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MINISTRY OF HEALTH

BASIC HEALTH SERVICES CELL  
PAKISTAN CHILD SURVIVAL PROJECT

REPORT ON LEVELS AND CAUSES  
OF INFANT AND CHILD DEATHS  
IN PAKISTAN  
(Draft)

by

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## INTRODUCTION

At the request of the Pakistan Child Survival Project, we conducted a survey of available data on levels and causes of infant and child deaths (children less than 5 years of age) in Pakistan. This consultancy started on December 31, 1990 and ended on January 12, 1991. In only 13 days it was not possible to make a proper scientific assessment of the data on infant and child mortality. This reports gives an overview of the availability of data, analyses briefly the consistency and inconsistencies among the sources, reviews the Institutions conducting research in the field of Population and Health and makes recommendations for future research.

### 1. THE PAKISTAN CHILD SURVIVAL PROJECT

#### 1.1 The project

The Pakistan Child Survival Project (1990-1995) is a USAID funded project (62 M \$) aiming at reducing infant mortality by 25% over a period of 5 years. It is conducted by four agencies: MSH (Management Sciences for Health), HIID (Harvard Institute for International Development), AED (Academy for Educational Development) and JB (Jaffer Brothers). The methodology of the project is described at length in the workplan (GOP/USAID, 1990).

#### 1.2 Interventions

The project focuses on four major intervention areas:

- Control of Diarrheal Diseases (CDD)
- Acute Respiratory Infections (ARI)
- Expanded Program on Immunization (EPI)
- Nutrition (NUT)

#### 1.3 Components of PCSP

The project has four major components:

- Program Planning and Management, as related to the four interventions;
- Training: in-service training of public and private health workers in CDD, ARI, NUT; out of country training at Master's degree level;

- Health Information Systems: development of improved HIS and of disease surveillance systems;
- Communications/Marketing: institutionalizing communication programs focused on child survival interventions: marketing of ORS, of iodized salt and of breastfeeding;
- Research of the applied type and focused on the four major interventions;
- Drug and Logistic Supply Systems as related to the four major interventions.

This consultancy is related to the health information system component and to the research component of the project. The aim of the research will be to evaluate the impact of the project on age and cause specific death rates among children 0-4 years of age.

## 2. SOURCES OF DATA

Pakistan has a variety of data on mortality levels and causes of death at a national level. The nature and quality of the data depends very much on the source. The sources and nature of mortality data are summarized in table 1.

For mortality levels, they can be grouped in 3 broad categories:

- vital registration and census: this is the classic way for estimating mortality levels, the vital registration providing deaths by age and sex and the census providing the denominator for computing death rates; some censuses have retrospective questions on children ever born and children surviving that can be used to estimate indirectly mortality levels.
- prospective national sample surveys: they provide at the same time the numerator and the denominator; estimates of death rates are given with a sampling error;
- retrospective national sample surveys: they can have retrospective information, from births and deaths over the last 12 months that can be related to the population at risk or indirect information that can be converted in estimates of mortality rates, either from Brass questions (children ever born/ children surviving) or from maternity histories.

Causes of death are available in some surveys only and usually only with broad categories.

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## 2.1 CENSUSES

Censuses have been conducted regularly every 10 years in Pakistan since independence: 1951, 1961, 1972, 1981, 1991. Other censuses before independence are also available for the same geographical area since 1901. The 1981 Census has Brass retrospective questions on children ever born and children surviving in the long form which is asked to 10% of the population. However the results were not tabulated in the final reports of 1984 (federal and provincial).

The quality of censuses, in terms of completeness and age misreporting, has been analyzed in the various Census reports. The main issue is age misreporting, which is shown by high values of the Whipple index. Age misreporting is particularly strong among young children and young adults, which biases any estimate of infant mortality, whether direct or indirect.

## 2.2 VITAL REGISTRATION

Before independence and until 1961, a vital registration system was working throughout the country, both in urban and rural areas and was based on Act XV of 1887 (Afzal, 1974). In urban areas local bodies, that is Town Committee, Municipal Committee and Municipal Corporation, were responsible for registration of births and deaths. In rural areas of the Punjab and of NWFP birth and death registration started in 1880 under the Punjab Law Act of 1872. In rural areas the village chowkidar was keeping the birth and death registers. He had to send monthly the registered births and deaths to the Police Officer from where copies of the registered events were sent to the District Councils and then reached the District Health Officer. The Ministry of Health used to compile the data and to publish in the Government Gazette of Pakistan the notified births, deaths, still-births, and some causes of death, including maternal deaths occurring in towns with a population of 30,000 people or more.

In 1959 a new system of "Basic Democracy" was installed. Under this system, births and deaths registration in urban areas remained with the local bodies. However in rural areas the responsibility of birth and death registration was taken away from the chowkidars and entrusted with the "Union Councils" in villages. From Union Councils reports are now sent to the Assistant Commissioner of Local Governments in the District and no longer to the District Health Officer. It costs Rupees 10 to get an official copy of a birth certificate.

The "National Registration Act" of 1973 defines the registration system, which is first to provide Identity Cards to all citizens age 18 or more. Each Identity Card has a 10 digits "Citizen Code Number". The card is issued to any citizen who requests it and has to be surrendered after death. ID cards are compulsory for all citizens above age 18.

We did not find evidence of a scientific study of the completeness of death registration in Pakistan neither before 1960 nor after 1960. Attempts to estimate the completeness of death registration in rural areas in the Punjab before 1960 indicate that roughly half the deaths were not reported (Khan, Personal Communication). From various reports, it seems that the current reporting is very poor and in any case data are not available at an aggregate level. For instance in the Sind, for towns having a population of 30,000 and over, only 15748 births (CBR= 19.2) and 2589 deaths were recorded in July 1989 (CDR= 3.1) which suggests that birth registrations is underestimated by 55% and death registration by 69% (table 3). Some of the towns report virtually nothing and, even in the towns that show the highest rates, figures are never close to official estimates of birth and death rates. The Federal Bureau of Statistics (FBS) started recently a small investigation on the reasons why the registration system was not working (personal communication of Mr Ishaq/DG): however the study was never completed and there is no report available. In rural areas the situation is even worse since no data is published.

