An estimate of disease burden in women and children in India in the 1990s.

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Preface

In 2001, the Government of India - Ministry of Health and Family Welfare (MoHFW) commissioned the Institute of Health System and the authors, to prepare an overview of burden of disease among women and children in India, to inform the Tenth Five Year Plan (2002-2007) Working Group On Health Care for Women and Children. An earlier version of this document, prepared in May 2001, was incorporated as chapter-II Working Group's draft report (unpublished: MOHFW RSS division letter No.11027/3/2001-TO).

The above document was reformated by April 2002 for publication as Working Paper. However, the paper could not be published at the time, due to oversight. The paper is now released for reference by Institute's faculty and other academic use.

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Women and children in India are vulnerable groups owing to the socio economic structure of Indian society. This vulnerability is reflected in their health status, which, going by the current level of MCH indicators such as IMR and MMR, is not very encouraging. Knowing this, the next step is to identify the major causes of disease burden in these groups. This will enable the development of targeted interventions that will provide them the necessary support for their survival, growth, development and sustainance. Such a priority setting exercise naturally requires robust data on disease burden, so that decisions can be taken with reasonable confidence. Alternatively, in the absence of wholly reliable data, it is necessary to have some estimates, with the levels of uncertainty, which again, will be of help in the formulation of health policy.

I. Sources of data:

A. Definitions

1. Age sex groups: The population sub groups and causes of disease burden in each are as follows:

i. Women - all females aged above 15 years in the following age groups :
   a. Maternal age : 15 - 44 yrs
   b. Menopausal age : 45 - 59 yrs
   c. Geriatric age : 60 yrs and above
   d. Disease burden in females aged below 15 years is accounted for in the estimates prepared for children.

ii. Children - both sexes in the following age groups
   a. Infants : < 1 yr
   b. Pre-school children : 1 - 4 yrs
   c. School age children : 5 - 14 yrs

2. Causes of disease burden:

As mentioned earlier, there is a variation the availability of cause of death data from different sources. In addition, there is a need to transform the available data into information that is useful for guiding health policy. In this scenario, it is critically important to select a scheme for classification of causes of disease burden that will be a) feasible in the purview of data availability and b) convey relevant information in a manner appropriate for decision makers.

An important constraint in the selection of various components of the classification scheme is that (each group or sub group of causes should retain the attribute of additive decomposition). Other factors which can guide the identification of individual clusters of diseases are common aetiology, common risk factors, common organ involvement, common intervention strategies, or common pathology etc. The Global Burden of Disease study used the

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approach to classification based on changes in disease trends along the epidemiological transition. In this study, keeping in mind the specificity of preparing estimates of disease burden for specific age sex groups, separate cause classification schemes have been designed for women and children. It may be noted that for both women and children, estimates have been prepared for all three age groups retaining the same cause of death structure, that enables studying changes in mortality structure with age.

B. Classification scheme of causes of disease burden in women

Table-1 shows the tree structure of the disease classification scheme for this group. It can be seen that there are five major cause groups, which have been selected on the basis of different criteria, and the justification for the selection of each is described briefly for each group.

Table-1: Classification system for diseases and injuries in women by causes of death

Grp / SGrp	Cause of death	Grp / SGrp	Cause of death
I.	Maternal conditions	IV	Other major causes
A	Maternal haemorrhage	A	Infectious and parasitic diseases
B	Maternal sepsis	i	Diarrhoeal diseases
C	Hypertensive diseases of pregnancy	ii	Tuberculosis
D	Obstructed labour	iii	Tetanus
E	Abortions	iv	Malaria
F	Other maternal conditions	v	Typhoid
II.	Disorders of female reproductive organs	B	Disorders of circulatory system
A	Breas cancer in women	i	Ischaemic heart disease
B	Cancer cervix etc.	ii	Cerebrovascular disease
C	Other dis. of female reproductive organs	C	Disorders of the nervous system
III.	Dis.due to socioeconomic vulnerability of women	D	Disorders of the digestive sys.
A	Anaemia	E	Diabetes mellitus
B	Burns	VI	All other causes
C	Poisonings	A	Ill defined conditions
D	Nuero psychiatric disorders	B	Septicaemia
E	Sexually transmitted diseases	C	All other infectious diseases
F	Effects of indoor air pollution	D	All other neoplasms
i	Lower respiratory tract infections	E	Other dis.of circulatory sys.
ii	COPD	F	All other respiratory disorders
		G	All other injuries
		H	All other causes

Women = Females > 15 yrs. Girls 14 yrs or less are included among children. Grp=Group, SGrp=Sub group

1. Maternal conditions:

Child bearing exposes the female sex to a number of hazards, which can be reduced by availability of adequate health care during the stages of pregnancy, delivery and puerperium. There are a number of proximal factors that increase the vulnerability of women to these hazards, such as early age at first pregnancy, poor nutritional status, rapid succession of pregnancies etc. For the purpose of this analysis, however, estimates of disease burden are restricted to the listed direct causes of maternal deaths. Data for these causes is available from both urban and rural cause of death reporting systems. In addition, data on obstetric morbidity

from a community based survey in Karnataka using self reported symptoms has been also described.

2. Disorders of female reproductive organs:

Diseases of reproductive organs are causes of burden in both males and females. However, the burden is much higher among females, both in the number of such disorders as well as in the number of individuals affected by them. Mortality due to such disorders mainly results from cancers. There are a number of conditions such as leucorrhoea, pelvic inflammatory disease, stress incontinence, menstrual disorders, uterovaginal prolapse to name a few which are major causes of morbidity among women, and will need to be considered in any discussion on estimates of disease burden. In addition, details of mortality due to disorders of female reproductive organs are available only from urban areas of the country, through the system of medical certification of cause of death, and are hence described only from urban populations. Data on gynaecological morbidity from two community based surveys, one using clincial evaluation diagnostic procedures and the other using self reported symptoms have also been described.

3. Disorders due to socio-economic vulnerability of women:

It has been well recognized that women in our country are a much stressed group, making them vulnerable to a number of health hazards, with resultant effects. A number of such effects, have been considered together in this cluster. Firstly, the disease burden due to anaemia is linked to a host of factors such as poor dietary intake, low levels of literacy, early and rapid succession of pregnancies etc, all of which arise out of socio economic vulnerability of females. Women being traditionally responsible for cooking, are exposed to the hazard of fire accidents, but fire is also the instrument in other cases of assault or self inflicted injury, with involvement in cooking serving as a convenient alibi. In addition to the fire hazard, cooking using biomass fuels exposes women to the risks of indoor air pollution, which is being incriminated in the high respiratory illness burden in women. Neuro psychiatric morbidity plays an underlying role in self inflicted injury, especially poisoning, and is commonly a result of exogenous socio economic factors that place the woman in a disadvantaged position. Professional female sex workers are vulnerable to the risks of contracting sexually transmitted diseases.

4. Other major causes:

This group consists of disorders for which the risks are equal in both males and females, but which account for significant proportions of overall burden. Diarrhoeal diseases share a common aetiology in unsafe water supply and poor domestic hygiene and sanitation, therefore can be tackled with common intervention strategies. Tuberculosis too is a major cause of burden, which needs to be quantified separately as we have a full fledged functioning national program which can be evaluated using these estimates. The fact that tetanus still accounts for deaths in adult women is disturbing, and there is a likelihood of this burden being linked with motherhood, therefore this cause has been listed separately in the classification. Ischaemic heart and cerebrovascular disease are principal causes of death in adults. Diabetes mellitus is an important individual disease that causes both morbidity and mortality, as well as is involved in causation of other diseases, especially of the circulatory system.

5. All other causes:

This group includes the conditions that fall into the residual categories for most of the major causes included in different groups above. There are three important inclusions in this group that require special mention. Firstly, the large number of deaths assigned ill defined causes. This raises doubts in the quality of medical certification. Similarly, the large number of deaths due to septicaemia, which is almost always likely to be a terminal event and an immediate

cause of death in many situations rather than an underlying cause of death. Finally, the large number of deaths categorised as 'Other disorders of the circulatory system', which includes deaths certified as due to cardio respiratory failure / cardio pulmonary arrest etc as the only cause of death entered on the certificate. The high proportions of deaths in these three categories has been brought out to illustrate the quality of data on which important policy decisions are to be taken, and to focus attention on steps required to remedy this situation. The other residual categories have been included to serve as accessories for computation of proportionate mortality ratios within disease categories, if desired.

