0.086	1990	0.043 ∓ .003
1976	0.071	1995	0.035 ∓ .003
1981	0.064		
1983	0.060	2000	0.025 ∓ .003

* Infant Mortality Study - Planning Directorate, Ministry of Health, Jordan.

By adding the figure .003 to IMR, the expected trend will be as follows**

1985:	0.056
1990:	0.046
1995:	0.038
2000:	0.028

Adding figure .003 means that all parameters of socio-economic development will be improved normally and on the same previous socio-economic trend which was started since 1972.

** Expected trend was based on 3 methods, these are:

i. Continuing previous trend
ii. Harbson and Myers method
iii. Regression analysis method

3. Infant and Child Mortality Differentials

3.1 Sex Differentials:

Probability of dying by sex differentials before ages 2, 3 and 5 shows that females have higher rates before age 2 and 3 while males have higher rates before age 5 (see table 3). This is of course due to accidents. But, it seems to me that those rates are unreliable after using Chi square test because they are very low compared to previous rates of former surveys as shown in Table 1.

Table No. 3

Child Mortality by Sex Differentials

	Probability of Dying Before Age:		
	2	3	5
Male	0.035	0.037	0.050
Female	0.058	0.044	0.044

3.2 Urban/Rural Differentials:

Urban/rural differentials of 1983 survey showed that infant and child death rates are lower in urban areas than in rural areas before age 2 and 3 while before age 5 are higher and this is due to high accidents rates in urban than rural areas (see Table 4).

Table No. 4

Probability of Dying Before Age

Residence	2	3	5
Urban	0.031	0.037	0.049
Rural	0.076	0.046	0.043

The same thing can be said for the previous surveys, that infant and child mortality is lower in urban than rural areas in general.

3.3 Child Mortality by Education of Mother:

Child mortality rate by education of mother showed inconsistency, as mother who has 1-6 years of education has higher rates than uneducated mothers, especially before age 2 and 3. These results are unreasonable especially for illiterate mothers, while the results of previous surveys are more consistent on these variables. (see table 5).

Table No. 5

Child Mortality by Education of Mother

Education	Probability of Dying Before Age		
	2	3	5
None	0.045	0.041	0.057
1 - 6 years	0.053	0.048	0.039
7 + years	0.039	0.030	0.038

This inconsistency of the child death rates by mother's education might be due to the sample size selection and whether adjustment for smoothing the l_x values were applied or not. Applying Chi square test will prove this conclusion as follows.

Testing Child Mortality Differentials by Chi Square Test:

X^2 (Chi Square) test was applied to test the rates of child mortality differentials so as to be sure of its accuracy and reliability. It was found that rates of child mortality differentials by sex or mother's education are rejected as Chi Square from X^2 tables are higher than the computed one as shown below:

Child Mortality by Sex Differential:

X^2 computed: 4.67
X^2 derived from Chi tables:
degree of freedom 2, at significance level:
0.01:9.6
0.05:6.0

Child Mortality by Education of Mother:

X^2 computed: 4.74
X^2 derived from Chi table:
degree of freedom 4, at significance level:
0.01:13.3
0.05: 9.5

The results here indicate the derived rates of child mortality by sex and mother's education are under suspicion.

Child Mortality Urban/Rural Differentials:

Rates of child mortality by urban/rural differentials are accepted after testing the results by Chi square test as the X^2 from X^2 tables are lower than the computed one as shown below:

X^2 computed: 12.5
X^2 derived from Chi tables:
degree of freedom 2, at significance level:
0.01:9.6
0.05:6.0

Figure No. 2 Infant Mortality Trend, (1960 - 2000)