It is unclear if the vital registration data should be stored at the national level by the Federal Bureau of Statistics, the Ministry of Health or the Ministry of Interior. The National Statistical Council had a meeting in 1986 where this issue was raised. The United Nations have recently proposed a plan for establishing a Population Register throughout the country.

The Ministry of Interior keeps statistics of ID cards delivered, with a special mention if there are duplicates, as well as of cards surrendered. By November 1990, there were 51,771,928 cards prepared, among them 5,154,122 duplicates and there were 765,812 cards surrendered. Reported to the eligible population of people age 18 years or more, this will assume that 70.5 % of the resident population received a card since 1973. The deaths figures imply that 10.6% of the deaths above 18 years would have their cards surrendered between 1973 and 1990.

### 2.3 PROSPECTIVE SAMPLE SURVEYS

The vital registration was working poorly even before 1960. In the early 60's, a need for better information on population dynamics was felt. Pakistan has therefore developed a series of Multiround Demographic Sample Surveys. The first started in 1962 and there were new rounds from 1984 to 1988.

#### POPULATION GROWTH ESTIMATION EXPERIMENT (PGEE) : 1962-1965.

This multiround demographic survey was conducted by the Central Statistical Office (CSO) and the Pakistan Institute for Development Economics (PIDE). The survey was based on a sample of 12 areas. The PGEE was a rather complex experiment, based on the Chandrasekar-Deming technique. This technique is used for dual record systems: it matches two pieces of information and corrects for under-enumeration assuming independence of the two estimates. The dual registration system was a Longitudinal Registration (LR) by an appointed whole time registrar living in or nearby the sample area and a retrospective Cross-sectional Survey (CS) conducted at periodic intervals of 3 months. Vital events were matched on an individual basis at the headquarters. Status of non-matched events was determined through field verification visits. At the end it was commonly felt that the Chandrasekar-Deming correction lead to an overestimate of the vital rates and the LR estimates were usually considered as the most reliable. This is however debatable at least for mortality estimates.

#### POPULATION GROWTH SURVEY (PGS) : 1968-1971 and 1976-1979

This multiround demographic survey was conducted by the Federal Bureau of Statistics. These two sets of multiround surveys were simpler than the PGEE: they were based on a single visit. The first sample (68-71) was stratified into 32 clusters in urban areas (A) that were visited every 3 months and into 32 clusters in rural areas (B) that were visited every 6 months. The recall period was 6 months in area A and 12 months in area B. The second sample of 26,000 households (155,000 persons) was stratified in 516 clusters of approximately 50 households. It used two definitions of residence: de jure (DJ) and de facto (DF). The DJ results are usually preferred for analysis. The visits were conducted every 3 months and the recall period was 6 months. Two successive rounds were enumerated by two different enumerators. Vital events of the overlap period were matched manually on names and dates in the office.

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PAKISTAN DEMOGRAPHIC SURVEY (PDS) 1984-1987 and 1988

This multiround demographic survey was conducted by the Federal Bureau of Statistics. The national sample (except the FATA, the FANA and the military restricted areas) was of 21,965 households dispatched among 549 clusters of about 45 households each. Births and deaths were recorded as in the PGS-76/79 survey, that is on a quarterly basis, with a reference period of 6 calendar months and with matching events recorded in the overlap period.

2.4 RETROSPECTIVE SAMPLE SURVEYS

Many national retrospective sample surveys have been conducted in the country since independence. The first retrospective sample survey seems to have been the NIS.

NATIONAL IMPACT SURVEY (NIS) 1968-1969

This survey on the patterns and determinants of fertility was conducted by the Lahore based Training, Research and Evaluation Center (TREC). The sample was 2500 ever married women. Births and deaths during the past 12 months before interview were recorded.

NB: the report could not be consulted.

HOUSING ECONOMIC AND DEMOGRAPHIC SURVEY (HEDS) 1973

This is a national sample survey based on the 1972 census. The sample was 255,000 households. Questions were asked on children ever born and children surviving.

NB: the report could not be consulted.

PAKISTAN FERTILITY SURVEY (PFS) 1975

This survey was part of the World Fertility Surveys (WFS). It was conducted by the Population Planning Council of Pakistan with the collaboration of TREC, PIDE, PCO, FBS and the university of Punjab. The retrospective questionnaire included a full maternity history. The survey was conducted in 6 languages (Urdu, Punjabi, Pushto, Sindhi, Baluchi and Brahui). The sample was stratified in 126 urban blocks and 200 villages. 4949 women in their reproductive ages were surveyed.

PAKISTAN LABOR FORCE AND MIGRATION SURVEY (PLM) 1979-1980

This survey was conducted by PIDE and ILO. It has 4 components: Migration, Labor Force, Income Distribution and Fertility.

NB: the report could not be consulted.

PAKISTAN CONTRACEPTIVE PREVALENCE SURVEY (PCPS) 1984-1985.

NB: the report could not be consulted.

NATIONAL HEALTH SURVEY OF PAKISTAN (NHS-P) 1989.  
(also called HEALTH EXAMINATION AND INTERVIEW SURVEY (HEIS)).

This survey is being conducted by the Pakistan Medical Research Council (PMRC) on a sample of about 15,000 people drawn from 80 clusters. It includes anthropometry, comprehensive clinical examination, blood, urine and stool samples as well as a questionnaire on household structure and characteristics, medical history and reproductive health, including a full maternity history. The field work in Punjab and NWFP is currently underway.