C. Classification scheme for causes of disease burden in children:

Table-2 shows the classification scheme for children aged 0 -14 years. It consists of four broad groups, of which the first three comprise of major causes and the last of miscellaneous causes. In the first age group, ie < 1 year, the bulk of the burden is due to perinatal disorders, the remaining being accounted for by infectious diseases. The five diseases for which the immunization program is in place have been grouped together as vaccine preventable diseases. Other infectious diseases that cause morbidity include otitis media and skin disorders. Nutritional deficiencies are a major cause of both mortality and morbidity among children in all age groups. As observed in the other classification scheme, the pattern gets distorted due to causes of death being assigned to 'Ill defined conditions' and septicaemia, which have hence been classified separately.

Table-2: Classification scheme for disorders in children aged 0 - 14 yrs

Grp / SGrp		Cause	Grp / SGrp		Cause
I	Perinatal disorders		III	Other major causes	
	A	Prematurity		A	Congenital malformations
	B	Birth asphyxia		B	Nutritional deficiencies
	C	Birth trauma		C	Anaemia
II	Infectious and parasitic diseases			D	Injury and poisoning
	A	Diarrhoeal diseases		E	Dis.of the circulatory system
	B	Vaccine preventable diseases		F	Dis. of the digestive system
	C	Tuberculosis	IV	Other causes	
	D	Malaria		A	Ill defined conditions
	E	Influenza		B	Septicaemia
	F	Typhoid		C	Other infect. and parasitic dis.
	G	Lower resp. tract infections		D	Other perinatal conditions
	H	Meningitis		E	Other dis. of the respiratory sys.
	G	Intestinal helminthiasis		F	Other dis. of the nervous sys.
				G	All other causes

Grp=Group, SGrp=Sub group

D. Data inputs for estimation of disease burden

Following is a brief summary of inputs required for estimation of disease burden in a population.

i. General demographic estimates consisting of (a) Age sex specific count of population, and (b) Age, sex specific death rates (ASDR) including the infant mortality rate (IMR). Population counts by age group and sex allows for estimation of the total number of prevalent and incident cases by applying the relevant incidence / prevalence estimates to the respective population counts. The age specific death rates coupled with age specific count of population provide an estimate of deaths in each age sex groups.

ii. Cause specific mortality proportions to allow for disaggregation of premature mortality estimates by cause groups. Disaggregation of premature mortality by cause groups is an essential step for setting of priorities. Maternal mortality rate (MMR) is a variant of the cause specific mortality proportions. This is calculated by grouping together deaths due to all causes associated with pregnancy and child birth.
iii. Descriptive epidemiological information consisting of incidence or prevalence, age at onset, duration and remission of various diseases in different age sex groups. Incidence-prevalence data is very useful to appreciate the disease burden due to non fatal health outcomes.
iv. Health state valuation by the community. These weights are used for computation of summary measures of population health. For example disability weights are needed for computation of years lived with disability and disability adjusted life expectancy. Health state weights or its complement the disability weights are arbitrary weights in the range of 0 to 1 assigned to specific morbidity conditions based on common appreciation of its severity, and suffering.

E. Data sources for estimation of disease burden

1. General demographic estimates:

Population counts are available from the decennial censuses conducted by the Registrar General of India (SRS). The sample registration schemes (SRS), also run by the RGI provides data on age specific death rates, infant mortality rates (IMR) used from these sources include age sex population distributions and age sex specific death rates.

2. Causes of death:

Cause specific mortality statistics are available in India for both rural and urban areas, again, through schemes run by the RGI. In rural areas, the Survey of Cause of Death - Rural (SCDR) scheme was in operation till 1998. In this scheme, continuous enumeration of deaths was carried out in a sample of villages in each state, and for each death, a report was obtained on cause of death by lay reporters using Verbal Autopsy methodology. Since 1999, this scheme has been replaced by the SRS - Cause of Death Scheme, which follows a similar methodology with some modifications. In urban areas, for all deaths that receive medical attention at the time of death, a report on cause of death is to be furnished by the attending physician to the local registrar of births and deaths. This medical certification of cause of death (MCCD) is according to the guidelines prescribed by the WHO. The level of detail with reference to cause of death varies in the two reporting system. The lay reporting system has a minimal mortality list restricted to 65 causes organised into 10 clusters, and the MCCD scheme provides more detail on cause of death, according to the Indian National List which has 278 groups of causes of death, which have been organized into 72 sections and further into 20 clusters. The presentations in this chapter has been organized in a manner that will allow some comparisons to be made between the causes of death in rural and urban areas, despite these differences in level of detail of availability of information. From both sources, data has been used to generate cause specific mortality proportions and in turn, these have been used to generate population estimates of cause specific deaths at three points in time for India, viz 1991, 1996 and 2001. For the 2001 estimates, age specific death rates pertaining to 1998 have been used.

3. Descriptive epidemiology:

Epidemiological data on morbidity due to various conditions has been obtained from research papers and published reports from diverse sources. A list of the references is included in the bibliography.

4. Summary measures of disease burden:

The Global Burden of Disease Study 1996 provides estimates of disease burden in terms of Years of Life Lost (YLLs) due to premature mortality, years lived with disability (YLDs), and Disability Adjusted Life Years (DALYs). As mentioned earlier, a large number of assumptions and approximations were used in generating these estimates, and should be interpreted accordingly.

II. Accuracy, reliability, geographic distribution

The SRS has been a fairly good source of mortality statistics so far. Various demographers have estimated that the SRS under reports deaths by about 10% but gives a robust estimate of ASDRs and age pattern of mortality. However this situation should not be taken for granted. There is some evidence to suggest that the accuracy of SRS estimates appear to have suffered some what during the 1990s (Mahapatra, 2001). SRS at present provides estimates of ASDR, IMR, and age composition of population for the country and 15 major states. The sample size is not adequate enough to generate district level estimates. This is a major handicap. District and sub district level estimates are essential inputs for decentralised planning and finer targeting of programmes based on need.

Table-3: Overall assessment of performance of cause of death reporting system in India

Criteria	Brief Review of Performance	Rating
Design of Reporting System	SCD-Rural based on verbal autopsy. Recently replaced by summary verbal autopsy questions added to the SRS. MCCD based on WHO-ICD basic tabulation lists.	Satisfactory
Coverage / Compliance	In rural areas, coverage is about 60-75% of designed sample. In urban areas, cause of death reports are filed only for 20-25% deaths. Under counting is uniform across age groups, except for children in 0-4 years.	Poor
Incidence of unclassifiable deaths	SCD-Rural: 20% or more. MCCD: 15%	Poor
Consistency of cause specific mortality proportion with general mortality level	In about 30 to 40% of age, sex, and cause group, mortality reported by Indian cause of death systems deviated by more than 3 standard deviations from the general mortality based model predictions for the corresponding groups.	Tolerable
Incorrect assignment of causes with clear age sex dependency	A few such cases are reported both by SCD-Rural and MCCD. Suggests no systematic screening of cause of death reports at any level.	Tolerable
Incidence of improbable age sex distribution by cause	No such evidence for top ten causes of death. However, deviations for other causes can not be ruled out.	Satisfactory
Consistency of cause specific mortality proportion over time	Examined for major cause groups and top ten detailed causes as well. Cause specific mortality proportions are consistent over consecutive years.	Satisfactory
Timeliness of reports.	One to seven year gap between the year to which data relates and the year of publication.	Poor

Source: Mahapatra & Rao, Cause of death reporting in India. A performance analysis. WP 36/2000,IHS,Hyd.

Valid and reliable statistics on cause of death is an essential input for setting of priorities in the health sector. An ideal cause of death reporting system consists of: (a) a fully developed vital registration system with, (b) cent percent medical attendance at the time of death, and (c) full compliance by the health care providers in writing up and transmission of cause of death reports. Mahapatra and Rao (2000) have recently analysed the performance of the cause of death reporting system in India. Table-3 shows a summary of their assessment of the cause of death reporting system in the country.

