ANDHRA PRADESH BURDEN OF DISEASE AND COST EFFECTIVENESS STUDY

REPORT

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Andhra Pradesh Burden of Disease and Cost Effectiveness Study

I. Introduction

There is no doubt that considerable improvement in the health status of the communities did occur during the past few decades. However, much more still remains to be done. While communicable diseases are still common in developing countries, the health systems need to cope up with the ageing population suffering from non communicable degenerative diseases. Emergence of illnesses like AIDS started to throw new challenges upon the systems.

Any discussion of the health policy should start with scaling of a problem which aids in setting health priorities and targeting the health services to the needy and disadvantaged groups of the society. Most of the assessments of relative importance of different diseases, so far, are based on how many deaths they cause. This has certain merits as death is an unambiguous event and the vital registration systems of many countries routinely provide the data required. Even this approach has lacunae as there are no consistent estimates of adult mortality in many developing countries and the available mortality estimates generally confine to infancy and childhood. There are, however, many non fatal conditions which are responsible for great loss of 'healthy life'. Disability has not been included in estimating the burden as it is considered a problem only in societies that had undergone epidemiological transition.

With expanding role of cost-effectiveness in health care planning, the need for more comprehensive measurement of burden of disease has become more urgent. Thus, there is an urgent need for a process through which every disease or health problem would be evaluated in objective fashion so that the programm ot be ignored.

So far, only one systematic effo e in Ghana for 48 causes. Recently, Christopher Mur o quantify the burden of disease which was used by th obal Burden of Disease (GBD)[1]. This new indicator, th s the standard

[1] World Development Report 1993

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expected years of life lost (YLL) on model life table West level 26. The value of time lived at different ages is captured in calculating the DALYs using an exponential function which reflects the dependence of the young and the elderly on adults. The time lived with disability is made comparable with the time lost due to premature mortality. For this, six classes of severity of disability have been defined and each class was assigned a disability weight between 0 and 1. Considering the fact that DALY measures the future loss, a social discount rate of three percent discount has been applied. Details of assumptions used in DALY estimation were summarised in Global comparative assessments in the health sector edited by CJL Murray and AD Lopez[2]. About 109 categories of diseases (ICD 9), which are responsible for more than 95% of all causes of death and disability, have been included in this study.

II. Genesis of Andhra Pradesh Burden of disease and Cost Effectiveness Study:

Subsequent to the Global Burden of Disease study, National Burden of disease studies have been planned to provide more insight to the Burden of Disease Approach (BDA). The countries where National burden of disease studies have been initiated include: Mexico, Columbia, South Africa and India. While in other countries these studies have been planned at National level, in India - considering the vast population and reported diversity in disease pattern - it was felt appropriate to make estimations at state/regional level to begin with. This resulted in the genesis of the Andhra Pradesh Burden of disease and Cost effectiveness of Health Interventions study. Supported by the World Bank, this study has been undertaken by the Administrative Staff College of India in technical Collaboration with the Harvard Centre for Population and Development studies.

III. Area and People:

The State of Andhra Pradesh, located in the coastal south India extending on to the deccan plateau, is the fifth largest state in India with a population of 66.3 million[3]. The state has 23 districts spread over three distinct geographical regions which include Coastal Andhra with large coastal plains and fertile deltas, Rayalaseema which is drought prone and interior dry

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2 Global Comparative Assessments in the Health Sector; Disease burden, expenditures and intervention packages Edited by CJL Murray and AD Lopez WHO 1994

3 Paper 1 of 1992, Final Population Totals, Census of India 1991; Registrar General & Census Commissioner

Telangana region. While the coastal plains constitute the most developed part of the state, Telangana region is more backward in terms of social development. Lack of rains and chronic hunger is a common feature of Rayalaseema. A large majority of the state's population (73%) reside in rural areas consisting of about 29,400 villages. About 27% of the state's population reside in 250 urban towns and cities, a trend more or less common to the rest of the country. About 80% of the urban population is residing in 66 towns having population more than 50,000 and the three corporations of Hyderabad, Vijayawada and Visakhapatnam

About 15.9% of the population belong to scheduled castes while scheduled tribes constitute 6.3%. According to 1991 census, the estimated percentage of literates among population aged seven years and above was 45.11% (Males: 56.2%; Females: 33.7%) compared to the national average of 52.1%. From a strong agricultural base, the state economy has, over the years, diversified into industry and science. The National Sample Survey Organisation's estimates of poverty during 1977-78 (32nd round) and 1983-84 (38th round) indicate that rural poverty in the state has declined from 45.45% to 38.67%. The corresponding decline in the urban poverty during the same period was from 37.02% to 29.4%.

IV. Objectives:

- To estimate the burden caused by common diseases including injuries and accidents in the State of Andhra Pradesh, India
- Compare the disease burden of urban and rural areas AP and
- Study the cost effectiveness of selected health interventions using DALYs as measure of effectiveness

V. Approach:

The essential approach used in Andhra Pradesh Burden of Disease Study was to gather relevant information from different sources, discuss with respective experts and to arrive at the preliminary set of estimates on mortality and disability for each disease. This was followed by a consistency check to validate the estimates made. The disease experts were approached again to give their comments. Thus, the entire exercise - which involved several rounds discussions and series of workshops with disease experts, researchers, demographers and programme managers - went through an extensive consultative process.

For estimation of YLL demographic data on age, sex and cause specific mortality rates are required while YLD requires epidemiological data on incidence, prevalence, severity and complications or sequelae. The epidemiological estimates are also used to check the consistency of demographic estimates and vice versa. The estimates of burden in APBD study are made for 1991 as it happens to be the Census year and hence provides true population distribution. Considering the variations in living conditions and access to health and related services, separate estimates have been made for urban and rural areas. The census definition of urban areas was used to distinguish from the rural areas.

VI. Demographic Estimates:

A Age specific mortality:

A preliminary workshop was conducted to identify the sources of mortality data. Two important sources of population distribution and age specific mortality identified were the 1991 Census and Sample Registration Scheme (SRS). In addition, community based studies undertaken from Andhra Pradesh which provided information mortality were listed during the workshop.

The final population totals for AP from 1991 census are not yet available. However, the primary census abstract provides preliminary data on population by sex below 6 years and above 6 years separately for urban and rural areas. Enquiry with Registrar General's office indicated that it may take one more year to complete the detailed analysis of 1991 AP Census data. Hence, the Sample Registration Scheme (SRS) estimates for urban and rural Andhra Pradesh were used to

develop life tables for males and females[4]. When the actual population distribution is made available from 1991 Census data, the SRS estimates will be replaced by them.

B Preliminary disease list preparation:

A preliminary list of diseases was prepared after reviewing the available data and discussing with the local disease experts and demographers. The GBD norm of grouping the diseases in to three groups on the basis of epidemiological transition was followed. The Group I included the pre- transition diseases: Communicable, Maternal and Perinatal. Considering the fact that nutrition deficiency disorders tend to be predominate in pre-transition period, they have been included in group I. The Group II consisted of non communicable and degenerative disorders while Injuries and accidents were included in Group III. As the cause of death and disease pattern emerged this preliminary disease list was modified to ensure that it captures all the major causes of mortality and morbidity in AP.

C Cause of Death determination:

Like many developing countries the Vital Registration System in India is poor both in terms of coverage as well as content. The usual option in such situation is either to use cause of death models or to estimate the cause of death pattern using epidemiological approach. The model based estimates may not capture the true cause of death pattern in developing countries as they are mostly based on past mortality patterns observed in developed countries. They are also influenced by changes in ICD revisions and diagnostic practices. In case of epidemiological estimates, adequate data may not available for all diseases to make estimations. Another option is to make the cause of death estimates using data from sample registration schemes or disease surveillance systems. In India two schemes provide information on cause of death pattern. Survey of Cause of Death (SCD) provides cause of death information for broad cause groups in rural areas using Verbal Autopsy techniques while Medical Certification Cause of Death (MCCD) provides physician certified cause of death information from selected hospitals. This data is available in three digit ICD 9 coding.

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[4] Annexure I

i. Cause of death estimation for rural AP:

The SCD Scheme- started as Model Registration Scheme in 1960s by the Registrar General, India - provides cause of death information for rural India using " lay reporting " method. In each state sampling units, covering 3-5 thousand rural residents each, are selected using standard guidelines to ensure representativeness. The state of Andhra Pradesh at present has 150 sampling units covering a population of 0.675 million which constitutes about 1% of the total population.