PAKISTAN DEMOGRAPHIC AND HEALTH SURVEY (PDHS) 1990-1991

This survey is part of the international Demographic and Health Surveys (DHS). The field work started in december 1990 and is scheduled to be completed in early 1991. The sample will be about 8,000 women in their reproductive ages, drawn from 408 Primary Sampling Units. The survey uses three questionnaires: household, husband and woman. It has full maternity histories.

The final questionnaire for Pakistan has only a three questions on causes of death:

- did a doctor or a health worker tell you about the cause of death?
- what did they say was the cause of death?
- what do you believe was the cause of death?

The coded cause of death will be one of the following, even if more information is reported to the enumerator and even when a proper diagnosis has been made by a physician: fever, diarrhea, cough, measles, vomiting, convulsions, other.

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## PAKISTAN INTEGRATED HOUSEHOLD SURVEY (PIHS) 1990-1991

This survey will be conducted with the help of the World Bank. The pilot study was conducted in June 1990 and the field work started in September 1991. It is a gigantic undertaking. The male questionnaire has 89 pages and the female questionnaire has 81 pages. Questionnaires are structured in 17 sections: (1) household information (2) housing (3) education (4) health: morbidity (5) employment and wages (6) family labor (7) energy (8) migration (9) farming and livestock (10) non-farm family enterprise (11) non food expenditures and durable goods (12) food expenses and home production (13) full maternity history (14) anthropometry for all children 0-4 and their mothers (15) credit and savings (16) transfers and remittances (17) other income. The maternity history includes estimates of age at death for children who died.

### 2.5 OTHER SURVEYS ON MORBIDITY AND NUTRITION

#### NATIONAL SURVEY OF WEST PAKISTAN (NSWP) 1965-1966 (also called : FIRST NATIONAL NUTRITION SURVEY)

This survey was conducted by the Ministry of Health, Directorate of Nutrition Surveys and Research. It was based on a sample of 8,800 persons.

NB: the report could not be consulted.

#### MICRO-NUTRIENT SURVEY (MNS) 1976-1977

NB: the report could not be consulted.

#### NATIONAL HEALTH SURVEY (NHS) 1982-1983

This survey was conducted by the Federal Bureau of Statistics (FBS). It collected morbidity data at the national level on 11,088 households drawn from 1400 primary sampling units. It focused on any illness within 30 days prior to interview.

NB: the report could not be consulted.

NATIONAL NUTRITION SURVEY (NNS) 1985-1987

This survey was conducted by the Nutrition Division of the National Institute of Health (NIH). The sample included 8360 households, that is about 60,000 persons. The focus was on "at risk" groups, that is 11,285 children age 0-4, 1,135 pregnant women and 2,949 lactating women. Data were collected on household structure and characteristics, anthropometry, clinical signs, blood and urine samples, food intake, feeding habits.

NATIONAL TB PREVALENCE SURVEY (NTPS) 1987-1988.

This survey was conducted by the Ministry of Health, TB program, on a sample of 40,000 people. Tuberculin test were taken on all children 0-14 years. The coughing population was examined and taken sputum samples. The prevalence was estimated at 17/10,000. Another study was conducted in 1974-1975.

NB: the final report has not been released (source Mr Chaudry).

2.6 PROSPECTIVE COMMUNITY STUDIES

In addition to national studies, there are a number of small scale studies that can give valuable information on mortality. We cite only those which are population based.

PMRC STUDIES

The Pakistan Medical Research Council (PMRC) has sponsored three population based studies:

- Rawalpindi : rural areas of Kutbal and Thatta (about 20,000) (disease pattern, anthropometry, socio-economic and demographic characteristics);
- Peshawar : rural area (about 10,000)
- Karachi : urban area in Gizri (about 10,00). (health services centers).

The Rawalpindi site was closed in 1988. The two others are still going on; they started in 1983-1984. They aim at determining patterns of morbidity, mortality, causes of death and to evaluate EPI and ORS programs. The Peshawar site provides health services but the Gizri project does not. A number of reports on morbidity and mortality are available.

We visited the Gizri site on January 9, 1991. The project started in 1983-1984. The team was working and we went to visit a family. Quality of demographic and anthropometric estimates seemed poor to both of us. Morbidity seemed on the opposite over-reported. The lack of supervision may be contributing to events being missed for registration.

#### THE AGHA KHAN UNIVERSITY STUDIES

The Agha Khan University (AKU) has a study site in five urban areas in Karachi and 3 others in the periphery of the city, one of them in an island. In each area, for a population of about 10,000 people, the project has 10 CHW's (Community Health Workers), one LHV (Lady Health Visitor), one CHN (CH Nurse) and one CHD (CH Director) who is a medical officer. The health center established in each project area provides mainly the preventive services to mother and children. It provides also some curative services as well. The main stress however is on ante-natal and post-natal services, vaccination of mothers and children, family planning and nutrition. The services are well organized and the project is used in part for training of the undergraduate medical students. Mortality by cause is also recorded but has scope for further improvement.

We visited one health center (Essa Nagri) from which the system is organized on January 8, 1991. We had a meeting with the 10 CHW's (Community Health Workers), the LHV (Lady Health Visitor), the CHN (CH nurse) and the CHD (CH director). The quality of demographic estimates seemed reasonable but not "research quality" according to the investigators themselves. The AKU has developed a system of verbal autopsies, but the questionnaire and the coding system seemed not sufficient to make a reasonable inference on causes of deaths. The project is rather an intervention and a demonstration project.

The Agha Khan Health Services (AKHS) has a study site in a rural area near Gilgit (Dr Zeba Rasmussen). We could not meet with Dr Rasmussen: we scheduled a meeting with her on January 10, 1991 but she could not leave Gilgit.

#### THE MCWAP STUDIES

The Maternity and Child Welfare Association of Pakistan (MCWAP) in Lahore sponsors a population based intervention program in eight different poor urban communities of the city of Lahore,

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each with a population of about 10,000 people. In addition there is another project which takes care of two rural areas around Lahore (Dr and Mrs Dr Awan, both Harvard graduates). The objective of these projects is to show the impact of intervention programs. Families in the project area with a female member in the reproductive age are followed every three months. Data on births, deaths, vaccination status, contraceptive users, ORS as well as morbidity are kept. The project in 5 urban areas started in 1984-1985.