To assess usability of cause of death statistics Mahapatra and Rao (2000) have examined the SCD-Rural and MCCD data for a period of about five years in the first half of 1990s using nine usability criteria. These usability criteria are: (a) content validity of lay reporting systems, (b) adequate coverage and compliance, (c) validity of statistics at sub-national levels of disaggregation, (d) minimal usage of residual categories, such as unclassifiable, or ill defined conditions, (e) consistency of cause specific mortality proportion with general mortality level, (f) absence of incorrect assignment of causes with clear age sex dependency, (g) no case of improbable age sex distribution by cause, (h) consistency of cause specific mortality proportion over time, and (i) timely compilation and publication of the statistics. The found that major factors affecting usability of the cause of death statistics in India are (a) poor coverage, (b) high incidence of unclassifiable deaths, (c) long delay and irregular publication of statistics, and (d) lack of systematic screening.

III.Problems of making estimates

Lack of reliable and valid data is the major problem in estimating disease burden. At the national level, the reliability and validity of statistics on general mortality, and cause of death needs to improve. Descriptive epidemiology data is very scanty even at the national level. What ever little data is available do not always provide estimates of generic epidemiological parameters like true incidence and population based prevalence. Recently the World Health Organisation (WHO) has started using summary measures of population health status. These summary measures basically combine the disease burden due to premature mortality and disease burden due to diseases that give rise to morbidity but may not directly lead to mortality. These measures have significance in view of epidemiologic transition. Any summary measure will require in addition to general mortality, cause of death and descriptive epidemiology, community valuation of different health states. A community based health state valuation study was conducted in Andhra Pradesh, India (Mahapatra, Nanda and others, 2000). However, the disability weights assigned to a various health states is a value judgement. Hence any summary measure of population health needs to be viewed with caution. Particularly the burden of disease estimates should not be viewed as exact. These are estimates sensitive to assumptions of disability weights and descriptive epidemiology estimates. However, these estimates provide useful insights at very broad levels of aggregations.

Another problem is about disaggregation of estimates by geographical regions and various population sub groups. Availability of data for composite national level estimates is poor. The situation generation of state and below state level estimates is all the more depressing.

IV.Estimates of disease burden in women and children.

A. Conventional measures of disease burden

1. Maternal mortality:

Estimates of maternal mortality are difficult to arrive at through methods of direct estimation, owing to the paucity of availability of region and time specific data. Two sets of estimates on maternal mortality rates are available for India, one obtained through indirect methods, and the other obtained using direct methods.

Table-4: Indirect estimates of maternal mortality, maternal death rates and percentage of maternal deaths to all female deaths in 15-49 age group for All India and States, 1982-86, and direct estimates for 1997 obtained from SRS.

State / Area	Indirect estimates 1982 - 86			SRS 1997
	Maternal mortality ratio	Maternal death rate*	Percentage of maternal deaths**	Maternal mortality rate
India total	580	82	21	407***
India rural	638	96	22	NA
India urban	389	44	17	NA
Andhra Pradesh	394	50	13	159
Assam	1,068	145	27	409
Bihar	813	139	27	452
Gujarat	373	51	15	28
Haryana	494	79	25	103
Karnataka	439	54	19	195
Kerala	247	21	15	198
Madhya Pradesh	507	84	21	498
Maharashtra	439	54	19	135
Orissa	844	113	24	367
Punjab	207	25	11	199
Rajasthan	627	110	29	670
Tamilnadu	372	38	10	79
Uttar Pradesh	920	160	32	707
West Bengal	561	73	20	266

* Number of deaths per 100000 women in 15-49 age interval

** Maternal deaths as percentage of all female deaths in 15-49 interval

*** 95 % CI for MMR estimate for India = 351 - 463.

Regression model based estimates: Mari Bhat et al in 1995 carried out an indirect estimation procedure to estimate MMR for India and the states. The technique involves estimation of maternal mortality by relating the sex differentials in mortality for people of reproductive age to the age schedule of fertility. This method was applied to data from the Sample Registration System for 1982 - 86, and the results indicate a level of 580 maternal deaths per 100,000 live births for India as a whole, with 638 in rural areas and 389 in urban areas. The steps involved included calculation of estimates from regression models based on two specifications, namely Specification A which used sex ratio of death rates as the dependent variable, and Specification B, which used female death rates as the dependent variable. The two estimates obtained separately were later averaged to produce the final results for India and states, as shown in the following table.

Direct estimates: The Sample Registration System carried out an estimation procedure based on data collected using Verbal Autopsy on maternal deaths that were recoded by the

System in 1997. However, the authors have appealed for caution to be exercised during interpretation of the results, owing to deficiencies such as inadequate sample size. The estimates from this method are shown alongside the earlier results in Table-4.

As can be seen, there has been a decline in the MMR in the past two decades. Bhat et al applied their method on data available from the NSS 14th, 16th and 19 rounds, as well as SRS data in the 1970s to develop a time series of MMR estimates as shown in Table-5, which shows a similar trend of reducing MMR over time.

Table-5. Changes in MMR Regression model based estimates based on sex differentials in mortality and fertility schedule data.

Data Source	Years	MMR
NSS, 14th and 16th rounds	1957-60	1,321
NSS, 19th round	1963-64	1,195
SRS	1972-76	853
SRS	1977-81	810
SRS	1982-86	580

Source: Mari Bhat P.N. and others; Maternal Mortality in India: Estimates from a Regression Model, Studies in Family Planning, 19095 Jul- 1995 Aug. 31: 26(4): 217-232.

Similar methodology may be applied on more recent data from SRS to validate results obtained through direct estimation techniques. Another indirect estimation method that employs the sisterhood survival technique is also under trial in a study in Andhra Pradesh. Since the sample size requirements for estimating maternal mortality are huge, a possible data source could be the census data collection mechanism.

Cause specific mortality statistics (Annexure-6) obtained from both rural and urban areas for the period 1991 to 1995 has been analysed, and the percentage distribution by cause is shown in Table-6. In addition, data in obstetric morbidity also provides useful information, as it has been estimated from one small prospective study that had been conducted in a village in India that for every maternal death, there are 16.5 pregnancy related morbidities.

Maternal mortality: Data on maternal causes of death is available from both urban and rural areas. However, a large proportion of deaths in urban areas are on account of residual groups, and thus cannot be analysed adequately. For instance, ‘other direct obstetric causes’ accounts for 28.8 % of maternal mortality, and this group includes conditions such as ectopic pregnancies, ruptured uterus, intra operative and anaesthesia related complications etc.

Table-6: Percentage distribution of maternal causes of death in urban and rural areas of India 1991 - 1995

Cause of death	Rural deaths	Urban deaths
Maternal haemorrhage	24.2 %	18.2 %
Maternal sepsis	11.1%	9 %
Hypertensive dis of pregnancy	11.6 %	11.5 %
Obstructed labour	6.8 %	2.3 %
Abortions	13 %	14 %
Anaemia	19.2 %	-
Other direct obstetric causes*	-	28.8 %
Indirect obstetric causes**	-	16.3 %
Other and unspecified maternal conditions	13.8 %	-
Total maternal deaths	1,646	12,482

* Direct causes = ectopic pregnancy, anasthesia related complications etc
**Indirect causes = malaria, heart disease, liver disease etc complicating pregnancy.

Abortions account for a significant proportion of maternal deaths. In urban areas, data is available on deaths due to spontaneous and legally induced abortions separate from other abortions, which account for about 20 % of all abortions. Maternal haemorrhage is an important cause of burden in both urban and rural areas. Data from rural areas shows that anaemia is responsible for almost 20 % of maternal deaths, apart from being a major cause of burden in women otherwise. Similar data is not available from urban areas, with deaths due to anaemia complicating pregnancy being clubbed with other indirect obstetric causes such as infectious diseases, heart conditions etc. Detailed disaggregated data would assist in proper assessment of burden due to these causes individually. Maternal deaths account for 12.1 % of deaths in the reproductive age group i.e. 15 - 44 years in rural areas, and 7.2 % of deaths in urban areas in the same age group. This percentage of deaths in urban areas would also include a number of complicated cases coming from rural areas to urban centres, and therefore the true proportion of urban maternal deaths would be less, justifying the notion that urban population has better access to maternal health care facilities.