The field work is restricted to the sample village and carried out by para medical worker (called Field Agent) of the selected Primary Health Centre trained in the verbal autopsy techniques. A set of guidelines for classification of diseases by a non-medical list of causes of death prepared by the office of the Registrar General of India is provided. The cause of death determination process involves isolation of major cause groups by way of elimination and final identification of specific cause in stages. The medical officer of the PHC scrutinises the deaths recorded by the field agent every month and investigates independently at least two deaths or 10% of deaths recorded to validate the information collected by the field agent.

Constraints of SCD data:

A. Methodological :

The verbal autopsy technique is essentially based on two assumptions:

- Each disease will have unique set of symptoms at the time of death
- The attendants can provide detailed description of events that led to death

Both these assumptions may not always hold good. There is often overlap of symptoms or the attendants may not be in a position to provide the detailed description of symptoms at the time of death. Another important determinant of quality of verbal autopsy technique is the skill of the interviewer to extract the required information from the attendants.

B. Large number of Unclassified deaths :

Under SCD the cause of death determination is done in a phased manner. Each death is initially classified under 10 major groups and then specific cause is determined. In case of deaths with inadequate information, the general tendency is to include the death in one of the major groups without further probing. Since, BDA requires specific cause of death information, there was no choice but to include deaths under the category of "not classified".

A preliminary analysis of SCD data from the state of AP for a period of six years (1988-93) had shown that out of a total 10,770 deaths (Males: 5979; Females: 4791) reported during this period, more than a third (37.5%) come under the 'not classifiable' category. Two thirds of the deaths included under 'not classifiable' category and 25% of the total deaths were due to senility[4].

C. Cause of death information restricted to few diseases:

Like any Verbal Autopsy technique the SCD provides cause of death information only for few diseases. Even among them some of the causes which are described more on the basis of symptoms are difficult to classify. Conditions such as jaundice, convulsions, paralysis, congestive heart failure etc., fall under this category. Similarly all cancers were included in a single group. Unless some additional information is provided it is not possible to classify these deaths. Though SCD protocol insists on recording such information by the field agent, it is often not enforced which makes it difficult to classify these deaths.

Expert opinion and field enquiry to Improve the quality of SCD data:

With all these constraints SCD still happens to be the single largest source of cause of death information from the rural community. In the APBD study an attempt was made to explore the scope to further improve the quality of SCD data. This is done in four stages.

- Initial review of cause of death description given for the unclassified deaths by medical experts
- Field enquiry of 301 deaths included in not classifiable category during 1992-93 (all the deaths with records available covered)
- Separate survey of 139 deaths classified under 'senility' during 1994 by trained experienced investigators to get more detailed description on events that led to death and symptoms at the time of death.
- Review of the field data by committee of experts (Physician, Paediatrician and Public Health Specialist)

Out of a total 440 deaths subjected to expert opinion and field enquiry 436 (99%) could be classified. Based on this feedback few more categories of diseases were to the SCD list. For example, enquiry revealed that 'electric shock' is an important cause of death in rural males. Using

this data an algorithm was developed to classify the deaths included in not classifiable category of SCD deaths[5].

ii. Estimation Cause of death for Urban AP:

Preliminary analysis of vital registration data from one circle in Hyderabad City indicated that content is poor as cardiorespiratory failure was reported to be the cause of death in as many as 40% of the deaths registered.

Review of MCCD data had shown that only one third of the total urban deaths are being covered under this scheme in AP. However, in the neighbouring state of Maharashtra more than 80% of the urban deaths are medically certified. Considering the proximity of the states and genetic similarity of population, we have assumed that the cause of death pattern in urban Maharashtra closely resembles that of urban AP. MCCD data from Maharashtra state covering a period of five years (1986 -90) was obtained and aggregate cause specific proportionate mortality rates were calculated for APBD age groups separately for both sexes. These rates were applied to the estimated deaths for Urban AP in each age and sex group to arrive at the first estimates of cause specific deaths in urban AP.

VII.Final APBD disease list and cause of death estimates:

After going through the list of major unclassified deaths in rural and urban AP, the disease list was finalised[6]. Where ever felt necessary, new disease was added and some diseases were excluded. For example, Japanese encephalitis was added in communicable diseases while Leishmaeniasis was excluded. Similarly electric shock and bites by venomous snakes were added in injuries and accidents. Since available cause of death data can not distinguish between acute and persistent diarrhoea, we have included all the diarrhoea's in one group. This decision was also influenced by the fact that interventions for diarrhoea - irrespective of the clinical forms - are similar.

In both urban and rural areas the estimated deaths by cause were matched with the APBD list of diseases. Appropriate algorithm was developed separately for rural and urban areas to distribute all the remaining deaths which are responsible for more than 0.1% of total deaths[7].

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5 Annexure III

6 Annexure II

7 Annexure IV

VIII. Epidemiological Estimates of mortality and disability :

Epidemiological estimates on disability and mortality were made for each of the disease included in the list. Considering the fact that SCD data can provide only broad leads the data was further validated for each disease using epidemiological approach. Similarly, the estimates of cause of death in urban areas made on the basis of Maharashtra MCCD data were also validated.

A Disease experts and Literature review:

For each of the disease included in the list experts have been identified through references and contacting National laboratories. The first round of communication was sent to them which described the methodology with a request to provide first set of estimates on incidence, prevalence, case fatality and remission rates for their respective diseases. The experts were also requested to quote the sources on which their estimates are based and give their opinion on quality of available data. This was followed by personal visit of project team members to different parts of the state and some of the National laboratories to clarify any doubts and to get more information on available epidemiological data in the state/country.

Meanwhile, a detailed literature search was undertaken to compile the epidemiological studies on each disease giving first preference to community based studies undertaken in AP. Information was also obtained from Post graduate dissertations and small scale surveys undertaken in different parts of the State through departments of community medicine. If there are no good community based studies available from the State, studies undertaken in neighbouring States or at National level were considered. For example, in case of cancers, the reported incidence from Madras cancer registry was used for epidemiological estimates. If adequate information is not available even at National level, data from comparable studies in neighbouring countries was considered. For example, in case of Chlamydia we could not get any community based studies from India and all the studies reviewed were hospital based. Hence, reported prevalence figures from Asian population in Singapore were used to arrive at the preliminary estimates. If no data is available from neighbouring countries, the GBD approach of using data from other comparable country was used. Use of hospital based studies was essentially restricted for estimation of case fatality and remission rates.

For all diseases with National programmes surveillance data was obtained from the concerned programme manager. This information was particularly useful in case of vaccine preventable diseases as immunisation coverage significantly alters the disease burden. The details of quality of reviewed studies are presented in Table. As it is evident from the table that better epidemiological data is available for Group I diseases[8]. The estimates for some of the Group II diseases hence were based on small scale studies and studies published from other countries. To make the approach used more explicit two examples of epidemiological estimations, which include Tuberculosis with good epidemiological data and Non Insulin Dependent Diabetes Mellitus with poor epidemiological data, are presented in Annexure[9].

After first round of literature review, expert comments and programme data analysis a workshop was held. The participants included core expert, local disease experts, programme managers and public health specialists. The first set of epidemiological estimates of all chronic diseases made were subjected to consistency using the Harvard disease model (DISMOD) which uses the known relationships between incidence, prevalence, case fatality and remission[10]. In case of acute diseases responsible for large number of deaths, consistency of epidemiological estimates were checked with the cause of death models.

B Final estimates of cause of death:

A combination of sources were used to estimate the cause of death pattern. Firstly all estimations of injury and accidents based on survey reports for rural and urban areas were taken as such. Then the proportionate distribution of deaths in group I and group II from epidemiological approach was compared with that of survey data. In urban areas only marginal differences were noticed between the two sets of estimates. Hence, the survey distribution for group I and II was taken as such while the distribution of deaths within each group was based on epidemiological estimations.