We visited MCWAP on January 7, 1991: the investigators were ready to close 5 sites after January 1991 if no money was found. We visited one of the health centers from which one of the study is organized. The focus of the study is on intervention, with emphasis of Family Planning. The objective of the study is to reduce birth rate, infant mortality and maternal mortality. Data we were shown suggest that birth rate and infant mortality were reduced over the last few years. However figures are on the low side and it is likely that some information is being missed.

#### OTHER STUDIES

The King Edward Medical College (KEMC) in Lahore follows a population of about 40,000 people in Gwalmandi since the late 1960's (Pr Fahmida Jalil).

The Ayub Medical College (AMC) in Abbotabad has undertaken a WHO sponsored study on ARI. They follow a population of about 50,000 people since 1986. They do verbal autopsies. Due to time constraints, we could not visit the project.

#### 2.7 INSTITUTION BASED DATA

#### MORBIDITY AND MORTALITY STATISTICS OF THE MOH

In addition to population based studies, other information is available from health services. The Ministry of Health issues regularly Morbidity and Mortality Statistics from the Federal Government Hospitals, the Dispensaries and the MCH centers. The data is fragmentary and inconsistent from one hospital to the next. Publications from the Biostatistics Section give however a list of causes of death that may be of statistical importance in the country (see annex 1).

## HOSPITAL REGISTERS

We visited the District Headquarters Hospital in Rawalpindi on January 6, 1991. A look at the annual report confirmed the poor quality of the statistical data. For instance, some infectious diseases appeared on the statistical sheet (699 amoebic dysentery, 717 bacillary dysentery, 819 tuberculosis) but there was a category of "pyrexia of unknown origin+other infectious diseases" with 12993 cases. There were 26 cases of nephritis reported but 19,655 cases of "other diseases of the urinary organs". However we found that birth and death registers were properly kept. The death register included age and sex as well as the diagnosis at admission. The most common cause of death was "cardio-pulmonary arrest". Autopsies are not conducted in Pakistan except for legal cases.

## EPI/CDD SURVEILLANCE SYSTEMS

The NIH divisions of EPI and CDD have their own disease surveillance systems from sentinel sites. From the record of the WHO advisers in charge of these programs the surveillance systems is not reliable for research purposes.

### 3. Mortality and Causes of Death data among children 0-4.

#### 3.1 Mortality levels

Table 2 summarizes various estimates of birth and death rates since 1960. Figure 1 and 2 show long term trends in Crude Death Rates (CDR) and in Infant Mortality Rates (IMR). Various authors have commented the accuracy of the data (Irfan, 1986; Sathar, 1991). We found evidence of inconsistencies between surveys, between methods of estimation as well as between authors.

A first glance at the data and the available analyses indicate that:

- a) there is little doubt that general as well as infant mortality has been declining steadily since the turn of the century; this general tendency will have to be taken into account for evaluating interventions;
- b) there are doubts about the magnitude of recent trends in neonatal, infant and child mortality, that is over the last 20 years; the level of inaccuracy in the estimates being roughly the same as the level of the changes;
- c) the level of relative uncertainty on the IMR is about 20%, that is figures average 100/1000 and range from 80 to 120/1000;

- d) the neonatal mortality rate is also approximated with the same magnitude of error (20%). A conservative estimate would be 60/1000, +/- 10/1000.
- e) the level of child mortality, that is age 1 to 4, is quite unreliable, since most of the time it is estimated by difference between one estimate of q(5) and the IMR. A conservative estimate would be 60/1000, +/- 25/1000.
- f) The same is true for the post neonatal mortality, usually estimated by difference between infant and neonatal mortality.

The level of the Maternal Mortality Ratio (MMR) is subject to debates. It ranges from less than 100/100,000 to 6000/100,000. These extreme figures are obviously wrong. In the 1984-1986 PDS, the MMR would be 148/100,000; if these figures were true, maternal deaths would be only 10.3% of deaths of females age 15-49, which is much lower than found in other countries; furthermore all maternal deaths were in the 20-39 age groups, whereas the highest MMR are usually found before age 20 and after age 40. From various authors, readings and guesses, it seems that the MMR is around 450/100,000 +/- 300/100,000.

Estimates of fertility are slightly better: estimates of the Total Fertility Rate (TFR) range from 6 to 8.5; a conservative estimate would be 7.0 +/- 1.0. However, most estimates of the Crude Birth Rates (CBR) fall in a shorter interval of confidence. Most sources agree on a value of 43/1000 +/- 5/1000 and there is no evidence of any trend over time. If this is true, the age structure of Pakistan is approximately stable, which allows one to apply stable models.

A quick comparison of a stable population with the age structure of the 1984-1986 PDS shows that the 0-1 age group was under-estimated by 25%; if this is true, estimates of Infant Mortality could be off by some 25% only because of age misreporting, that is without taking into consideration undercounting of deaths.

### 3.2 Causes of death

Causes of death in the vital registration system are useless. In the above example of Sind, July 1989, among the 2589 deaths reported 4 were attributed to Respiratory infections, 27 to Fevers and the rest to "other and unknown". Many surveys report some kind of cause of death, usually from report of the family. To our knowledge, no scientific evaluation on the value of such report was conducted. In any case, the published data from demographic surveys are not satisfactory for our purpose because of the grouping of

causes of death in large categories (see annex 2). For instance Measles and Pertussis deaths are always mixed with "other infections diseases" and Neonatal Tetanus rarely appears as a separate category.