Obstetric morbidity: As mentioned earlier, maternal mortality is just the tip of the iceberg of the obstetric health problems of women. Based on various estimates, it has been calculated that there are 8.25 million such morbidities each year world-wide. These estimates, however crude and unreliable, point to the magnitude of the problem of obstetric morbidity. Bhatia and Cleland conducted a community based survey in a sub district in Karnataka in 1993, and came out with some illuminating data on prevalence of obstetric and gynaecological morbidity based on self reported symptoms. The sample consisted of 3600 women (2400 rural and 1200 urban) aged less than 35 years who had at least one child under 5 years age. Sampling strategy was based on logistical considerations, and a contact - response rate of 95 % was achieved.

Table-7. Prevalence of obstetric morbidity in 3600 women from urban and rural areas in Karnataka, 1993.

Type of morbidity	#	%	Type of morbidity	#	%
During Pregnancy			**During delivery**		
Life threatening problems			Life threatening problems		
Swelling of hands and face	156	4.3 %	Labour > 18 hrs	204	5.7 %
Hypertension	135	3.8 %	Excessive bleeding	45	1.3 %
Fever for more than 3 days	106	2.9 %	Loss of consciousness	33	0.9 %
Bleeding	34	0.9 %	Fits or convulsions	4	0.1 %
Fever with rigor	42	1.2 %	Ruptured uterus	4	0.1 %
Fits and convulsions	12	0.3 %	Other major problems		
Other major problems			Torn vagina or cervix	26	0.7 %
Severe vomiting	347	9.7 %	**Post natal period**- Other major problems		
Urinary problems	34	0.9 %	High fever	120	3.3 %
Varicose veins	46	1.3 %	Lower abdominal pain	417	11.6 %
			Pain in pelvic region	278	7.7 %
Post natal period- Life threatening problems			Foul discharge	50	1.4 %
Excessive bleeding	359	10 %	Painful urination	86	2.4 %
Shock	49	1.4 %	Depression	81	2.3 %
Fits or convulsions	4	0.1 %	Breast abscess	26	0.7 %

All questions on obstetric morbidity related to the most recent child birth. Thus, the recall period ranged between 2 to 60 months. The morbid conditions reported by women have been grouped according to their potential severity and life threatening nature, in each of the three stages of maternity, i.e. ante natal, delivery and post natal stages, and are shown in Table-7. The most common causes of morbidity in the prenatal phase include hypertensive disorders of pregnancy and infectious disorders, manifesting with fever. As had been mentioned earlier, hypertensive disorders of pregnancy are important causes of maternal mortality too. Prolonged labour is the most common condition in the delivery phase, and this condition is associated with long term gynaecological morbidity. Excessive bleeding is the most common condition in the post natal phase.

From the analysis, it was found that 10.2 % of women reported one or more of the life threatening conditions during pregnancy. Nearly 10 % of women reported severe vomiting which was sufficient to warrant consultation or treatment. Similarly, during labour, 7.7 % of the sample reported a symptom, and all such symptoms are potentially life threatening problems. During the post partum period, 23 % of the respondents reported at least one adverse health condition, and 10 % of these conditions were potentially life threatening problems.

2. Disorders of female reproductive organs:

Cause specific data for such disorders is available only from urban areas. Cancers are reported from rural areas, but not with details of site specificity. Table-8 shows the percentage distribution of deaths due to such disorders from urban areas in the period 1991 - 1994.

Table-8: Percentage distribution of female deaths due to reproductive tract disorders in urban areas during 1991 - 1994

Cause	F15-44	F45-69	F70-w
Cancers of female reproductive tract	0.6 %	1.3 %	0.5 %
Breast cancer	0.5 %	1.1 %	0.4 %
Other reproductive tract disorders	0.1 %	0.1 %	0.04 %
Total female deaths	172,082	145,165	90,541

While these disorders seem to comprise small fractions of the total burden, they have been described, as per the general dictum that any cause of burden that constitutes at least 1 % of total burden should be mentioned separately. In Table-9 a detailed breakdown of individual female reproductive tract cancers has been given, aggregated across all adult age groups. It can be seen that cancers of the cervix and ovary are the principal causes of genital cancers, while breast cancer also accounts for over 40 % of the burden due to such disorders. Other reproductive tract disorders, such as pelvic inflammatory disease, genital tract infections, and menstrual disorders, while not being causes of mortality, are responsible for a great deal of morbidity, as will be discussed later.

Table-9: Percentage distribution of deaths due to disorders of female reproductive organs in India - urban areas 1991 -1994.

Cause of death	Percentage
Malignant neoplasm of uterus	3. 9 %
Malignant neoplasm of cervix uteri	29.3 %
Malignant neoplasm of ovary and uterine adnexa	16.8 %
All other malignant neoplasms of female genital organs	3.4 %
Malignant neoplasm of female breast	41.8 %
All other disorders of female genital organs	5.6 %
Total deaths due to female reproductive organ disorders	7,006
Total female deaths at ages > 15 yrs for this period = 422758	

Cancers of the cervix, ovary and breast account for over 85 % of mortality due to such disorders. However, when these figures are considered as a proportion of all cause mortality, disorders of female reproductive organs account for 1.7 % of all female deaths at ages > 15 years.

Reproductive organ disorders cause a lot of morbidity in adult females. The following is a list of disorders. Several surveys have been conducted on such gynaecological morbidity among women in India, and for this report, we have included findings from one survey which reported prevalence based on clinical evaluation, and another that recorded self reported symptoms.

Clinical evaluation: A population based cross sectional study of gynaecological and sexual diseases in 650 rural women in Maharashtra was conducted by Bang RA et al in 1989. All women were subjected to clinical examination, and laboratory investigations wherever necessary. Of the sample, 55 % had gynaecological complaints, while 45 % were symptom free. However, 92 % of all women were found to have one or more gynaecological or sexual disease, and the average number of these diseases per woman was 3.6, with the total number of conditions being reported in these 650 women being 2344. Standard clinical diagnostic criteria were applied. A breakdown of these disorders is shown in Table-10.

Table-10. Distrubution of gynaecological and sexual diseases in 650 women from rural Maharashtra in 1989.

Diagnosis	Number	Percentage
Amenorrhoea	29	1.2 %
Sterility	44	1.9 %
Menstrual disorders	525	22.4 %
Infective vaginitis	605	25.8 %
Other vaginitis	43	1.9 %
Leucorrhoea	22	0.9 %
Inflammation of cervix	604	25.8 %
Pelvic inflammatory disease	157	6.7 %
Ovarian disorders	21	0.9 %
Syphilis	68	2.9 %
Disorders of sexual function	147	6.3 %
Other gynaecological diseases	79	3.4 %
Total number of conditions = 2,344, the denominator used for computing percentage prevalence		

Self reported symptoms: One of the few community based surveys in India is that conducted by Bhatia JC and Cleland J in one sub district in Karnataka in 1993. Questions concerning respondent's reported symptoms of reproductive morbidity formed one of 14 sections in the questionnaire, and administering this section took 10 minutes out of a total interview time of one hour. These questions were not framed to assess the occurrence of medically determined gynaecological problems, but instead, to elicit women's perceptions that they were experiencing symptoms of biomedically defined morbidities. Symptom based algorithms were applied on the data to indicate gynaecological disease. The findings of the survey are as shown in Table-11. An important additional bit of information that had been collected in this survey is the mean duration for each of the morbid conditions, which is very useful to estimate the actual morbidity in terms of time lived with disability.

Table-11: Reporting percentage of self reported gynaecological morbidity in women aged < 35 yrs in Karnataka, 1993

Symptoms associated with	Reporting %	Mean duration (months)
Menstrual problems	7.3	20.8
Lower reproductive tract infections	16.9	26.5
Acute pelvic inflammatory disease	5.2	23.4
Anaemia	23.4	17.4
Haemorrhoids	1.8	16.4
Urinary tract infections	1.5	24.4
Uterovaginal prolapse	0.4	11.9
Fistula	0.3	14.9
Infertility	0.2	22.1
The total number of women interviewed = 3600		

Detailed breakdown of such morbidity prevalence in five year age intervals for these disorders will serve as invaluable inputs for estimating the years of life lived in these states by women in our country. It is likely that the burden due to these diseases would add significantly to

the overall disease burden among women, and such estimates would help in searching for aetiological factors and formulating strategies for early recognition and treatment. It is also perceived that much of this morbidity is suppressed on account of the relatively less morbid nature of the conditions, and the lack of adequate knowledge on the part of primary health care providers regarding early diagnosis and management.