In case of rural areas, however, some inconstancies were noticed. As mentioned earlier the SCD data provides information only for broad cause groups and some of the cause of death descriptions such as convulsions, congestive heart failure, jaundice etc. essentially describe symptoms which may occur due to many diseases. The major discrepancy was noticed in case of

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8 Annexure V

9 Annexure VII

10 CJL Murray & A D Lopez; Quantifying disability: data methods and results; Bull of WHO 1994, 72 (3): 481-494

Diarrhoea and ARI where the SCD data tended to underestimate the deaths particularly in 0-4 yrs. The reported validity of verbal autopsy for childhood deaths varied considerably between studies. Studies in Kenya have shown that the sensitivity of verbal autopsy techniques was low for ARI[11] . The deaths estimated from epidemiological approach were also compared with model based estimates using Preston's cause of death models of countries with comparable mortality pattern. Preston[12] made an estimate of Cause Specific Mortality Rate for 12 major causes of death using data from 48 Nations with a range of life expectancies from 27 to 77 yr. From this data proportionate mortality rates due to diarrhoea for three countries which had general mortality rates comparable to India were calculated. All these estimates suggest a proportionate mortality due to diarrhoea was between 23-29% in the 0-4 years which is consistent with the epidemiological estimates. Studies on diarrhoea mortality report a cause specific mortality between 0.8 to 1.5/1000 among children in 5-14 and 0.4 to 2.5 per 1000 per year in case of adults[13] [14] [15]. Hence, for diarrhoea and ARI we have based the estimates more epidemiological approach.

The Maternal deaths were taken as reported from the survey data for both urban and rural areas as the expert felt that MMR estimates seemed to be quite plausible. However, in case of Perinatal Mortality the SCD data seemed to be an over estimate. An estimation of neonatal mortality was made on the basis of observed relationship between the neonatal and post-neonatal mortality[16]. The estimates suggested that perinatal mortality estimates based on survey data were higher in rural areas while in urban areas they matched fairly well. Considering these constraints we have essentially used the epidemiological approach to estimate the cause of death pattern in rural areas while estimates based SCD data were used as such for injuries & accidents, Maternal

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11 Snow RW et al Childhood deaths in Africa: uses and limitations of verbal autopsies. Lancet 1992 340:351-55

12 Samuel H Preston; Causes of Death, Life tables for National Populations; Seminar Press 1972 ISBN 0-12-895550-3

13 El Alamy MA et al. The incidence of diarrhoeal disease in a defined population of rural Egypt. American Journal of Tropical Medicine and Hygiene, 35:1006-1012 1986

14 Nazir HZ M et al., The incidence of diarrhoeal diseases and diarrhoeal diseases related mortality in rural swampy low-land area of south Sumatra, Indonesia. J of Tropical Paediatrics, 31:268-272

15 Shaikh K et al. Pattern of diarrhoeal deaths during 1966-1987 in a demographic surveillance area in rural Bangladesh. J of Diarrhoeal Diseases Research 8: 147-154 (1990)

16 CJL Murray & Jose Luis Bobadilla; Epidemiological Transitions in the Formerly Socialist Economies: Divergent Patterns of Mortality and Causes of Death; Health Transition Working Paper Series No.94.07 1994

Mortality and for checking the total estimated deaths under broad groups such as Gastrointestinal, Chronic respiratory disorders, Neuropsychiatric diseases etc.

IX. Results

A Probability of dying:

The first round of estimates suggest that probability of dying in 0-14 years in AP is less compared to all India average for both sexes (Males: 13% Vs 15%; Females: 11% Vs 16%). Both urban and rural AP fared better than all India average. This trend, however, altered for the later age groups. While marginal differences were noticed among males in 15-59 years (Males: AP: 28%; India 27%), no difference was noticed among females. In 60-69 years age group the probability of dying in AP was higher than that of all India averages for both sexes (Males: AP: 40%, India: 32%; Females: AP: 29%, India 26%).

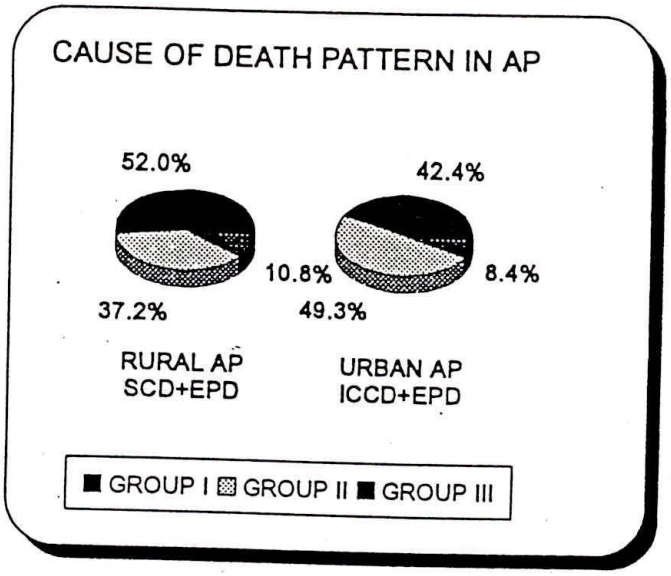
Between the urban and rural areas, probabilities of dying were lower for all age groups in urban areas. Lower child mortality and higher adult mortality in AP compared to India suggest that health interventions targeted at children are more effective in AP. This also indicates that the demographic transition process is more advanced in AP compared to the National average.

B Cause of death

A. Cause of death pattern :

The estimated cause of death pattern for all age groups in urban and rural AP is presented in the figure 1. While Group I diseases predominated in rural areas, Group II diseases were responsible for higher mortality in urban areas. About 11% of deaths in rural and 8% in urban areas were due to injuries and accidents. In both rural and urban areas unintentional injuries constituted the majority of Group III deaths. The proportion of deaths constituted by intentional injuries was higher in rural areas compared to urban areas (28% Vs 7%). Eighty seven percent of estimated intentional deaths in rural areas were self inflicted compared to 37% in urban areas indicating a higher suicide rate among rural residents.

Fig 1



When the cause of death pattern in AP for all ages and both sexes was compared with that of India the proportion of deaths due to Group I (50.1% Vs 43.3%) and Group III (10.3% Vs 6.5%) diseases was higher in AP. Considering the lower probabilities of dying in 0-4 years in AP, where Group I diseases predominate, this trend is surprising.

B. Cause of death pattern by sex

Similar trend was observed when cause of death pattern was compared between the sexes. While Group I deaths predominated among both sexes in rural areas, deaths due to Group II were higher in urban areas. In both areas proportion of deaths due to Group II was higher among females. This difference was more marked in case of urban area. This is quite plausible considering the fact that females are considered to be genetically stronger than males and hence less vulnerable to infectious diseases. Proportionate mortality due to Group III deaths between the two sexes was more or less similar in rural areas while in urban areas males tended to have marginally higher mortality due to Injuries and accidents compared to females.

C. Cause of death pattern by age:

0-4 Years:

About 90% of the estimated deaths in this age group were due to Group I diseases. The proportion of deaths due to Group I diseases was higher in rural areas compared to urban areas (91% Vs 85%). The leading causes of death included Perinatal conditions (M: 27.4%, F: 26.6%), ARI (M:22.2%, F: 23.9%), Diarrhoea (M: 19.1%, F:18.9%) and Measles (M: 6.6%, F: 7.5%) in rural areas. Even in urban areas, excepting Measles, the same causes were responsible for

maximum number of deaths. The higher proportion of Group II deaths in urban areas was mainly due to congenital anomalies. While proportion of Group III deaths are comparable between rural and urban areas among male children, in case of female children however, the corresponding proportion was higher among rural residents compared to their urban counterparts. Most common cause of the Group III deaths among rural girl children was "fall". It is difficult to say to what extent this is due to gender discrimination and female infanticide. This aspect, however, requires further in-depth studies.

5-15 Years:

In this age group also the Group I causes of death predominated. While about a quarter of the estimated deaths in urban areas were due to Group II causes, only about a tenth of the total deaths were due to non communicable diseases in rural areas. The leading causes of Group I deaths included ARI, Anaemia, Diarrhoea and Measles in rural areas and ARI in urban areas. The proportion of deaths due to Injuries and accidents in this age group was much higher in rural areas compared to urban areas (Males: 38% Vs 17%; Females: 24% Vs 17%). The leading cause of accidents in rural areas was "Drowning" while in urban areas it was " Motor Vehicle Accidents".