The only information on causes of deaths that we found useful was from hospitals. This is obviously a very biased information. The 1985 PDS survey indicates that only 9.3% of deaths below age 5 years occur in institutions. This information however gives at least a list of diseases that may play a role in deaths of children (see annex 1). It is not possible to assess which are the causes of deaths that account for the largest numbers of deaths among children. It is likely from various reports and from experience of other developing countries that diarrheal diseases and acute respiratory infections account for a large proportion of deaths age 0-4 years, may be up to one third or one half of those deaths; a dozen of other causes share unequally the major part of the rest.

#### 4. INSTITUTIONS DOING RESEARCH IN POPULATION AND HEALTH.

##### 4.1 Federal Bureau of Statistics (FBS)

The Federal Bureau of Statistics is the official organization for conducting demographic and economic surveys throughout the country. FBS is a huge organization under the Statistics Division and has its sub-offices all over the country. It employs a staff of about 2000 people. It collects data on various economic, social and manpower activities. It issues regularly a number of publications. It has also undertaken a morbidity survey in 1982 which gives individuals perception of diseases. Presently it is collaborating with the PMRC in undertaking the National Health Survey of Pakistan. We visited the DG in Islamabad and the Printing office in Karachi. The FBS provides national samples to various organizations.

##### 4.2 National Institute for Population Studies (NIPS)

NIPS is an autonomous institution under the Population Welfare Division. The organization has been created in 1984 and has devoted its efforts towards evaluation of Population Welfare programs. NIPS has conducted a number of large studies in the field of Population (PGS), Fertility (PFS), Education and Health (PDHS). NIPS has published a book on the "State of Population in Pakistan, 1988" which includes demographic features of Pakistan including some health indicators. The Institute has a core of 17 demographers, some of them of MA/PhD level. A number of them are currently

trained abroad. NIPS is currently undertaking the PDHS.

NIPS has the expertise for conducting demographic and health surveys at a national level. However there is no physician and no epidemiologist employed at NIPS. NIPS would be a good candidate for conducting the field work for a Population and Health Prospective Survey, provided experts in epidemiology are included in their teams.

#### 4.3 Pakistan Institute for Development Economics (PIDE)

PIDE is a major research institution, working mostly in the field of Economics but also in Sociology and Demography. We visited Dr Zeba Sathar, demographer, who recently completed a review of mortality trends and differentials (Sathar, 1991). PIDE has a good research capacity, international connections but is specialized in research from secondary data. PIDE expertise for data management and data analysis could be utilized.

#### 4.4 Pakistan Medical Research Council (PMRC)

The PMRC is an organization under the Ministry of Science and Technology with the function to organize, coordinate and promote scientific research in various fields of medicine and public health in the country. It works in close cooperation with the Ministry of Health and Provincial Health Departments. It has established 18 Research Centers in various medical institutions in the country. Out of these, 12 are in various medical colleges, 2 are in postgraduate medical institutions and one at the NIH, Islamabad. In addition there are three research centers undertaking health systems research which is population based. These centers are based at Peshawar, Islamabad and Karachi (see above 2.6). Experience for PMRC longitudinal studies could be used for designing a study. PMRC at present does not have adequate supervision staff for its field activities.

#### 4.5 Agha Khan University, Dpt of Community Health Sciences (AKU/CHS)

The AKU has an active department in the field of Community Health. The AKU/CHS has various intervention projects throughout the country. It also conducts surveys such as the Maternal and Infant Mortality Survey (MIMS). However the scope of the work of AKU is rather local and limited and aims first at service delivery and training.

#### 4.6 Maternity and Child Welfare Association of Pakistan (MCWAP)

This is a non-governmental organization (NGO) which started in March 1961. The objectives of MCWAP is to promote the health of women, to lower childhood mortality and morbidity, to promote healthy growth, to promote birth control (spacing and limiting), to seek and present vital information relevant to health and welfare of mothers and children and to educate families for achieving better health. It has links with international federations.

They provide basic family planning, education and health services to poor communities. They also conduct operation research on fertility and mortality (pregnancy wastage and abortions, feeding practices, socio-economic correlates). A collaboration with MCWAP could be profitable to both parties for research in pregnancy wastage and child mortality.

### 5. RECOMMENDATIONS FOR FUTURE RESEARCH

#### 5.1 Scientific assessment of mortality levels

Before starting any major research, it might be worthwhile to conduct a proper scientific assessment of existing mortality data. This would imply to go back to original documents, to analyze in depth the biases in the original data, to compute proper intervals of confidence for each estimate and to do a meta-analysis of the whole set of data. This will produce a "likely" estimate of mortality rates and a proper interval of confidence for these estimates. This could be done by a student at Harvard under M. Garenne supervision.

#### 5.2 A prospective study of levels and causes of mortality among preschool children

The aim of the PCSP is to reduce mortality of young children. The interventions of the PCSP are disease-specific and therefore age-specific. For evaluating the impact of the PCSP it will be necessary to estimate as accurately as possible the levels and causes of mortality below age 5 years before and after the project and to monitor the trends during the project.

A first grouping of age could be 0-27 days, 28 days to 5

months, 6 months to 11 months, 1 year to 2 years and 3 to 4 years; a first grouping of causes could be diarrheal diseases (acute watery diarrhea, persistent diarrhea, dysentery, cholera), ARI, acute malnutrition (marasmus, kwashiorkor) and EPI diseases (neonatal tetanus, measles, whooping cough, diphtheria, tuberculosis, poliomyelitis).

To achieve this goal, and given the inaccuracy of available data we recommend to conduct a high quality study which should have the following components:

- a) be based on a national random sample; the sample could be chosen to document a 25% reduction in infant mortality;
- b) be independent of interventions;
- c) include a strong retrospective baseline study: mortality levels by detailed age groups, causes of death, use of health services, anthropometry, breastfeeding and solid food;
- d) be prospective for the duration of the study: continuous registration of births and deaths and family composition, introduction of solid food, breastfeeding and weaning, vaccinations, use of ORT and treatment of ARI;
- e) include a final comprehensive study, with the same components as the baseline.