3. Disorders due to socio economic vulnerability of women

As described earlier, women are susceptible to a number of disorders which are related to factors such as lack of education, economic dependence, family responsibility related exposures and stress. We have attempted to capture the burden due to a set of disorders all of which would be related to such factors, so that this aspect as an independent cause of burden could be evaluated and addressed accordingly. As described in the definitions, this set comprises of some conditions that are causes of both mortality and morbidity, such as those listed in Table-12, while others are more commonly causes of morbidity, such as neuro psychiatric disorders and sexually transmitted diseases.

Mortality data: Data on deaths is available for some conditions from both urban and rural areas as shown in Table-12.

Table-12: Percentage distribution of female deaths in period 1991-1995 due to disorders related to socio economic vulnerability of women in urban areas

Cause of death	F15-44	F45-69	F70-w
Anaemia	3.6 %	2.1 %	1.9 %
Burns	18.4 %	2.3 %	1.0 %
Poisoning	6.3 %	0.7 %	0.2 %
Lower respiratory tract infections	1.6 %	2.4 %	4.8 %
COPD	0.8 %	2.5 %	4.3 %
Total female deaths	172,082	145,165	95,041

As can be observed, burns are a significant cause of burden in the young adult age group, accounting for almost a fifth of the overall burden in this age group. When combined with poisonings, the total is responsible for 25 % of the overall mortality in this age group. As mentioned earlier, lower respiratory tract infections and Chronic Obstructive Pulmonary Disease have been included in this group, as an effect of exposures to particulates emitted during combustion of biomass fuels used for household cooking.

Morbidity data: Neuro psychiatric disorders are important causes of burden in adult women. From one report, a meta analysis of 13 psychiatric epidemiological studies, it was concluded by the authors Reddy & Chandrasekhar that the prevalence of psychiatric morbidity was higher among women, with an overall prevalence rate of 49.9 per thousand among females as against 40.5 per thousand among males. However, further age sex breakdown of data is not available in this report, and we are on the lookout for more detailed study reports, and will incorporate the findings in our estimates of population psychiatric morbidity. Similarly, data on sexually transmitted diseases in women will also be added.

Table-13: Statewise distribution (%) of nutritional grading in females according to BMI classification 1996-97

BMI	Nutnl grade	KER	TN	KAR	AP	MAH	GUJ	ORR	ALL
Number of subjects		3,480	1,534	3,394	2,862	2,022	1,691	3,039	18,022
<16	CED III	5.1	9.7	16.1	14.6	9.7	15.4	13	11.8
16-17	CED II	6.4	11.7	15.4	15.5	13.1	14.1	14.1	12.8
17-18.5	CED I	13.1	19	25.5	26.8	27.4	26.4	26.1	23.2
18.5-20	Normal	16.5	21.6	19.3	19.5	20.8	19.3	24.4	20
20.5-25	Normal	43.2	29.3	20.3	20	25.8	21.8	20.8	26.4
25-30	Obese I	13.4	7.4	3	3.3	2.9	3.3	1.4	5.2
>=30	Obese II	2.4	1.2	0.4	0.3	0.3	0.7	0.2	0.8

Morbidity due to nutritional deficiencies. The burden due to nutritional deficiencies in women can be gauged from data available from the National Nutritional Monitoring Bureau, National Institute of Nutrition, that conducts regular surveys using nutritional anthropometry on sampled populations in eight states of India. Table-14 shows the prevalence of Chronic Energy Deficiency among women. It can be seen from the data that except in Kerala, in all other states the prevalence of any grade of nutritional deficiency is over 40 %, and is the highest at 56.9 % in Andhra Pradesh. Such malnutrition is invariable associated with micro nutrient deficiencies, and an evaluation of the National Nutritional Anaemia Prophylaxis Program conducted by the NIN in 1989 revealed that 46.7 % of pregnant women surveyed had Hb levels below 9 gm %, with another 40.8 % having Hb between 9 and 11 gm %. The NFHS -2 conducted in 1997 - 1998 revealed similarly alarming results, indicating that there has not been any change in the degree of anaemia prevalence in the past decade.

Table-14: Prevalence of self reported morbidity in 2722 women respondents in WHO - APHSR study, 2000 - 2001.

Condition	#	%
Arthritis	1,372	26.9 %
Back pain / disc problem	1,170	22.9 %
Vision problems	801	15.7 %
Migraine (recurrent headaches)	874	17.1 %
Gastritis / ulcer	470	9.2 %
Sleep problems	494	9.7 %
High blood pressure	325	6.4 %
Asthma / allergic resp disease	266	5.2 %
Heart disease	175	3.4 %
Hearing problems	130	2.5 %
Diabetes	74	1.5 %
Chronic bronchitis / emphysema	46	0.9 %
Stroke / cerebral bleeding	14	0.3 %
Tumour / cancer	3	0.1 %
Depression and anxiety	573	11.2 %

General self reported morbidity: During a recent community based survey conducted in Andhra Pradesh to assess the Health System Responsiveness, the following pattern of morbidity was reported by the female respondents aged 18 years and above.

It may be noted that some respondents had more than one complaint, hence the sum of percentages exceeds 100. This data indicates that there is significant morbidity due to musculo skeletal disorders and psychiatric conditions among women.

4. Other major causes of burden

Deaths due to other major causes of burden from urban areas are shown in Table-15. This group has accounted for disorders that individually or as part of a whole organ system account for at least 1 % of overall mortality within the specific age group.

Table-15: Percentage distribution of female deaths in urban areas due to other major causes during 1991 - 1995

Cause of death	F15-44	F45-69	F70 - w
Diarrhoeal diseases	1.9 %	1.9 %	1.5 %
Tuberculosis	9.2 %	6.1 %	2.6 %
Ischaemic heart disease	1.9 %	12.8 %	14.1 %
Cerebrovascular disease	2.6 %	8.9 %	8.8 %
Nervous system	3.4 %	2.5 %	1.8 %
Digestive system	4.5 %	4.2 %	2.0 %
Diabetes mellitus	0.9 %	4.6 %	3.0 %
Total female deaths	172,082	145,165	95,041

It is observed that increasing age is associated with an increased proportion of deaths due to Ischaemic and cerebrovascular disease, and with a fall in the proportion of diarrhoeal diseases and tuberculosis, and these trends are in as per expectations.

5. All other causes

Table-16: Percentage distribution of female deaths from urban areas due to all other causes during 1991 - 1994.

Cause of death	F15 - 44	F45 -69	F70 - w
Ill defined conditions	11.1 %	15.1 %	27.7 %
Septicaemia	2.6 %	2.0 %	1.4 %
Other infectious diseases	3.9 %	2.0 %	0.7 %
Other circulatory disorders	8.0 %	13.8 %	14.6 %
Other respiratory disorders	1.4 %	1.6 %	1.4 %
All other neoplasms	2.4 %	5.2 %	2.9 %
All other injuries	4.0 %	2.9 %	1.6 %
All other causes	2.2 %	3.1 %	1.9 %
Total female deaths	172,082	145,165	95,041

Female deaths in urban areas due to all other causes are shown in Table-16. This group comprises of all the residual categories of disorders that find mention in some of the previous tables. These figures help in completing the picture of the overall distribution of cause specific

mortality among adult women. There are three important points to note in this data. Firstly, the high proportions of causes assigned to the group 'Ill defined conditions'. As generally believed, if the overall percentage of deaths ascribed to this group exceeds 10 %, it raises doubts on the quality of medical certification of cause of death. As can be seen ,the proportion of such deaths is 27 % in the last age group, probably as a result of a large number of deaths in this category being ascribed to senility.

Secondly, the high proportion of deaths due to other circulatory disorders. A large number of deaths are medically certified to have occurred due to 'Cardio respiratory Arrest' or 'Cardio pulmonary Arrest' etc. Such deaths are assigned to this category, and this again points to the quality of certification. Finally, septicaemia, being an immediate cause of death has being categorised separately.