15-45 Years:

While the Group I diseases still predominated the cause of death at state level, the difference between the proportionate mortality due to Group I and Group II diseases was less marked in urban areas compared to rural areas. Tuberculosis was the leading cause of death among Group I diseases among males and females in both rural and urban areas. However, in rural areas deaths due to maternal conditions contributed equal number of deaths. Marked difference in proportionate mortality due to maternal conditions was noticed between rural and urban areas (32.3% Vs 6.5%). The leading causes of Group II deaths among males included digestive disorders, cardiovascular diseases and cancers in both urban and rural areas while the leading Group II causes among females included cancers and cardiovascular diseases. The most common cancers among males were that of Mouth & oropharynx, Oesophagus, Stomach and Lymphomas & Leukaemias. In females Cancers of Cervix, Breast and Oesophagus were more common.

Deaths due to injuries and accidents constituted a major cause of death in this age group. In rural areas higher proportion of deaths were caused by unintentional injuries among males compared to intentional injuries (18% Vs 12.7%). The leading cause of unintentional injury among males in rural areas was "Motor Vehicle Accidents" while "Self Inflicted" predominated among intentional injuries. In case of rural females the proportionate mortality due to intentional injuries was higher than that of unintentional (13.2% Vs 11.7%). The leading causes of death were Fires and Self Inflicted respectively among non intentional and intentional injuries. In urban areas the unintentional injuries predominated in both sexes (Males: 23.5% Vs 2.4%, Females: 31.6% Vs 1.8%). Similar to rural areas, the Motor Vehicle Accident was the leading cause of death among unintentional injuries in urban males. In case of females, however, Fires were reported to be the leading cause. Thus Fires emerge as a leading cause of Group III death among females irrespective of the place of residence. Some of the deaths reported under unintentional Fires could be due to suicide or even homicide. It is, however, difficult obtain reliable information on exact cause of death in such circumstances.

45- 59 Years:

In both rural and urban areas the Group II deaths predominated in this age group. It is however, interesting to notice that still a third of total deaths from rural areas were estimated to be due to Group I conditions both among males and females while in urban areas about a quarter of deaths in this age group were estimated to be due to Group I conditions. The most common Group I cause of death was Tuberculosis among males and females irrespective of their place of residence. Among Group II conditions IHD, Cancers and Cirrhosis were estimated to be the leading causes among males in both rural and urban areas. Among females Cancers, Cerebro Vascular Accident and IHD were the leading causes of death. Group III deaths were more or less uniformly distributed. In rural females deaths reported under the category of "Self Inflected" tended to be higher.

60 + years:

Majority of the deaths in this age group were due to Group II conditions. The proportion of Group I deaths among rural males was higher than urban males (25% Vs 22%) while no such difference was observed among females. Tuberculosis, Respiratory Infections and Diarrhoea were the leading Group I cause of deaths in this age group. Among Group II diseases, Ishaemic

Heart Disease, Cerebro Vascular Accidents, Cancers, COPD and Cirrhosis Liver were the leading causes of death among males. More or less similar trends were noticed among females except for lower estimates of deaths due to Cirrhosis. In urban males also deaths due to cirrhosis were less.

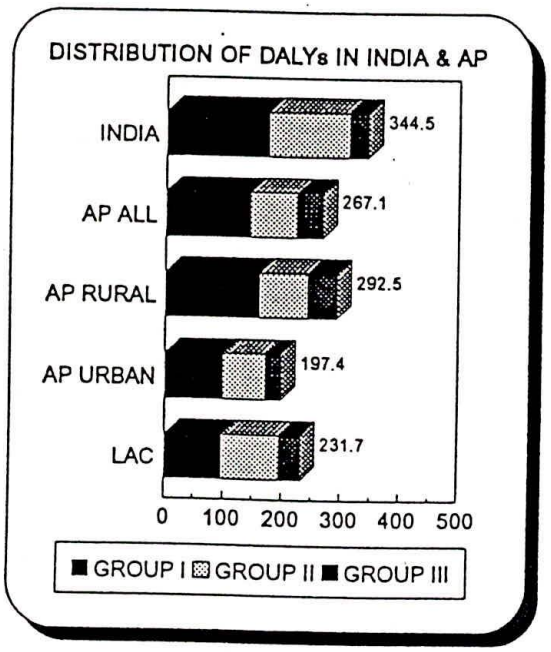
C Disability Adjusted Life Years Lost in AP:

i. Total DALYs lost:

The preliminary estimates indicate that 17,657,518 total DALYs were lost in Andhra Pradesh during the year 1991[17]. Out of the total DALYs lost 14,037,909 (79.5%) were estimated to be from rural areas and the rest (20.5%) were contributed by residents of urban areas. Considering the fact that rural population constituted 73% of the total State's population, it is evident that disease burden is higher among rural residents. About 52% of the total DALYs lost were contributed by males and the rest by females.

ii. DALYs lost per 1000 population:

Fig 2



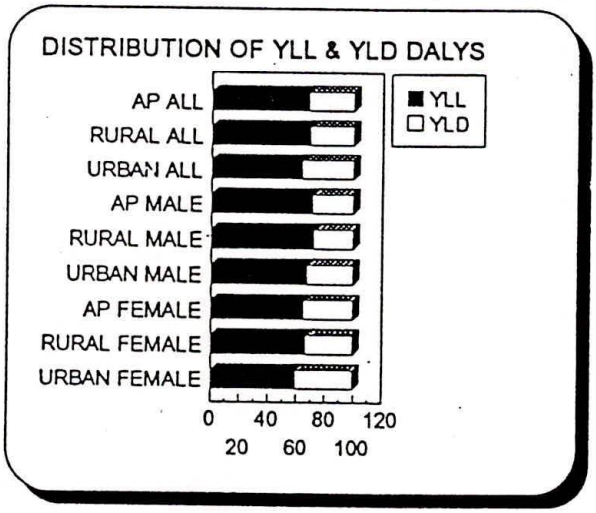
When the APBD preliminary results were compared with that of GBD it is evident that DALYs lost per 1000 persons in the State of AP were less than all India estimates (267 Vs. 345) as shown in Fig 2. It is also evident that there is significant difference in the disease burden in Urban and Rural areas (197 Vs. 293). Since GBD estimates are made at country level for all the

[17] Annexure VI

States without distinguishing between urban and rural areas, these trends seem quite plausible. Also, the fact that SCD cause of death pattern - which is based on rural deaths - was used for Group I, II and III distribution in GBD estimates which could have influenced the estimates more in favour of rural areas. DALYs estimated to be lost/1000 population in Urban AP (197) indicates that disease burden among residents of Urban AP is marginally lesser than the GBD estimates for Latin American Crescent (231).

iii. DALYs lost due to YLL:

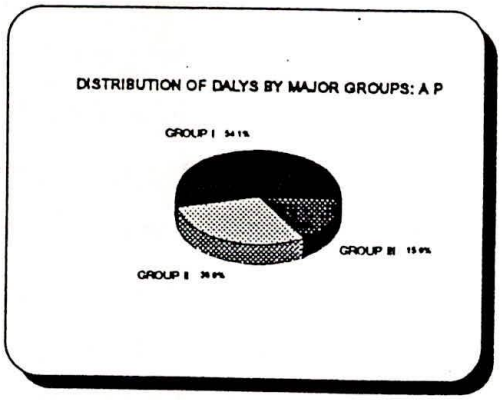
Fig 3



At the aggregate level DALYs lost due to YLL were responsible for two thirds (68.2%) of total DALYs lost. In both rural and urban areas YLL contributed a majority of total DALYs lost. In the GBD study also similar trends were observed in most of the developing countries. The proportion of DALYs lost due to YLL was higher in rural AP compared to urban AP (69.3% Vs 63.6%). Between the sexes, males lost higher DALYs due to YLL in both rural and urban areas (Rural:Males:72%, Females:66.5%; Urban: Males:67.3%, Females:59.18%).