This study could be conducted by NIPS, and benefit from the expertise of demographer and epidemiologist consultants. The study could use the existing infrastructure of the PCSP in each province. It may cost around US \$ 450,000 over the 4.5 years.

The protocol of the study could be designed in the first semester of 1991, the pilot study conducted after the monsoon of 1991 and the baseline part completed before the end of 1991. The registration could continue from 1992 to 1994 and a final round conducted in the first semester of 1995.

A large study, well prepared and well conducted, would provide reliable age and cause specific mortality rates for under 5 children. The sample would probably be large enough to also estimate maternal mortality with a reasonable interval of confidence.

This study could be used for strengthening the National Essential Health Research capacity. The methodology could be usefully applied to other longitudinal settings such as PMRC, AKU and MCWAP and give them the capacity to undertake research quality work in the future.

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Table 1 : sources of mortality data in Pakistan at the national level.

Source	Information					
	popul- ation	deaths (prospe- -ctive)	deaths last 12 months	CEB/ CSV	Maternity history	cause of death
<b>Censuses</b>						
Census 1951	YES	NO	?	NO	NO	NO
Census 1961	YES	NO	?	NO	NO	NO
Census 1972	YES	NO	?	NO	NO	NO
Census 1981	YES	NO	?	YES	NO	NO
Census 1991	YES	NO	?	?	NO	NO
<b>Vital registration</b>						
before 1962	NO	YES	NO	NO	NO	NO
1962 and after	NO	NO	NO	NO	NO	NO
<b>Prospective Sample Surveys</b>						
PGEE 62-65	YES	YES	NO	NO	NO	YES
PGS 68-71	YES	YES	NO	YES	NO	NO
PGS 76-79	YES	YES	NO	NO	NO	YES
PDS 84-87	YES	YES	NO	NO	NO	YES
PDS 1988	YES	YES	NO	NO	NO	YES
<b>Retrospective Sample Surveys</b>						
NIS 68-69	NO	NO	YES	NO	NO	NO
HEDS 1973	NO	NO	NO	YES	NO	NO
PFS 1975	NO	NO	NO	NO	YES	NO
PLM 79-80	NO	NO	NO	NO	YES	NO
PCPS 84-85	NO	NO	NO	YES	NO	NO
NHSP 1989 =HEIS	NO	NO	NO	NO	YES	NO
PDHS 1991	NO	NO	NO	NO	YES	YES
HIES 1991	NO	NO	NO	NO	NO	NO
PIHS 1991	NO	NO	NO	NO	YES	NO
<b>Other surveys on morbidity or Nutritional status</b>						
NSWP 65-66	NO	NO	NO	?	?	NO
MNS 76-77	NO	NO	NO	?	?	NO
NHS 1963	NO	NO	NO	?	?	NO
NHS 82-83	NO	NO	NO	?	?	NO
NNS 85-87	NO	NO	NO	?	?	NO
NTPS 87-88	NO	NO	NO	?	?	NO

Table 2 : Various demographic estimates according to sources

	PGEE 62-65 (LR / CD)	PGS 68-71 (CS)	PGS 76-79 (CS)	PFS 1975	PLM 75-79	PCPS 83-84	PDS 84-86
<b>Population growth</b>							
CBR	42/52	37.8	42.8	39	-	-	42.8
CDR	15/18	11.4	10.5	-	-	-	11.1
CRNI	27	26.3	31.3	-	-	-	31.7
<b>Mortality</b>							
IMR	177/211	113	94	-	125	106	113
NNMR	- /77	-	54	-	83	-	59
q(5)	256/309	-	-	225	169	-	184
e°	-	-	-	-	-	-	58
MMR	-	-	-	-	-	-	153
<b>Fertility</b>							
GFR	192/249	186	206	-	-	-	197
TFR	6.09/7.95	6.04	7.04	7.20	-	-	6.95
MAM(F)	-	20.0	-	-	-	-	-
MAM(F)	-	25.5	-	-	-	-	-

- CBR Crude Birth Rate (/1000 person-years)
- CD Crude Death Rate (/1000 person-years)
- CRNI Crude Rate of Natural Increase (/1000 person-years)
- IMR Infant Mortality Rate (/1000 live births)
- NNMR Neonatal Mortality Rate (/1000 live births)
- q(5) Probability of dying between age 0 and 5 (/1000 live births)
- e° Life expectancy at birth (years)
- MMR Maternal Mortality Ratio (/100,000 live births)
- GFR General Fertility Rate (/1000 person-years)
- ASFR Age Specific Fertility Rate (/1000 person-years)
- TFR Total Fertility Rate (births/woman)
- PAR Mean Parity at age 50 (births/woman)
- MAM Mean age at marriage (years)

Table 3 : Example of Monthly Statistics of Births and Deaths of Towns Having A Population of 30,000 and over for the month of July 1989, Province of SIND.

Town	Population	Births	Deaths	CBR	CDR
1 Karachi	7395564	13721	2085	22.3	3.4
2 Hyderabad	945258	529	243	6.7	3.1
3 Sukkur	232375	574	76	29.6	3.9
4 Larkana	203161	75	19	4.4	1.1
5 Mirpurkhas	181877	69	21	4.6	1.4
6 Nawabshah	126691	219	31	20.7	2.9
7 Shikarpur	106238	59	22	6.7	2.5
8 Jacobabad	105712	26	10	3.0	1.1
9 Tando Adam	82095	87	12	.7	1.8
10 Khan Pur	78597	12	14	1.8	2.1
11 Tando Moh Kh	45042	70	5	18.6	1.3
12 Shahdadpur	58913	148	15	30.1	3.1
13 Dadu	47861	5	16	1.3	4.0
14 Kotri	46517	48	9	12.4	2.3
15 Shahdat Kot	42036	2	0	.6	0.0
16 Kandh Kot	40439	2		0.6	0.6
17 Rohri	39551	5	0	1.5	0.0
18 Thatta	49737	55	6	13.3	1.4
19 Tando Allah	38967	42	3	12.9	0.9
Sind, Urban	9866631	15748	2589	19.2	3.1
Completeness %				44.5	31.5