B. Disease burden in children - Conventional measures

1. Infant mortality Rate (IMR) and its subdivisions:

IMR is widely acknowledged to be a sensitive indicator of community health. While IMR measures deaths occurring in the first year of life per 1000 live births, it is better understood if it is analysed as per the contributions from its various components, as described below:

i. Early neonatal mortality rate: number of deaths in first seven days per 1000 live births
ii. Late neonatal death rate: number of deaths between 8 - 28 days per 1000 live births
iii. Neonatal mortality rate: Deaths in first four weeks, i.e. 0-28 days per 1000 live births, in other words, the sum of early and late neonatal deaths
iv. Post neonatal mortality rate: Deaths between 1 - 12 months per 1000 live births
v. IMR: sum of neonatal and post neonatal deaths

Analysis of IMR along these subdivisions informs about the relative importance of deaths in each of the time periods, as different causes operate at the different periods which might call for different intervention strategies. The SRS has reported data on neonatal and post neonatal mortality as shown in Table-17.

Table-17: Time trends in neonatal, post neonatal and infant mortality in India, 1981-1999.

Year	Neonatal mort. rate			Post neonatal mort. rate			Infant mort. rate		
	Rural	Urb	Comb	Rural	Urb	Comb	Rural	Urb	Comb
1,981	75.6	38.5	69.9	43.5	24	40.5	119.1	62.5	110.4
1,985	66.6	33.1	60.1	39.9	25.6	37.1	106.5	58.9	97.2
1,990	57.4	30.9	52.5	28.9	19.5	27.2	86.3	50.1	79.7
1,991	55.4	32.2	51.1	31.3	20.6	29.3	86.7	52.8	80.4
1,992	53.6	33	50	31.4	20	29.4	85	53	79.4
1,993	52.3	28.4	47.1	28.2	15.8	25.5	80.5	44.2	72.6
1,994	52	32.6	47.7	27.5	19.6	26	79.5	52.2	73.7
1,995	52	29	48	28	19	26	80	48	74
1,996	50	28	47	27	17	25	77	45	72
1,997	NA	NA	NA	NA	NA	NA	77	45	71
1,998	NA	NA	NA	NA	NA	NA	77	45	72
1,999	NA	NA	NA	NA	NA	NA	75	44	70

As can be observed from Table-18, there has been a decline in the IMR by forty points in the period 1981 - 1999. However, there has been very little change in the IMR over the past six years, varying between 70 and 74. In addition, it can be observed that neonatal deaths account

for about 63 - 65 % of all infant deaths. For the year 1996, the SRS has also reported a breakdown of neonatal deaths, into early and late neonatal deaths, as follows:

Table-18: Percentage distribution of infant deaths according to time period of death

Rate	Rural	Urban	Combined
Early neonatal death rate	48 %	51.1 %	48.6 %
Late neonatal death rate	16.8 %	11.1 %	16.6 %
Post neonatal death rate	35.1 %	37.7 %	34.7 %
Infant mortality rate	77	45	72

As can be seen, early neonatal deaths, i.e. deaths occurring within the first seven days of life account for nearly half the infant deaths occurring in India. The stagnation of the IMR during the past few years could well be due to this high proportion of early neonatal deaths. An assessment of the causes of early neonatal mortality would give direction for possible intervention strategies that would result in a further decline in IMR.

2. Causes of death among women and children

Cause specific mortality data was available for urban and rural areas as described earlier. Annexure-5 contains details of cause specific mortality proportions based on data from 1991 - 1995 for rural areas. These cause specific mortality proportions were applied on 1991 Census population data and 1991 SRS age specific death rates to obtain estimates of deaths due to individual causes in the population, which have been displayed in Annexure-5, Annex Tables 5.3 and 5.4 for rural and urban areas respectively. From the data in Annex Tables 5.3 and 5.4, a ranking of causes in terms of number of deaths caused has been arrived at in each age group in rural and urban areas.

Table-19: Rank order of top causes of death in children, India - rural, 1991

Rank	A0	A1-4	A5-14
I	Prematurity	Lower resp tract inf	Injuries
II	Lower resp tract inf	Diarrhoeal diseases	Diarrhoeal diseases
III	Diarrhoeal diseases	Circulatory disorders	Digestive disorders
IV	Vaccine prev diseases	Injuries	Lower resp tract inf
V	Circulatory disorders	Digestive disorders	Circulatory disorders
VI	Congenital malformations	Typhoid	Typhoid
VII	Digestive disorders	Vaccine prev diseases	Malaria
VIII	Birth trauma	Influenza	Influenza
IX	Injuries	Malaria	Vaccine prev diseases
X	Typhoid	Meningitis	Tuberculosis

Ranking of various conditons based on this data is given in Table-19 for children in rural areas and Table-20 for urban areas. It can be seen that in the infant age group, prematurity is the major cause, and combined with birth trauma, accounts for about 35 % of deaths. Lower respiratory tract infections, vaccine preventable diseases and other infectious disorders such as malaria are also important causes of mortality in childhood. Influenza and typhoid are ranked high in these age groups, but possibly there is some confusion in the application of the SCD Verbal Autopsy algorithms in assigning this cause of death, as there is very little mortality due to

these causes in the urban areas, in which the cause of death is medically certified, and hence more reliable.

Table-20: Rank order of top causes of death in children, India - urban, 1991.

Rank	A0	A1-4	A5-14
I	Prematurity	Lower resp tract inf	Injuries
II	Birth asphyxia	Diarrhoeal diseases	Circulatory disorders
III	Lower resp tract inf	Tuberculosis	Tuberculosis
IV	Diarrhoeal diseases	Injuries	Lower resp tract inf
V	Congenital malformations	Nutritional deficiencies	Diarrhoeal diseases
VI	Meningitis	Vaccine prev diseases	Digestive disorders
VII	Circulatory disorders	Meningitis	Meningitis
VIII	Nutritional deficiencies	Digestive disorders	Anaemia
IX	Birth trauma	Circulatory disorders	Vaccine prev diseases
X	Vaccine prev diseases	Anaemia	Malaria

As in rural areas, and as expected, prematurity and other perinatal disorders are top causes of mortality in the infant age group. Infectious disorders are major causes in the pre-school and school age children. It may be noted that nutritional deficiencies are among the top ranking causes in both infant and pre-school ages, and the presence of anaemia as a major cause at such young ages also requires to be investigated and attended to.

C. Morbidity in children

Nutritional deficiencies. The NNMB data on prevalence of protein energy malnutrition among pre-school and school age children is in the following tables. Table-21 shows state wise distribution (%) of nutritional grading in pre-school children (1 - 5 yrs) according to Gomez classification 1996-97.

Table-21: Nutritional - weight for age- status of pre-school children in seven states, 1996-97

State	Boys					Girls					Both			
	n	Nrml	Mild	Mod	Sevr	n	Nrml	Mild	Mod	Sevr	Nrml	Mild	Mod	Sevr
KE	482	18.5	53.1	25.5	1.9	404	26.7	47.8	23.3	2.2	22.2	50.7	25.1	2
TN	395	14.7	49.9	32.4	3	424	14.2	48.6	34.4	2.8	14.4	49.2	33.5	2.9
KA	858	11.2	37.9	45.2	5.7	826	7.6	40.1	45.5	6.8	9.4	39	45.4	6.2
AP	1,034	5.9	37.7	49.6	6.9	928	8.7	38.5	45.3	7.5	7.2	38.1	47.6	7.1
MA	529	7.9	34.8	49.7	7.6	486	6.8	36.2	49.2	7.8	7.4	35.5	49.5	7.7
GJ	335	3.9	27.5	53.4	15.2	312	5.1	36.5	40.1	18.3	4.5	31.8	47	16.7
OR	821	3.3	42.2	50.4	4.1	821	2.7	39.8	52.6	4.9	3.3	42.2	50.4	4.1
All	4,463	8.8	40.6	44.8	5.8	4,201	9.1	40.6	43.6	6.7	8.9	40.6	44.3	6.2

KE=Kerala,TN=Tamil nadu, KA=Karnataka, AP=Andhra Pradesh, MA=Maharashtra, GJ=Gujarat, OR=Orissa. Nrml=Normal i.e. weight for age >90% of average, Mild= 75-90%, Mod=Moderate 60-75%, Sevr=Severe i.e. < 60%

The data shows that prevalence of moderate to severe malnutrition, that is weight for age less than 75 % as compared to reference standards, is about 50 % in both boys and girls in the

preschool age. Table-22 shows the situation for school going children. Again, it can be seen that the prevalence of moderate to severe malnutrition in this age group is in the region of 55 - 60 %.