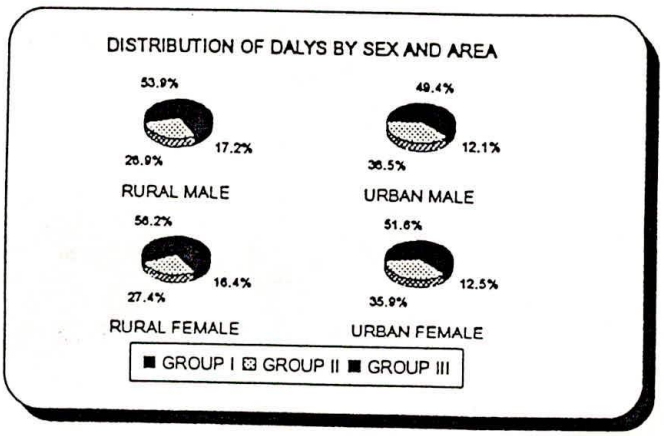
iv. DALYs lost by major Groups:

Fig 4



More than a half of the total DALYs lost (54%) were due to Group I disorders. Since YLL happens to be the major contributor of the DALYs lost, this trend is not surprising. About 30% and 16% of the total DALYs lost were due to non communicable diseases, injuries and accidents respectively. Between the areas, the burden caused by Group I and Group III was more in rural areas compared to Urban areas. In urban areas also burden caused by Group I diseases is responsible for maximum loss of DALYs. However, the burden caused by Group II disorders was relatively higher in urban areas indicating that the urban residents are in a more advanced phase of epidemiological transition (Fig. 5).

Fig 5



X. Leading causes of DALY loss

As shown in the above figures the major causes of DALY loss in Group I diseases include Perinatal, ARI and diarrhoeal disorders. Burden due to TB was much higher in case of males. Females residing in rural areas lost nearly double the DALYs /1000 population due to Maternal conditions compared to their urban counterparts. DALYs lost due to Measles, Tetanus were lower in urban areas which could be attributed to better immunisation coverage and cleaner delivery practices. DALYs lost due to diarrhoea in urban areas were nearly half that of rural areas indicating better access to safe water and sanitation.

Fig 6

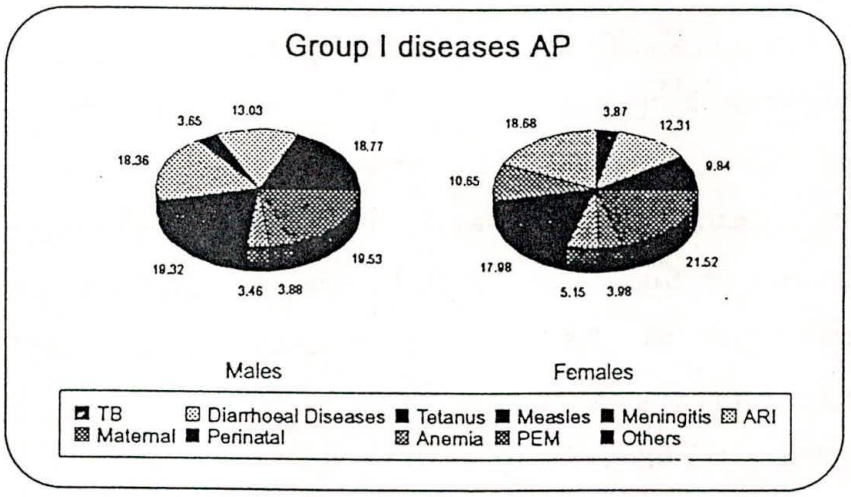


Fig 7

Leading causes for DALYs lost in Group II

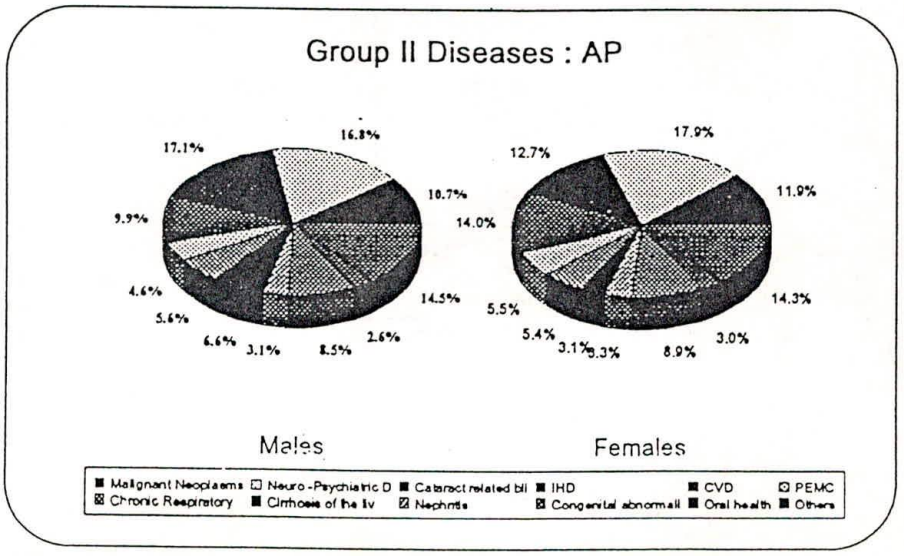
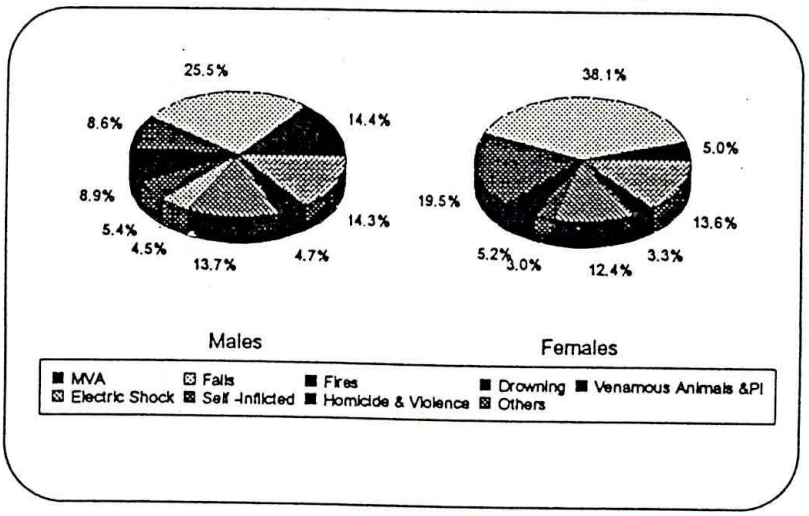


Figure 8

Leading causes of burden in Group III



Among the Group II disorders the leading causes of burden include Ischaemic Heart disease, Cancers, Cerebro-vascular accidents, Congenital disorders and Cirrhosis in both rural and urban areas. Falls and Fires were the most common causes of burden among Group III disorder's in case of females residing in rural and urban areas respectively. Self inflicted injuries were more commonly reported from rural areas among both sexes.

XI. Discussion:

The preliminary results of the APBD study indicate that the epidemiological transition process in AP is at a more advanced stage compared to that of India. Like many other developing countries the DALYs lost due to premature mortality contributed more to the disease burden. The fact that urban residents had lesser burden of disease compared to their rural counter parts is not surprising considering the better access to health care and infrastructural services such as safe water supply. Burden caused by pre-transition disorders such as infectious diseases, maternal and perinatal conditions and nutritional deficiencies contributed to more than a half of the total DALYs lost. This calls for an exhaustive review and total revamping of the existing intervention programmes. The fact that nearly 16% of the DALYs lost were due to injuries and accidents

needs special attention by the policy makers particularly the reported high mortality rates due to falls, fires and suicides.

The APBD study summarises the experience of estimating the disease burden in a developing country with several constraints of data. The basic objective of the study is to estimate the burden making use of the 'available data' rather than waiting for the "best data". The consultative process which involved Disease experts, Researchers, Public health specialists and Health programme managers ,and the consistency checks enforced at different levels helped to make the best plausible estimates. The study team, however, would like to continue the dialogue with the Reserachers/Disease experts. Based on their feed back on the preliminary estimates next revision will be made.