Annex 1

LIST OF DISEASES FREQUENTLY FOUND IN MORBIDITY AND MORTALITY REPORTS FROM HOSPITALS

Cholera (rarely appears in statistics)  
 Typhoid  
 Typhus  
 Amoebiasis and other dysenteries  
 Watery diarrheas  
 Tuberculosis (various kinds)  
 Viral hepatitis  
 Septicemia  
 Malaria  
 Meningitis  
 Tetanus  
 Measles  
 Whooping Cough  
 Pneumonia, Broncho-pneumonia, bronchitis  
 Influenza

Protein-Energy malnutrition  
 Goiter  
 Anemia  
 Avitaminosis

Prematurity, low birth weight

Asthma  
 Epilepsy

Female genital infections  
 Abortion  
 Various obstetric

Diabetes  
 Neoplasms (various kinds)  
 Eye diseases (cataract)  
 Mental disorders  
 Hypertension  
 Heart diseases  
 Cerebro-vascular diseases  
 Ulcers  
 Appendicitis  
 Hernia  
 Cirrhosis  
 Nephritis

Accident and Violence

Annex 2

List of Causes of death use in Demographic Publications  
(50 causes of morbidity/sickness, based on 1955 ICD)

- C-1 Tuberculosis of respiratory system
- C-2 Tuberculosis, other forms
- C-3 Syphilis and its sequelae
- C-4 Gonococcal infection
- C-5 Dysentery, all forms
- C-6 Other infective diseases commonly arising in intestinal tract
- C-7 Certain diseases common among children  
(scarlet fever, diphtheria, whooping cough, measles, mumps)
- C-8 Typhus and other rickettsial diseases
- C-9 Malaria
- C-10 Diseases due to helminths
- C-11 All other diseases classified as infective and parasitic
  
- C-12 Malignant neoplasms, including neoplasms of lymphatic and hematopoietic tissues
- C-13 Benign neoplasms and neoplasms of unspecified nature
- C-14 Allergic disorders
- C-15 Diseases of thyroid glands
- C-16 Diabetes mellitus
- C-17 Avitaminosis and other deficiency states
- C-18 Anaemia
- C-19 Psychoneuroses and psychoses
- C-20 Vascular lesions affecting central nervous system
- C-21 Disease of the eye
- C-22 Disease of the ear and mastoid process
- C-23 Rheumatic fever
- C-24 Chronic rheumatic heart disease
- C-25 Arteriosclerosis and degenerative heart disease
- C-26 Hypertensive disease
- C-27 Diseases of veins
- C-28 Acute nasopharyngitis (common cold)
- C-29 Acute pharyngitis and tonsillitis, and hypertrophy of tonsils and adenoids
  
- C-30 Influenza
- C-31 Pneumonia
- C-32 Bronchitis
- C-33 Silicosis and occupational pulmonary fibrosis
- C-34 All other respiratory diseases
  
- C-35 Diseases of stomach and duodenum
- C-36 Appendicitis
- C-37 Hernia of abdominal cavity
- C-38 Diarrhea and enteritis
- C-39 Disease of gallbladder and bile ducts
- C-40 Other diseases of digestive system

C-41 Nephritis and nephrosis  
C-42 Diseases of genital organs (male and female)  
Annex 2 (end)

C-43 Deliveries and complications of pregnancy, childbirth and the puerperium

C-44 Boil, abscess, cellulitis and other skin infections  
C-45 Other diseases of skin

C-46 Arthritis and rheumatism, except rheumatic fever  
C-47 Diseases of bones and other organs of movement  
C-48 Congenital malformations and diseases peculiar to infancy

C-49 Other specified and ill-defined diseases

C-50 Accidents, poisoning and violence (external cause)

Annex 3 : List of Abbreviations

GOP Government of Pakistan

MOI Ministry of Interior  
RO Registration Office

MOH Ministry of Health

BHS Basic Health Services  
WFP World Food Program  
NIH National Institute of Health  
(was NHL : National Health Laboratories)  
ND Nutrition Division (within NIH)  
PMRC Pakistan Medical Research Council  
(has many Health Systems Research Centers)  
NHRC National Health Research Complex

MOF Ministry of Finances

FBS Federal Bureau of Statistics  
SD Statistics Division (within MOF)  
(was CSO : Central Statistical Office)  
PCO Pakistan Census Organization  
PIDE Pakistan Institute for Development Economics  
TREC Training Research and Evaluation Center  
NSC National Statistical Council

MPD Ministry of Planning and Development  
NIPS National Institute for Population Studies (since 1984)

Associations

PPCP Population Planning Council of Pakistan (Islamabad)  
MCWAP Maternity and Child Welfare Association of Pakistan (Lahore)

Universities and Institutes

AKU Agha Khan University (Karachi)  
JPGMC Jinnah Post Graduate Medical Center (Karachi)  
CCM College of Community Medicine (Lahore)  
KEMC King Edward Medical College (Lahore)  
CZPGMC Cheikh Zaid Post Graduate Medical College (Lahore)  
UP University of Punjab

Journals

PDR Pakistan Development Review  
PPR Pakistan Population Review (forthcoming).

Annex 4 : List of persons visited

December 31, 1990. Islamabad

- Dr Dennis Mull, PCSP chief of party, BHSC/MOH,  
PCSP : Dr Theo Lippeveld, Mr Steve Sacca, Mr Jim Messick;
- Dr Heather Goldman, Deputy Chief HPN and PCSP Project Officer,  
USAID;
- Dr Rushna Ravji, Public Health Physician, USAID.

January 1, 1991. Islamabad.

- Dr Abdul Ghafoor and Colonel Akram Khan. NIH.
- Dr Shamsul Arfeen. DDG Basic Health Services Cell/MOH.

January 2, 1991. Islamabad.