Table-22: Nutritional grading in school age children (6 - 17 yrs) according to Gomez classification NNMB, 1996-97.

Age	Sex	Number	Normal	Mild	Moderate	Severe
6 - 9	Boys	3,758	5.1	31.7	55.4	7.8
	Girls	3,566	5.9	31	54.1	9
	Both	7,144	5.5	31.4	54.7	8.4
10 - 13	Boys	2,846	2.5	14.8	55.1	27.5
	Girls	3,074	2.8	18.2	49.2	29.9
	Both	5,920	2.7	16.6	52	28.8
14 - 17	Boys	2,072	2.1	15.8	53.8	28.3
	Girls	2,208	3.8	34.6	51.6	10
	Both	4,280	3	25.5	52.7	18.9

1. Prevalence of other clinical abnormalities in school age children

During a survey conducted in coastal districts of AP on 937 school age children, the following prevalence of general clinical abnormalities were noted. Clinical examination was conducted on each child in conjunction with haemoglobin estimation and stool tests for helminthiasis. Table-23 shows the prevalence of some abnormalities detected.

Table-23: Prevalence of clinical abnormalities in the study population

Abnormality	Males (n=473)	Females (n=464)	Overall (n=937)
Angular stomatitis	32.3	26.2	29.6
Dental caries	10.4	14.1	12.2
Rhinitis	11.4	9.3	10.4
Pharyngitis	9.7	8.6	18.5
Tonsillitis	7.4	7.8	7.6
Otitis media	8.7	7.9	8.3
Wax	15.2	12.3	13.8
Scabies	13.3	4.9	9.2
Multiple folliculitis	8.2	2.8	5.5
Tinea	1.9	1.5	1.7

It can be seen that disorders such as scabies and otitis media have apparently high prevalence. Table-24 shows the prevalence of helminthiasis in 530 of the 937 children who complied with the sampling instructions.

Table-24: Percentage prevalence of helminth infestation in the study population

Helminth type	Male (n=281)	Female (n=249)	Overall (n=530)	Overall prevalence 1993
Roundworm	48.8	42.4	46.3	91.3
Hookworm	32.5	31.2	31.8	45
Whipworm	31.2	29.7	30.5	70.8

There appears to be some reduction in the prevalence as compared to a similar study conducted on school age children in AP in 1993.

As mentioned above, the same children were also subjected to haemoglobin estimation, and Table-25 shows the prevalence of various grades of anaemia detected. Mild anaemia represents a Hb level of 9 - 11 gm%, moderate 7 - 9 gm % and severe a Hb level of < 7 gm %. Again, the prevalence of anaemia, especially in the adolescent age group is high. Iron prophylaxis for these children will improve the Haemoglobin status prior to the onset of menstruation and further stresses in the form of motherhood.

Table-25: Percentage distribution of grades of anaemia among surveyed children from age - sex groups in the study population from both districts

Haemoglobin Status	5 - 9 years		10 - 14 years		15 years	
	M (n=220)	F (n=220)	M (n=211)	F (n=189)	M (n=17)	F (n=29)
Normal	6.6	4.9	23.1	6.8	8.8	6.8
Mild Anaemia	51.4	49	29.9	33.1	91.2	58.6
Moderate Anaemia	32.1	32	37.6	50	0	27.8
Severe Anaemia	9.9	14.1	9.4	10.2	0	6.8
Total	100	100	100	100	100	100

D. Summary measures of disease burden in women and children:

Annexure-3 shows the DALYs due to various causes in three age groups of women as estimated in the GBD study 1996. As mentioned earlier, DALYs are a measure of disease burden that take into account both time lost due to premature mortality as well as time spent in health states less than perfect health. The same annexure shows the burden of disease in terms of DALYs lost in 1990 and the projected disease burde in 2000, 2010 and 2020, based on expected epidemiological trends and variations in other socio economic parameters such as income, human capital in terms of education, smoking intensity etc. A ranking order similar to that discussed for conventional measures of mortality is described in Table-26. For this ranking, the projected burden figures for the year 2000 has been taken, as these are the figures that are the closest related in time to the present.

Table-26: Rank order of conditions according to DALYs lost by women in India, 2000

Rank	F15-44	F45-59	F60-w
I	Psychiatric disorders (9642)	Tuberculosis (1689)	Ischemic heart disease (3895)
II	Maternal conditions (3336)	Ischemic heart disease (1361)	Cerbovascular disease (1538)
III	Tuberculosis (3105)	Psychiatric disorders (1009)	Cataract (861)
IV	HIV (2383)	Cataract (577)	Indoor air pollution - LRTI (659)
V	Burns (unintentional) (2108)	Indoor air pollution-COPD (535)	Tuberculosis (653)
VI	STDs (excl HIV) (1674)	Cervical cancer (496)	Indoor air pollution-COPD (524)
VII	Self inflicted injuries (unintentional) (1462)	Cerbovascular disease (462)	Psychiatric disorders (420)
VIII	Anaemia (1030)	Osteoarthritis (462)	Diabetes mellitus (366)
IX	Rheumatic heart dis. (425)	Diabetes mellitus (323)	Diarrhoeal diseases (202)
X	Asthma (365)	Rheumatic heart dis. (290)	Osteoarthritis (202)

E. Disease burden in children - Summary measures

Annexure-4 shows the DALYs due to various causes in three age groups of children as estimated in the GBD study 1996. As above, the disease burden for the year 2000 has been taken for arriving at the rankings shownin Table-27.

Table-27: Rank order of causes of burden in DALys (thousands) in children, 2000

Rank	Children 0 - 4	Children 5-14
I	Lower resp tract infection (15135)	Falls (4723)
II	Perinatal conditions (14691)	Road traffic accidents (2404)
III	Diarrhoeal diseases (14615)	Lower resp tract infection (1811)
IV	Vaccine prev diseases (8869)	Fires (1380)
V	Cogenital malformations (7889)	Diarrhoeal diseases (1084)
VI	Malnutrition (2786)	Vaccine prev diseases (1030)
VII	Falls (2070)	Drownings (894)
VIII	HIV (1860)	Anaemia (826)
IX	STDs excl HIV (1317)	Tuberculosis (766)
X	Circulatory disorders (1087)	Circulatory disorders (654)

As can be seen, the burden due to injuries in the age group 5-14 years is high, with four of the top ten causes of burden being from this category.

F. Summary

An important point to be stressed on while using measures of disease burden, whether they are conventional measures such as mortality statistics or epidemiological estimates or summary measures is that the should be evaluated based on the quality of the data inputs that were used to arrive at the measures. For India, there are many shortcomings in the quality of mortality data available, and there is an immediate requirement to improve the quality of data inputs that are used for estimating disease burden.

From the data that has been presented, it can be concluded that for women, the major causes of burden are those related to their socioeconomic vulnerability, specially in the age group 15 - 44 years. Neuro psychiatric morbidity and infectious diseases are also important causes of burden. Neoplasms and ischeamic heart disease form a significant component of burden in the elderly age group. Maternal undernutrition contributes towards disease burden both in women and in children, as is shown in the high proportion of burden in infancy due to and perinatal mortality. The burden due to injuries in children is also high, as is the burden due to nutritional disorders and infectious diseases.

V. Initiatives during the tenth plan to obtain better estimates

A. Improving validity, reliability and usefulness of general mortality statistics in the country:

i. A comprehensive evaluation of the validity, reliability and timeliness of SRS in various states should be taken up.

ii. Coverage of SRS should be increased to allow for district level estimates of IMR, general mortality.

iii. A scheme to strengthen the vital statistics collection system in urban areas and selected rural areas should be drawn up. Such a scheme can be started in areas where it has the greatest potential to succeed and then gradually expand to other areas to progressively bring more and more areas of the country under a satisfactory vital statistics system.