Annexure I

Life Table for AP Rural Male										
x	n	Mx	ax	qx	Px	lx	dx	Lx	Tx	ex
0	1	0.08	0.3	0.07	0.93	100000	7396.17	94822.68	5725792.3	57.26
1	4	0.01	0.4	0.03	0.97	92603.83	2972.01	363282.49	5630969.62	60.81
5	5	0	0.5	0.01	0.99	89631.82	803.07	446151.4	5267687.13	58.77
10	5	0	0.5	0.01	0.99	88828.74	795.88	442154.03	4821535.73	54.28
15	5	0	0.5	0.01	0.99	88032.87	1223.89	437104.6	4379381.7	49.75
20	5	0	0.5	0.02	0.98	86808.97	1718.99	429747.4	3942277.09	45.41
25	5	0	0.5	0.02	0.98	85089.98	1392.5	421968.68	3512529.7	41.28
30	5	0	0.5	0.02	0.98	83697.49	1903.16	413729.55	3090561.02	36.93
35	5	0.01	0.5	0.03	0.97	81794.33	2099.36	403723.26	2676831.47	32.73
40	5	0	0.5	0.02	0.98	79694.97	1928.9	393652.61	2273108.21	28.52
45	5	0.01	0.5	0.05	0.95	77766.07	4015.2	378792.37	1879455.6	24.17
50	5	0.01	0.5	0.07	0.93	73750.87	5022.4	356198.38	1500663.23	20.35
55	5	0.02	0.5	0.1	0.9	68728.48	6918.54	326346.04	1144464.85	16.65
60	5	0.05	0.5	0.21	0.79	61809.94	13047.54	276430.86	818118.81	13.24
65	5	0.06	0.5	0.27	0.73	48762.4	13142.54	210955.67	541687.95	11.11
70	5	0.11	@NA	1	0	35619.87	35619.87	330732.27	330732.27	9.29

Life Table for AP Urban Male										
x	n	Mx	ax	qx	Px	lx	dx	Lx	Tx	ex
0	1	0.07	0.3	0.06	0.94	100000	6217.12	95648.02	6147638.88	61.48
1	4	0.01	0.4	0.03	0.97	93782.88	2369.25	369445.31	6051990.86	64.53
5	5	0	0.5	0	1	91413.63	455.93	455928.31	5682545.55	62.16
10	5	0	0.5	0	1	90957.7	363.1	453880.73	5226617.24	57.46
15	5	0	0.5	0	1	90594.59	451.84	451843.36	4772736.52	52.68
20	5	0	0.5	0.01	0.99	90142.75	1119.79	447914.29	4320893.16	47.93
25	5	0	0.5	0.01	0.99	89022.96	753.49	443231.09	3872978.87	43.51
30	5	0	0.5	0.01	0.99	88269.47	965.65	438933.22	3429747.78	38.86
35	5	0	0.5	0.01	0.99	87303.82	1256.79	433377.11	2990814.56	34.26
40	5	0.01	0.5	0.04	0.96	86047.02	3374.39	421799.14	2557437.45	29.72
45	5	0.01	0.5	0.03	0.97	82672.63	2683.91	406653.38	2135638.31	25.83
50	5	0.02	0.5	0.07	0.93	79988.72	5819.46	385394.94	1728984.93	21.62
55	5	0.02	0.5	0.11	0.89	74169.26	8429.52	349772.49	1343589.99	18.12
60	5	0.03	0.5	0.15	0.85	65739.74	10104.47	303437.52	993817.51	15.12
65	5	0.05	0.5	0.24	0.76	55635.27	13170	245251.35	690379.99	12.41
70	5	0.1	@NA	1	0	42465.27	42465.27	445128.63	445128.63	10.48

Life Table for AP Rural Female										
x	n	Mx	ax	qx	Px	lx	dx	Lx	Tx	ex
0	1	0.08	0.3	0.07	0.93	100000	7125.89	95011.88	6072352.14	60.72
1	4	0.01	0.4	0.02	0.98	92874.11	2194.09	366230.63	5977340.27	64.36
5	5	0	0.5	0.01	0.99	90680.02	902.29	451144.39	5611109.64	61.88
10	5	0	0.5	0.01	0.99	89777.73	626.25	447323.03	5159965.25	57.47
15	5	0	0.5	0.01	0.99	89151.48	1327.32	442439.11	4712642.22	52.86
20	5	0	0.5	0.02	0.98	87824.16	1394.03	435635.73	4270203.11	48.62
25	5	0	0.5	0.02	0.98	86430.13	1541.87	428295.98	3834567.38	44.37
30	5	0	0.5	0.01	0.99	84888.26	928.66	422119.66	3406271.4	40.13
35	5	0.01	0.5	0.03	0.97	83959.6	2400.03	413797.93	2984151.74	35.54
40	5	0	0.5	0.02	0.98	81559.57	1814.68	403261.17	2570353.81	31.52
45	5	0.01	0.5	0.03	0.97	79744.9	2240.8	393122.49	2167092.64	27.18
50	5	0.01	0.5	0.05	0.95	77504.1	4111.92	377240.68	1773970.15	22.89
55	5	0.02	0.5	0.08	0.92	73392.18	5543.7	353101.64	1396729.46	19.03
60	5	0.02	0.5	0.11	0.89	67848.48	7711.15	319964.53	1043627.83	15.38
65	5	0.04	0.5	0.2	0.8	60137.33	11845.85	271072.05	723663.29	12.03
70	5	0.11	@NA	1	0	48291.49	48291.49	452591.24	452591.24	9.37

Life Table for AP Urban Females										
x	n	Mx	ax	qx	Px	lx	dx	Lx	Tx	ex
0	1	0.05	0.3	0.05	0.95	100000	4550.3	96814.79	6707644.78	67.08
1	4	0	0.4	0.01	0.99	95449.7	1030.25	379326.22	6610829.99	69.26
5	5	0	0.5	0	1	94419.45	282.83	471390.19	6231503.77	66
10	5	0	0.5	0	1	94136.62	141.1	470330.36	5760113.58	61.19
15	5	0	0.5	0.01	0.99	93995.52	842.17	467872.18	5289783.23	56.28
20	5	0	0.5	0.01	0.99	93153.35	649.8	464142.26	4821911.05	51.76
25	5	0	0.5	0.01	0.99	92503.55	737.08	460675.06	4357768.79	47.11
30	5	0	0.5	0.01	0.99	91766.47	640.12	457232.05	3897093.73	42.47
35	5	0	0.5	0.01	0.99	91126.35	861.61	453477.72	3439861.68	37.75
40	5	0	0.5	0.01	0.99	90264.74	853.46	449190.05	2986383.96	33.08
45	5	0	0.5	0.01	0.99	89411.28	1331.19	443728.43	2537193.91	28.38
50	5	0.01	0.5	0.03	0.97	88080.09	2859.46	433251.81	2093465.48	23.77
55	5	0.01	0.5	0.07	0.93	85220.63	5723.93	411793.34	1660213.67	19.48
60	5	0.03	0.5	0.12	0.88	79496.7	9843.87	372873.85	1248420.33	15.7
65	5	0.05	0.5	0.21	0.79	69652.83	14395.86	312274.53	875546.48	12.57
70+	5	0.1	@NA	1	0	55256.98	55256.98	563271.95	563271.95	10.19

Probability of Dying			
Region	Sex	5q0	45q15
Rural	Male	0.1037	0.2979
	Female	0.0932	0.23895
Urban	Male	0.0859	0.2744
	Female	0.0558	0.1543

Annexure II. APBD Disease List					
	I. Communicable, Maternal & Perinatal		*E. Nutritional/Endocrine*		*G. Cardiovascular Diseases*
	A. Infectious & Parasitic	31	1. Protein-Energy Malnutrition	64	1. Rheumatic Heart Disease
1	1. Tuberculosis	32	2. Iodine Deficiency	65	2. Ischemic Heart Disease
	2. STD's Excluding HIV	33	3. Vitamin A	66	3. Cerebrovascular Disease
2	a. Syphilis	34	4. Anemias	67	4. PEMC
3	b. Chlamydia		**II. Noncommunicable**		*H. Chronic Respiratory Diseases*
4	c. Gonorrhea		*A. Malignant Neoplasms*	68	1. COPD
5	3. HIV	35	1. Mouth and Oropharynx	69	2. Asthma
6	4. Diarrhoeal Diseases	36	2. Esophagus		*I. Diseases of the Digestive System*
	5. Childhood Cluster	37	3. Stomach	70	1. Peptic Ulcer Disease
7	a. Pertussis	38	4. Colon/Rectum	71	2. Cirrhosis of the Liver
8	b. Polio	39	5. Liver		*J. Diseases of the Genito-Urinary System*
9	c. Diptheria	40	6. Pancreas	72	1. Nephritis/Nephrosis
10	d. Measles	41	7. Trachea/Bronchus/Lung	73	2. Benign Prostatic Hypertrophy
11	e. Tetanus	42	8. Melanoma and Other Skin		*K. Diseases of the Musculo-Skeletal System*
12	6. Meningitis	43	9. Breast	74	1. Rheumatoid Arthritis
13	7. Hepatitis	44	10. Cervix	75	2. Osteoarthritis
14	8. Malaria	45	11. Corpus Uteri	76	L. Congenital Abnormalities
	9. Tropical Cluster	46	12. Ovary		*M. Oral Health*
15	a. Lymphatic Filariasis	47	13. Prostate	77	1. Dental Caries
16	10. Leprosy	48	14. Bladder	78	2. Periodontal Disease
17	11. Trachoma	49	15. Lymphoma	79	3. Edentulism
	12. Intestinal Helminths	50	16. Larynx		**III. Injuries**
18	a. Ascaris	51	B. Other Neoplasm		*A. Unintentional*
19	b. Trichuris	52	C. Diabetes Melltus	80	1. Motor Vehicle Accidents
20	c. Hookworm	53	D. Other Endocrine	81	2. Poisonings
21	13. Japanese encephalitis		*E. Neuro-Psychiatric*	82	3. Falls
	B. Respiratory Infections	54	1. MAD	83	4. Fires
22	1. Acute Respiratory Infections	55	2. BAD	84	5. Drowning
23	2. Otitis Media	56	3. Psychoses	85	6. Venamous animals and plants as cause of poisoining
	C. Maternal Conditions	57	4. Epilepsy	86	7. Foreign body and accidental aspiration
24	1. Hemmorhage	58	5. Alcohol Dependence	87	8. Electric Shock
25	2. Sepsis	59	6. Alzheimer's and other dementia		*B. Intentional*
26	3. Eclampsia	60	7. Parkinson's Disease	88	1. Self-inflicted
27	4. Hypertension	61	8. Drug Dependence	89	2. Homicide and Violence
28	5. Obstructed Labor		*F. Sense Organ*	90	3. Legal intervention
29	6. Abortion	62	1. Glaucoma-related Blindness		