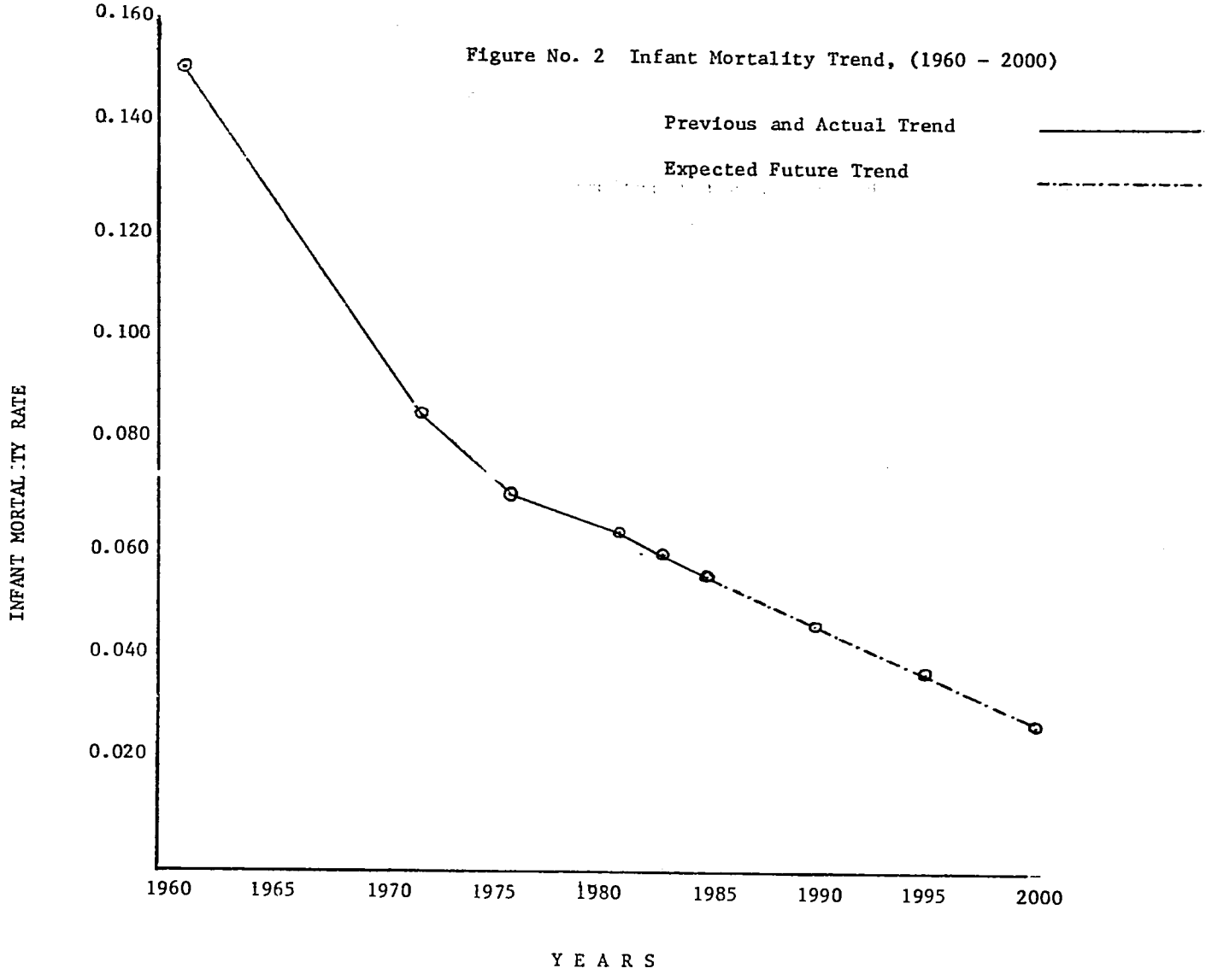
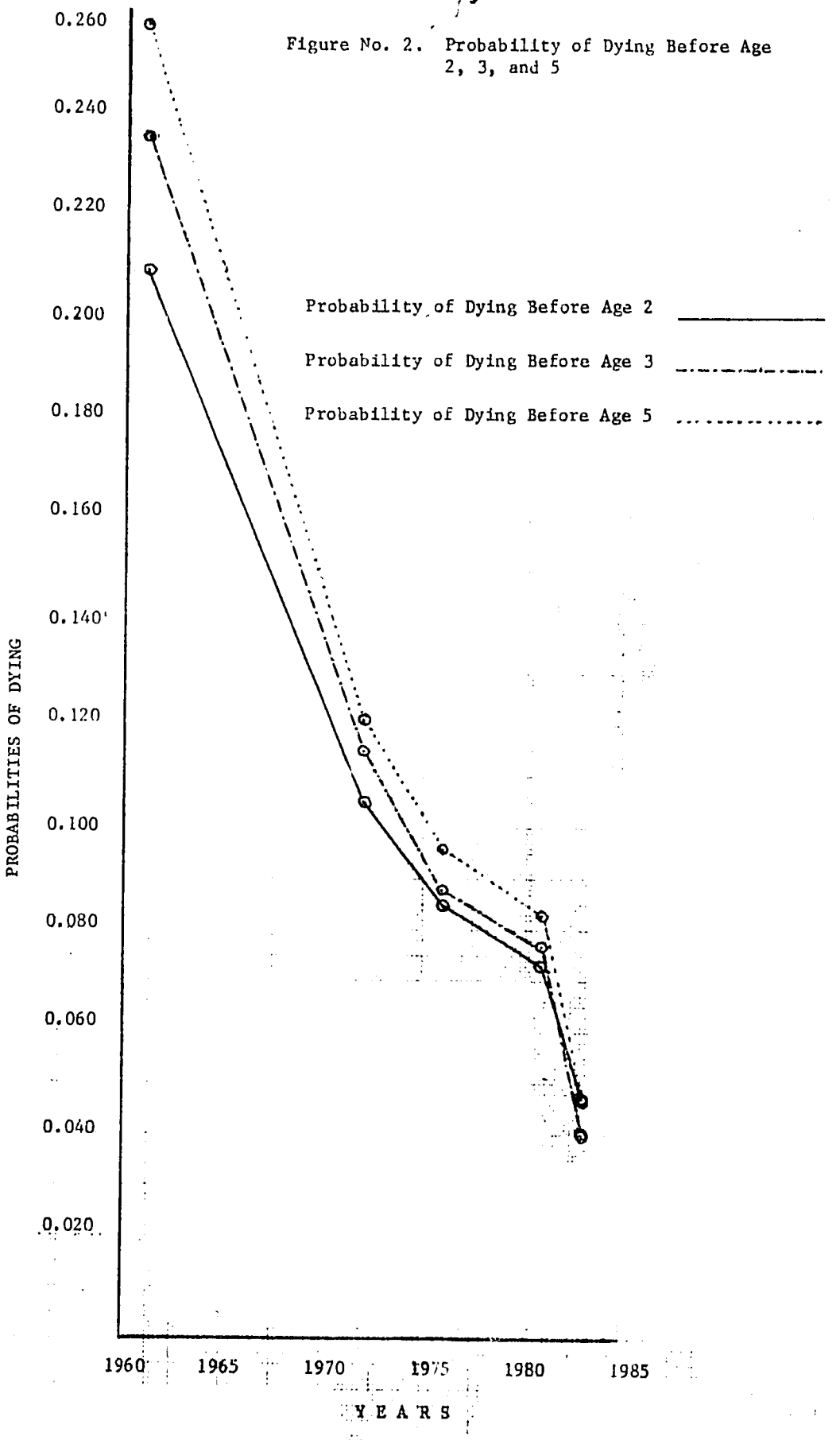