B. Improving validity and reliability of cause of death statistics:

i. The working group propose that a drive be launched by the Ministry of Health, Government of India, and all State Governments through the Ministries of Health and Municipal Administration, to improve coverage by cause of death reporting systems. Simple steps like periodical reviews jointly by the Departments of Health and Municipal Administration, identification of non reporting municipalities and sample units, and further identification of non reporting health care institutions sustained over a period of say five years will raise coverage substantially.

ii. Professional skills for writing up of cause of death reports should be strengthened: Training programmes should be organised to build up cause of death reporting writing skills among physicians,

iii. Cause of death statistics should be compiled and published at the state level. This will facilitate state level analysis of cause of death data and motivate further improvement of the accuracy of cause of death statistics. Quick availability of cause of death statistics at the state level and research on its implications etc. will promote a climate of evidence and information based policy formulation for more effective RCH programmes.

iv. Research on cause of death structure and their policy implications, should be promoted. Existing Institutions with capacity in cause of death research should be identified to provide leadership in stimulating cause of death research. Efforts should be made to develop at least one research centre in cause of death statistics for every major state.

v. Computerisation of filing, tabulation and flow of cause of death statistics, at the municipality and at the State level must be taken up on priority. This will, it is expected, reduce the time gap between collection compilation and publication of statistics.

vi. To reduce the unusually high level of unclassifiable deaths, it is recommend that an amendment be brought in the Registration of Births and Deaths Act (RBD Act.) requiring hospitals and health care institutions to maintain medical records.

vii. The SRS based cause of death reporting system, recently introduced by the RGI should be independently evaluated in the major states. Its performance in terms of coverage, validity and reliability of cause of death statistics should be compared to the SCD-Rural scheme. A thorough review of various options available to improve cause of death reporting system in the rural areas should be taken up.

C. Improving descriptive epidemiology

i. The ICMR may examine the possibility of inserting a standard term of reference for generation of descriptive epidemiology of the disease(s) studied, where ever feasible. If marginal increase in funding will help generate evidence on descriptive epidemiology of the disease in the country, then such funding should be provided. Descriptive epidemiology data should be published by age sex groups. As far as feasible these data should be compiled in five year age groups, and if the sample size does not permit the same, then as many age groups as is feasible.

ii. In addition ICMR may allocate funds for intramural and extramural studies designed to generate descriptive epidemiology of diseases in various parts of the country.

iii. Each disease control programme should allocate resources to take up bench mark and evaluation studies by independent research institutions designed to generate representative sample (i.e. population) based estimates of disease frequency.

D. Reducing time gap in publication of census based indirect estimates of IMR and fertility etc. by districts.

i. Starting with the 1981 census, questions on children ever borne to women have been added to allow for indirect estimates of infant mortality rate, and fertility rates at the district level. District levels estimates of IMR have been computed from the 1981 and 1991 census data. A major problem is the time gap between the census and availability of estimates based on these data. Currently it takes about 7 to 8 years after the census for these data to be analysed and results published. The RGI and Census Commissioner may explore possibilities for reducing this time gap. Some options are (a) computerisation of data acquisition, (b) involvement of research institution to generate the estimates.

E. Sustenance of the National Family Health Surveys

i. The National Family Health Survey (NFHS) is an useful and independent source of estimates of IMR, and other indicators of reproductive and child health. So far two surveys have been done in the 1990s. It will be desirable to sustain this. A system of 5 yearly NFHS will need to be established.

F. District family health surveys

i. A major problem with NFHS is that its sample size is small. Hence estimates at district and sub district level are not feasible. A District Family Health Survey (DFHS) has been implemented in Andhra Pradesh on pilot basis in three districts. The DFHS approach is to keep the questionnaire small and administer it over a large enough population to allow for accurate estimates of IMR, and fertility at the district and sub district level. It will be desirable to further explore and build on the DFHS type of study to generate district and sub district level Indirect estimates of IMR, fertility etc.

Bibliography

Registrar General, India Sample Registration System 1981 – 1996, Annual Statistical reports, New Delhi : Office of the registrar General, India; Fertility and Mortality (SRS) Survey Division: Ministry of Home affairs, New Delhi.

Registrar General, India, Census of India 1991 Population Data. New Delhi Ministry of Home Affair.

The Registrar General, India. Survey of Causes of Death (Rural) 1991 – 95 Annual Reports. New Delhi: The Registrar General of India.

The Registrar General, India, Medical Certification of Causes of Death 1991 –94 annual reports. New Delhi: The controller of Publications, RGI

Christopher J.L Murray and Alan D. Lopez. The Global Burden of Disease – Summary A Comprehensive assessment of mortality and disability from diseases, injuries, and risk factors in 1990 and projected to 2020. Geneva: The Harvard School of Public Health on Behalf of the World Health Organization and the World Bank; 1996; ISBN: 0-9655466-0-8.

Lao T Ruzicka and Atan D. Lopez. The Use of Cause of Death Statistics for Health Situation assessment: National and International Experiences. World Health Statistics, 1990; 249-257

Govt. of India, Ministry of Health & Family Welfare, Annual Report 2000-2001. New Delhi: Ministry of Health & Family Welfare; 2000.

Indian Cause of Death Dataset Version 1.1 (INCOD VI.I). Institute of Health Systems; DS1/2000.

Cause of death reporting in India: a performance analysis. Institute of Health Systems, HIS WP36/2000.

Mahapata, Prasanta, Estimating national burden of disease; sensitivity to local data. The burden of disease in Andhra Pradesh, 1990s. Institute of Health System, Monograph series. MG01/2000.

Mari Bhat P.N.: Navaneetham K., and Irudaya Rajan S. Maternal Mortality in India: Estimates from a Regression Model, Studies in Family Planning, 19095 Jul- 1995 Aug. 31: 26(4): 217-232.

Registrar General India, Sample Registration System Bulletin 2000 Apr; 33(1):1-8. ISSN: 0971-3549.

Registrar General, India Sample Registration System Bulletin. 2000 Oct; 34(2): 1-4. ISSN: 0971-3549 .

Jagdish C. Bhatia and John Cleland. Obstetric Morbidity in South India: Results from A Community Survey. Social Science & Medicine, 1996: 43(10): 1507-1516.

Bang R.A.: Bang A.T.: Baitule M., and Choudhary Y. High Prevalence of Gynaecological Diseases in Rural Indian Women. The Lancet. 1089 Jan 14.

Jagdish Bhatia C and John Cleland J. Self-reported symptoms of gynaecological morbidity and their treatment in South India. Studies in Family Planning, 1995 Aug 31: 26(4): 203-216.

Smith Kirk R. National Burden of Disease in India from Indoor air Pollution PNAS. 2000 Nov 21: 97(24): 13286-13293.

Venkataswamy Reddy M. and Chandrashekar C.R> Prevalence of Mental and Behavioural Disorders in India: A Meta-Analysis, Indian Journal of Psychiatry, 1998: 40(2): 149-157.

NIN, National Nutritional Monitoring Bureau (1996-97). Report of NNMB Surveys (1996-97). Hyderabad: National Institute of Nutrition Indian Council of Medical research: 1996: Report of NNMB Surveys (1996097).

Dasgupta J.: Mital R., and Saxena N.C (edi), Evaluation of the National Nutritional Anaemia Prophylaxis Programme. An ICMR Task Force Study, New Delhi: Indian Council of Medical Research 1989.

Andhra Pradesh Health Systems Responsiveness Study. A report under preparation. Institute of Health System – WHO Collaboration Study: 2001.

Govt. of India Ministry of Health & Family Welfare. Family Welfare Programme in India Year Book 1997-98, New Delhi: Department of Family Welfare Ministry of Health & Family Welfare: 1997: Annual report.

Rao PVC, Mahapata P and Padmavati A. Child labour, Health and Education: A study on children residing near aquaculture units in Andhra Pradesh. Institute of Health Systems. RP3/2000.

Mahapatra Prasanta, presentation at the second meeting of the Planning Commission - Working Group on the Health of Women and Children, Nirman Bhavan, New Delhi, April, 2001