Annexure III ESTIMATION OF CAUSE OF DEATH IN RURAL AP

Distribution of as reported by SCD AP (1988-93)					
SCD CODE	CAUSE OF DEATH	Males	Females	All	Not class.
100	ACCIDENTS & INJURIES NOT : CLASSIFIABLE	66	39	105	105
111	SNAKE BITE	53	36	89	
112	SCORPION BITE	8	3	11	
113	RABIES	19	14	33	
121	DROWNING	71	55	126	
122	FALL FROM HEIGHT	38	24	62	
123	VEHICULAR ACCIDENTS	128	42	170	
124	BURNS	20	46	66	
130	SUICIDE	162	122	284	
140	HOMICIDE	22	10	32	
151	EXCESSIVE HEAT	8	15	23	
152	EXCESSIVE COLD	0	0	0	
153	NATURAL CALAMITY	10	13	23	
200	MATERNAL : NOT CLASSIFIABLE	0	25	25	25
210	ABORTION	0	9	9	
221	TOXAEMIA	0	13	13	
222	ANAEMIA	0	13	13	
231	BLEEDING OF PREGNANCY	0	28	28	
232	MALPOSITION OF CHILD	0	8	8	
233	PUERPERAL SEPSIS	0	5	5	
300	FEVERS : NOT CLASSIFIABLE	225	223	448	448
311	MALARIA	8	6	14	
321	INFLUENZA	14	22	36	
331	TYPHOID	33	36	69	
400	DIGESTIVE DISORDERS : NOT CLASSIFIABLE	35	28	63	63
411	GASTRO-ENTERITIS	71	108	179	
412	CHOLERA	4	5	9	
413	FOOD POISONING	22	9	31	
414	DYSENTERY	59	66	125	
421	PEPTIC ULCER	64	28	92	
431	ACUTE ABDOMEN	87	73	160	
500	COUGHS : NOT CLASSIFIABLE	22	25	47	47
511	TUBERCULOSIS OF LUNGS	432	196	628	
513	BRONCHITIS & ASTHMA	578	346	924	
521	PNEUMONIA	31	20	51	
530	WHOOPING COUGH	6	4	10	
600	CNS DISORDERS : NOT CLASSIFIABLE	24	16	40	40
610	PARALYSIS	344	259	603	
620	MENINGITIS	20	21	41	
630	CONVULSIONS	76	64	140	
700	CONGESTIVE & OTHER HEART DISEASES	156	99	255	255
710	ANAEMIA	87	98	185	
730	HEART ATTACK	489	232	721	

800	OTHER MEDICALLY CERTIFIED DEATHS	28	17	45	
811	CIRRHOSIS & CHRONIC LIVER DISEASES	42	24	66	
812	JAUNDICE	151	92	243	
821	CHICKENPOX	0	1	1	
822	MEASLES	8	21	29	
823	LEPROSY	23	8	31	
831	TETANUS	8	13	21	
841	POLIOMYELITIS	2	3	5	
851	MENTAL DISEASE	18	21	39	
861	CANCER	189	251	440	
871	DIABETES	55	28	83	
881	HYPERPLASIA OF PROSTATE	15	9	24	
882	URAEMIA	32	12	44	
890	OBSTRUCTED HERNIA	4	0	4	
900	INFANT DEATHS : NOT CLASSIFIABLE	213	176	389	389
910	PREMATURITY	174	146	320	
922	CONGENITAL MALFORMATION	15	7	22	
923	BIRTH INJURY	12	4	16	
931	RESPIRATORY INFECTIONS OF THE NEW BORN PERINATAL	87	79	166	
932	CORD INFECTION	13	13	26	
933	DIARRHOEA OF NEW BORN	41	49	90	
1000	SENILITY	1357	1313	2670	2670
	Total	5979	4791	10770	4042

Details of Unclassified deaths from SCD subjected to expert opinion and field enquiry

SCD code	Description	No. subjected for E O & F E	No. Classified
1.00	Accidents and injuries not classifiable	27	27
2.00	Maternal not classifiable	6	6
3.00	Fevers not classifiable	107	107
4.00	Digestive disorders not classifiable	12	12
5.00	Coughs not classifiable	10	10
6.00	CNS disorders not classifiable	4	4
7.00	Congestive and other heart diseases	53	53
8.00	Burns	11	11
9.00	Causes peculiar to infancy not classifiable	71	68
10.00	Senility	139	136
TOTAL		440	434

Algorithms used to classify the SCD estimated deaths responsible for >0.1%					
SCD Codes	Deaths	%	Cum %	Diseases	Solution
1.13	31.61	0.29%	0.29%	Rabies	Added to Group Ia total
1.51	32.15	0.30%	0.59%	Excessive Heat	Added to Unintentional Injuries (Group IIIa) total
1.53	22.33	0.21%	0.80%	Natural Calamity	Added to Unintentional Injuries (Group IIIa) total
4.31	179.89	1.67%	2.47%	Acute Abdomen	Added to Digestive (Group II i) total
5.13	1321.68	12.28%	14.75%	Bronchitis & Asthma	To follow the distribution of Bronchitis & asthma from 26 countries
6.1	1217.91	11.34%	26.09%	Paralysis	> 45 yrs to include in Stroke, < 45 to distribute in meningitis and encephalitis as per ICD distribution
6.3	158.21	1.48%	27.57%	Convulsions	<15 as per ICD distribution in meningitis & encephalitis, 15-45: Epilepsy, 45-60:50% epilepsy, 50% stroke, >60: Stroke
8.12	267.49	2.48%	30.05%	Jaundice	To distribute <5 yrs. under hepatitis and for the remaining age groups to follow ICD age wise distribution of Hepatitis, Cirrhosis & Cancer Liver
8.51	114.26	1.06%	31.11%	Mental Disease	To include in Neuropsychiatric total
8.61	831	7.74%	38.86%	Cancer	To include in Cancer total