Figure No. 2. Probability of Dying Before Age 2, 3, and 5



V. Causes of Infant and Child Deaths

Background:

In developing countries, a high proportion of total deaths are due to deaths among children under 5 and reflects a great post-neonatal component. The most major causes of death in the age group (0-5) are; diarrhea, pneumonia, malnutrition, and accidents.

The risk of death changes markedly with age, especially within the first year of life as shown in the following items*:

A. Early neonatal (0-6 days): Mortality is mainly associated with:

   i. Congenital abnormalities
   ii. Obstetrical complications and obstetrical care

B. Late neonatal (7-27 days) mortality is associated with:

   i. Congenital abnormalities
   ii. Infections of new born (e.g. tetanus)

C. Neonatal mortality (0-27 days) is associated with reasons given in A and B.

D. Post neonatal mortality (28 days - 11 months) is associated with:

   i. Infectious diseases

E. Infant mortality is a combination of the above.

F. (1-4) years mortality is associated mainly with infections, malnutrition and accidents.

In fact, a fall in mortality may not reflect an improvement in morbidity, (people may be sick but not die). It is difficult to separate out the diseases which lead to death because often there are multiple causes of death.

Jordan Fertility and Family Health Survey, 1983

Method:

Information on causes of death was collected for each dead child who was born in the last five years. Beside this, described symptoms during illness and soon before death according to the questionnaire.

Ministry of Health physicians review the questionnaire forms and assigned four major categories: tetanus, diarrhea, pertussis and measles.

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* Gray, R.H., 1980 Population and Health - pp. 44 - 47.