- Dr Tara Upreti, Training adviser PCSP.
- Dr Heather Goldman PCSP Project Officer, USAID
- Dr Rushna Ravji, Public Health Physician, USAID.

January 3, 1991. Islamabad.

- Mr M. Chaudry, statistician, TB program.
- Naseem Iqbal Farooqui, Senior Fellow, NIPS.
- Mr Basit Aziz, Director of Administration, Directorate of  
Registration.
- Mr S. M. Ishaq. DG Federal Bureau of Statistics.

January 5, 1991. Islamabad.

- Pr Iftikar A. Malik. Chairman PMRC.
- Dr Zeba Sathar. Demographer, Chief of Research, PIDE.
- Dr Mustaq Chaudry. DDG World Food Program/MOH.
- Mr Nazir A Shaikh. Chief Statistical Officer. Biostatistics/MOH.

January 6, 1991. Islamabad and Rawalpindi.

- Dr Sawat Ramaboot, WHO adviser for CDD and ARI at NIH;
- Dr Ali Idriss, WHO adviser for EPI at NIH;
- Visit to District Headquarters Hospital, Rawalpindi.  
Dr Hamidullah Khan, Medical Superintendent.
- Dr Shastia Riaz, in charge of Diarrhea Treatment Center.
- Visit to Pakistan Medical Research Council Headquarters.  
Dr Irhsad Ali Sheikh.

January 7, 1991. Lahore.

- National Health Research Complex: Dr N. Rehan, Dr Col M. Ayub. Medical Officer in charge of field research.
- MCW Association: Dr and Mrs Dr Awan.
- Visit to a MCWA field site:
- Mr Khalid Hayat Khan, ex Prof of Statistics Punjab Univ.

January 8, 1991. Karachi.

- Dr Nisar Ahmad Siddiqui, Project Director BHSC/MOH.
- Agha Khan University, Community Health Services: meeting with Dr John Bryant, Khatija Hussein, Vincent DeWitt; Field visit to a AKU health center.

January 9, 1991. Karachi.

- Former PMRC headquarters: Dr Motein, Principal Research Officer.
- Field visit to the Gizri Project (health system Research Study): Dr Sultana Habibullah and Mr Abid Siddiqui.

January 10, 1991. Islamabad.

- Short talk with a MPH candidate
- Debriefing at USAID.

Figure 1

35

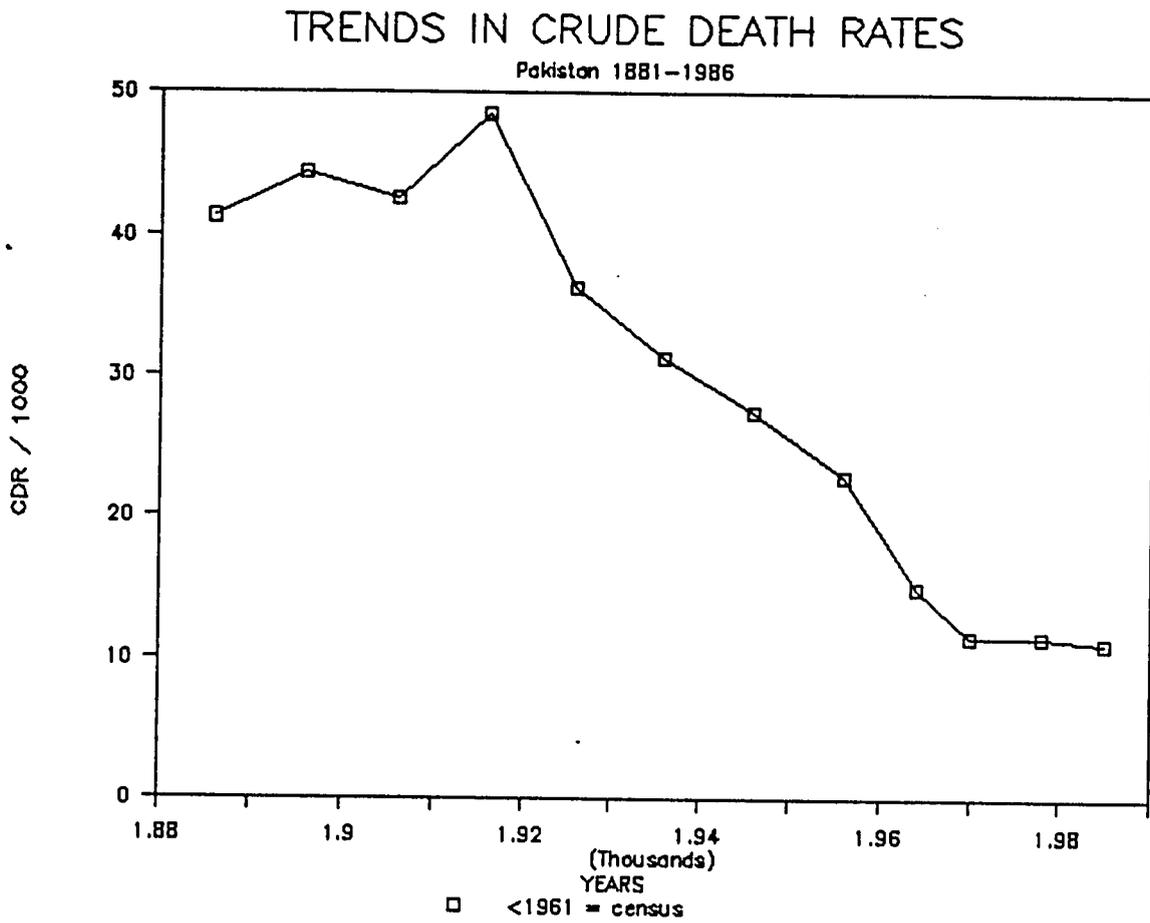


Figure 2

### TRENDS IN INFANT MORTALITY RATES

Pakistan 1901-1986