The percentage distribution of reported causes and the most probable diagnosis assigned were classified into three main causes of death:

1. Prematurity/birth defects
2. Respiratory diseases/pneumonia
3. Diarrhea/gastroenteritis

The present distribution of dead children who were born during the five years preceeding the survey by symptoms plus panel diagnosis are listed by importance, as follows:

a. Accident 19.5% a) premature/birth defects 19.5%
b. Pneumonia/pertussis and other respiratory diseases 18.4%
c. Diarrhea/gastroenteritis 10.9%
Other causes as measles, tetanus and malnutrition have very low percentage. (See Table no. 6).

The previous surveys or censuses did not include the main causes of infant and child death, so it is difficult to obtain the trend of main causes or to make comparative analysis.

Morbidity Statistics in Hospitals, 1976:

There is a possibility to compare the 1983 survey results with that of morbidity statistics in hospital 1976, and the notifications of registered deaths.

In the section of hospital deaths by age and sex and cause of death for 1976*, we found that the main causes of infant and child deaths were pneumonia, enteritis and other diarrheal diseases, avitaminoses and other malnutritional deficiency, accidents, other infective diseases and premature/birth defects (see table no. 6). Death statistics in hospitals show that 33% of total deaths are infant below one year of age.

Death Notifications 1978 - 1980:

Infant and child deaths by Causes were taken from death notifications for years 1978, 1979 and 1980**. Average number of deaths were obtained for years below 1 and 1-4. The results are shown in Table no. 2. It is found that the main causes of infant and child deaths were enteritis and other diarrheal diseases, pneumonia, accidents, congenital anomalies and other infective diseases (see table no. 7).

Finally, we can say that the most important causes of death of 1983 survey or the 1976 morbidity statistics or death notifications are due to pneumonia and diarrheal diseases, while other causes of high proportions as accidents or prematurity in 1983 JFFHS comes as a result of mother's rememberance to incidents, or to sampling errors.

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* Department of Statistics, Morbidity Statistics in Hospitals, 1976 pp. 77-82
** Morbidity Statistics in Hospitals, 1976.

Table (6)

Percent Distribution of Dead Children Who Were Born During the 5 Years Preceding the Survey by Reported and Diagnosed Cause of Death - 1983 Jordan Fertility and Family Health Survey

Cause of Death	Reported	Symptoms Plus Panel Diagnosis
Premature / birth defects	7.5	19.5 %
Accident	19.0	19.5 %
Pneumonia /Pertussis / other respiratory diseases	10.9	18.4 %
Diarrhea / gastroenteritis	6.9	10.9 %
Measles	1.1	4.0 %
Tetanus	1.1.	3.4 %
Others	37.9	1.7 %
Malnutrition	0.0	0.6 %
Don't know / unclassified	15.5	21.9 %
No. of Cases	100.0 174	100.0 174

Table (7)

Infant and Child Deaths by Main Causes in Hospitals, 1976

Cause of Death	Number	Percentage
Pneumonia	175	17 %
Enteritis and other Diarrheal Diseases	94	11 %
Avitaminoses and other Nutritional Deficiency	81	9.5%
Accidents	61	7 %
Other Infective Parasitic Diseases	51	6 %
Congenital Anomalies	27	3 %
Birth Injury , Difficult Labour	21	2.5%
Other Cases	375	44 %
	855	100 %

Source: Morbidity Statistics in Hospitals, 1976.

Table (8)

Registered Infant and Child Deaths by Main Causes - for Years 1978 - 1980

Cause of Death	Number	Percentage
Enteritis and other Diarrheal Diseases	237	13.3%
Pneumonia	224	12.5%
Accidents	70	4 %
Congenital Anomalies	59	3.3%
Infectious Diseases	57	3.2%
Others	1138	63.7%
	1785	100 %

Source: Statistical Yearbook, 1978-1980, Department of Statistics.

Table No. 9

Infant and Child Deaths by Main Causes, 1983 JFFHS, 1976, 1978 - 1980

Cause of Death	1983 JFFHS	1978 - 1980 Death Notifications	1976 Hospital Deaths
Accidents	19.5%	4 %	7 %
Prematurity/Birth defects	19.5%	3.3	5.5
Pneumonia	18.4	12.5	17
Diarrhea/gastroenteritis	11	13.3	11
Infectious Diseases	7.4	3.2	6
Malnutrition	0.6	0.7	9.5
Others/unclassified	23.6	63.0	44
	100	100	100

Symptoms During Illness and Soon Before Deaths, 1983 JFFHS:

Distribution of dead children by symptoms during illness or soon before death assures the previous main causes of death as pneumonia, diarrhea, premature and accidents.

Symptoms soon before death (appendix No. 7) shows that the highest proportions as; 3 or more loose stools per day and mucus are due to diarrheal diseases, body stiff due to diarrhea and vomiting, muscle spasms/convulsion due to pneumonia. Paralysis of one or both legs is due to congenital and accidents.

Symptoms during illness (appendix no. 7) shows that the highest proportions as high fever, unable to open mouth, emaciated, cough and whooping cough are due to pneumonia/pertussis, tetanus. 3 or more loose stools per day due to diarrheal diseases. The other symptoms due mostly to congenital, malnutrition and infectious diseases as measles, tetanus and other respiratory diseases.

Symptoms during illness and symptoms soon before death proved that the highest proportions of causes of death are due to pneumonia and diarrheal diseases and not accidents or prematurity as shown from 1983 JFFHS .

VI. General Assessment and Findings

Jordan Fertility and Family Health Survey of 1983 is considered as the unique survey because it is the first survey that deals with mortality among children below age 5 and reflects the health status of those children and their main causes of death. For this reason, this type of survey can be of great value for health planning purposes.

In our point of view, this survey should not be criticized more because of limited information about causes of death, as the definitive causes of death are difficult to obtain in such survey and even in developed countries. This is due to many reasons as educational background of respondents, or the type of questions.

After verifying and testing the measures of infant and child mortality by applying the Chi square test, we can notice the following:

1. There is a continued decline of infant and child mortality which shows a consistency with rates of previous surveys especially for infant mortality. While child mortality rates are clearly too low comparing with rates of previous surveys.

2. Infant mortality rate of (60) per 1,000 live births in 1983 by indirect estimation is considered quite reasonable and acceptable and showed consistency with previous rates of former surveys and also with the expected trend of infant mortality up to the year 2000 which was projected in 1982 as shown below:

	1981	1983	1985	1990	1995	2000
IMR (Per 1,000 Live births)	64	60	56	46	38	28

3. The main causes of infant and child deaths are the following: Pneumonia, diarrhea, other infectious diseases, accidents, prematurity and malnutrition. 1983 JFFHS showed that accidents and prematurity have the highest percentages while other sources as 1976 morbidity statistics in hospitals or death notifications showed the opposite as pneumonia and diarrhea are the highest.

4. Distribution of dead children by symptoms during illness or soon before death assures that respiratory diseases and diarrheal diseases are the major cause of death and not the accidents or prematurity. This result supports our views toward this fact.

5. Jordan is considered as an upper middle-income country as the per capita income in Jordan in 1983 was about 575.7 JD. In spite of the fact that Jordan is a country of the highest fertility in the third world countries, it has the lowest infant mortality rate and the highest life expectancy in comparison with other developing countries in the world. This means that the health and socio-economic status of Jordan has achieved high progress during the last years. (See Appendix 6).

VII. Recommendations

Recommendations that adopted here are based on general assessment and findings, these recommendations are as follows:

1. A new survey of similar type of 1983 JFFHS should be conducted in the near future by the Ministry of Health, but with more details and focusing on morbidity and mortality in the early age groups.

2. The questionnaire should be redesigned again and questions should be written in easily so as to help respondents in replying.

3. There should be an enough period of training for the staff especially the interviewers who are responsible for data collection.

4. Results of full details should be presented in the principle report for purposes of complete analysis.

5. Family book should contain detailed information about deaths especially the direct and indirect cause of death. This will help for improving the mortality data of such survey.

6. The Ministry of Health should do all effort through primary health care institutions to control the health status of infants and children in the early age group, specially the infectious diseases as pneumonia, enteritis and other diarrheal diseases. This will require expanding the primary health care services through comprehensive health centers so as to offer health services to all inhabitants especially in the rural areas.

7. Ministry of Health should encourage Family planning services in MCH Centres as animportant factor for reducing infant and child deaths in Jordan .

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A P P E N D I C E S

Table 1

Direct Estimates of Infant Mortality Rate by Age, Births 1 - 4 Years Before Interview, 1983 Jordan Fertility and Health Survey

Age Group	$_1q_0$
15-19	.049
20-24	.031
25-29	.020
30-34	.019
35-39	.018
40-44	.031
45-49	.054
Total	.026

Table 2

Age at Death in Months, Children Born in the 5 Years Before Interview Who Had Died, 1983 Jordan Fertility and Family Health

Age at Death (Months)	Frequency
0	64
1	20
2	17
3	7
4	7
5	9
6	5
7	4
8	6
9	10
10	0
11	1
12-23	16
24-35	5
36-47	2
48-59	1
Total	174

Table 3

Comparison of Survey Age Distribution of Child Deaths with Model Life Table Distribution, 1983 Jordan Fertility and Family Health Survey

	Percent of Deaths Under Age 1	$_1q_0$	e_0
1983 JFFHS	86.2	26[a]	-
Model Life Table Region and Level			
West, 23	86.4	19	73.1
North, 24	85.3	15	75.9
East, 22	87.5	35	70.1
South, 23	88.0	44	73.0

[a]Percent 0-1 of those 0-5.

Table 4

Probability of Dying Before Age 2, 3, and 5 Based On Indirect Estimates, 1983 Jordan Fertility and Family Health Survey, 1976 Jordan Fertility Survey and 1981 Jordan Demographic Survey

	Probability of Dying Before Age:		
	2	3	5
1976 JFS	.085	.088	.096
1981 JDS	.073	.077	.083
1983 JFFHS			
Total	.047	.040	.047
Sex			
Male	.035	.037	.050
Female	.058	.044	.044
Residence			
Urban	.031	.037	.049
Rural	.076	.046	.043
Education			
None	.045	.041	.057
1-6 Years	.053	.048	.039
7+ Years	.039	.030	.038

Table 5

Estimates of Mean Duration of Breastfeeding and Post Partum Amenorrhea by Residence, 1976 Jordan Fertility Survey and 1983 Jordan Fertility Family Health Survey

A. Mean Duration of Breastfeeding (Months)	Total	Urban	Rural
1976 JFS	10.9	9.9	12.7
1983 JFFHS	11.4	10.7	12.7
B. Mean Duration of Post-Partum Amenorrhea (Months)			
1983 JFFHS	6.2	5.9	6.9

NOTE: All estimates based on the 1-24 month prevalence/incidence method.

Table 6

Fertility and Mortality Indicators in Jordan and Selected Countries in the World, 1982

	Total Fertility Rate	Infant Mortality	Life Expectancy
Arab Countries			
Jordan	7.1	60	67
Syria	7.2	58	67
Iraq	6.7	73	59
Kuwait	5.7	32	72
United Arab Emirates	6.0	50	71
Oman	7.1	123	58
Saudi Arabia	7.1	108	56
Yemen Arab Republic	6.8	163	44
Egypt	4.6	104	58
Sudan	6.6	119	48
Libya	7.2	95	58
Tunisia	5.0	65	62
Algeria	7.0	111	57
Morocco	5.8	125	53
Developing Countries			
India	4.8	94	55
Ethiopia	6.5	122	47
Brazil	4	73	64
Turkey	4.1	83	64
Developed Countries			
U.S.A.	1.8	11	75
United Kingdom	1.8	11	74
German Federal Republic	1.4	10	74
France	1.8	10	75
Canada	1.8	10	75
Sweden	1.7	7	78
Japan	1.7	7	77
Yugoslavia	2.0	34	72
U.S.S.R.	2.4	27	70

Source: World Development Report, 1984 - The World Bank

Table 7

Percentage of Distribution Dead Children Who Were Born in the Last 5 Years Preceding the Survey by Symptoms Experienced Before Death
1983 Jordan Fertility and Family Health Survey

	Total
A. Symptoms During Illness	
High fever	37.8
Unable to open mouth/suck normally	22.2
Emaciated/wasting away	20.7
3 or more loose stools per day	19.3
Cough	17.8
Whooping cough	17.8
Prolonged cough followed by vomiting	16.3
Unable to open mouth to cry	12.6
Red, tearing eyes	11.9
Rash	6.7
Swollen feet	5.2
Red hair	1.5
B. Symptoms Soon Before Death	
3 or more loose stools per day	17.0
Body stiff	11.9
Muscle spasms/convulsion	7.5
Mucus or bloody stool	3.7
Paralysis of one or both legs	2.2
No. of Cases	133

Note: Excludes 41 cases where death due to accident.