Annexure IV ESTIMATION OF CAUSE OF DEATH IN URBAN AP					
Algorithms used to classify the MCCD estimated deaths responsible for >0.1% in Urban AP					
ICD Codes	Deaths	%	Cum%	Disease discription	Solution
71	1092	0.16%	0.16%	Rabies	To move over to Group Ia total
161	1378	0.21%	0.37%	Malignant neoplasm of larynx	To add to the APBD list
200,202,203	505	0.08%	0.45%	All other Malignant neoplasm of lymphatic and haempoietic tissue	To combine with Hogdkins and Leukaemias
190-199	5860	0.88%	1.33%	Malignant neoplasm of other and unspecified sites	To proportionately distribute to all listed cancer sites including 'other cancers '
264-269	4242	0.64%	1.97%	All other Nutritional deficiencies	To move over to Group IIE totals
286-289	658	0.10%	2.07%	All other diseases of blood and blood forming organs	To move over to Group IIE totals
290	801	0.12%	2.19%	Senile and presenile, organic psychotic conditions	To move over to dementias including Alzheimers
302,-316	1100	0.17%	2.36%	All other Mental disorders	To add to Group IIF(Neuropsychiatric) for the present and to develop some algorithm to get Alzheimers
323-339,341-344,346-359	10949	1.65%	4.01%	All other diseases of Nervous System	To add to Group IIF(Neuropsychiatric) for the present and to develop some algorithm to get deaths due to alcoholism and drug dependence
402-404	2154	0.32%	4.33%	Hypertensive heart Diseases	To add to APBD list
401,405	4545	0.68%	5.02%	All other Hypertensive Diseases	To add to Hypertensive diseases list
415-429	40846	6.16%	11.17%	Diseases of Pulmonary Circulation and other forms of heart disease	To add to the Group IIG(Cardiovascular Total) for the present and develop appropriate algorithm on the basis of autopy series from India
444	838	0.13%	11.30%	Arterial embolism and thrombosis	To add to the Group IIG(Cardiovascular Total) for the present and develop appropriate algorithm on the basis of autopy series from India
411-443,446-448	1413	0.21%	11.51%	Other diseases of Arteries, Arterioles & capillaries	To add to the Group IIG(Cardiovascular Total) for the present and develop appropriate algorithm on the basis of autopy series from India

455	718	0.11%	11.62%	Haemorrhoids	To add to the Group IIG(Cardiovascular Total) for the present and develop appropriate algorithm on the basis of autopy series from India
445,449,450, 456-459	982	0.15%	11.77%	All other diseases of Circulatory system	To add to the Group IIG(Cardiovascular Total) for the present and develop appropriate algorithm on the basis of autopy series from India
490-496	19367	2.92%	14.69%	Bronchitis, Chronic and unspecified emphysema and asthama	To use alogorythem developed on the basis of observed relationship between bronchitis and asthma in 26 developed countries
511	725	0.11%	14.80%	Pleurisy	To move to Group IIH(Respiratory) for the present
488,489,497-510,512-519	9638	1.45%	16.25%	All other Diseases of Respiratory system	To move to Group IIH(Respiratory) for the present
560	2481	0.37%	16.62%	Intestinal obstruction without Mention of Hernia	To add to the APBD list
567	2103	0.32%	16.94%	Peritonitis	To add to the APBD list
530,534,536-539,544-549, 554-559,561-566,568-570, 572,573,576-579	12466	1.88%	18.82%	All other diseases of the other parts of the digestive system	To move to Group II I (Digestive) total for the present and to develop algorithm
591,593,595-599	715	0.11%	18.93%	All other diseases of Urinary System	To move to the Group II J (Genito Urinary) total
797	26624	4.01%	22.94%	Senility without mention of psychosis	To follow the standard algorithm already developed under GBD to distribute to Group I& II
780-796,798, 799	44754	6.74%	29.68%	All other sign symptoms and ill defined conditions	To follow the standard algorithm already developed under GBD to distribute to Group I& II
E900-E909,E911-E918,E921,E923-E929	4072	0.61%	30.30%	All other accidents including late effects	To add to Group IIIa (unintentional) for the present
E980-E981	7711	1.16%	31.46%	Injury undetermained whether accidentally or purposely inflicted	To proportionately distribute to Group IIIa & IIIb deaths
E970-E979	1136	0.17%	31.63%	All other types of violence	To add to the Group IIIb total and include under War/legal intervention

Annexure V Quality of data available for APBD estimates[1] I			
Group	Disease	India	AP
Communicable	Tuberculosis	***	***
	STD excluding HIV	**	
	HIV	**	
	Diarrhoea	***	***
	Childhood cluster	**	**
	Meningitis	*	*
	Japanese Encephalitis	***	***
	Hepatitis	**	**
	Enteric Fever	*	*
	Malaria	***	***
	Filaria	***	***
	Leprosy	***	***
	Trachoma	**	*
	Intestinal Parasites	**	**
	Acute Resp.Infections	***	***
Maternal	Maternal	*	*
Perinatal	Perinatal	*	*
Nutritional	PEM	***	***
	Anaemia	***	***
	IDD	***	***
	Vita. A deficiency	***	***

[1] *** Good community based studies; ** Community based studies; * Hospital Based data

Quality of data available for APBD estimates[1] II

Preliminary results of Disease Burden -NOT FOR QUOTATION 9 October 1995

Group	Disease	India	AP
Cancers	Cancers	**	*
Endocrinal	Diabetes	***	**
Neuro-psychiatirc	Major Affective Disorders	**	
	Bipolar Affective Disorders		
	Psychosis	**	
	Epilepsy	**	
	Alcoholism	*	
	Drug dependence	*	
	Dementias		
Sense organs	Cataract	***	***
	Glaucoma	*	
Cardiovascular	Rheumatic Heart disease	***	***
	Ischaemic heart disease	**	
	Cerebrovascular disease	*	
	Peri Endo Myocarditis and cardiomyopathies	*	
Chronic Respiratory	COPD	*	
	Asthma	*	
Digestive	Peptic Ulcer	*	
	Cirrhosis of liver	*	
	Hernia	*	
	Appendicitis	*	
Genitourinary	Nephritis & Nephrosis	**	*
	BPH	*	
Muskulo Skeletal	Rheumatoid arthritis	*	
	Osteoarthritis	*	
Congenital	Congenital	*	
Oral Health	Dental carries	***	***
	Periodontal disease	***	***
	Eduntulism	*	*

1 *** Good community based studies; ** Community based studies; * Hospital Based data

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Annexure VI Disability Adjusted Life Years(DALYs)

REGION	N	DISEASE	ALL	ALLM	ALLF	M0	M5	M15	M45	M60	F0	F5	F15	F45	F60
AP	0	Sum	17,657,518	9,159,641	8,497,877	3,395,371	754,549	2,511,708	1,318,827	1,179,187	3,297,589	665,098	2,476,426	915,340	1,143,423
AP	1	I.Communicable, Maternal & Perinatal	9,528,102	4,852,049	4,676,054	2,880,158	394,568	954,294	376,283	246,746	2,669,881	391,872	1,146,691	273,742	193,867
AP	2	A. Infectious & Parasitic	4,513,587	2,571,091	1,942,496	1,025,683	271,704	798,072	320,827	154,805	919,953	243,123	494,903	183,085	101,433
AP	3	1. Tuberculosis	1,370,483	910,529	459,953	12,156	46,750	489,094	252,985	109,545	8,373	37,968	233,567	128,505	51,540
AP	4	2. STD's Excluding HIV	91,155	31,776	59,379	1,144	284	29,910	394	44	1,001	500	56,999	793	85
AP	5	a. Syphilis	59,711	28,558	31,153	1,057	244	26,895	326	36	944	260	29,323	567	59
AP	6	b. Chlamydia	24,226	2,769	21,457	6	32	2,674	50	7	8	192	21,010	221	26
AP	7	c. Gonorrhea	7,219	450	6,769	82	8	341	17	1	49	48	6,666	6	1
AP	8	3. HIV	21,402	12,939	8,463	267	52	12,052	501	68	274	56	8,080	42	12
AP	9	4. Diarrhoeal Diseases	1,207,987	632,288	575,699	490,071	39,856	67,179	15,030	20,152	444,097	38,994	60,016	13,404	19,189
AP	10	5. Childhood Cluster	818,806	424,095	394,711	334,488	40,474	42,519	4,944	1,669	307,551	43,445	37,443	4,594	1,678
AP	11	a. Pertussis	118,387	61,714	56,673	55,984	5,730	0	0	0	51,149	5,524	0	0	0
AP	12	b. Polio	96,821	51,602	45,219	50,421	1,021	160	0	0	44,176	902	141	0	0
AP	13	c. Diptheria	8,503	4,358	4,145	3,312	841	205	0	0	3,093	835	217	0	0
AP	14	d. Measles	358,030	176,876	181,154	155,888	20,988	0	0	0	156,552	24,601	0	0	0
AP	15	e. Tetanus	237,065	129,545	107,520	68,883	11,895	42,154	4,944	1,669	52,581	11,583	37,085	4,594	1,678
AP	16	6. Meningitis	207,971	124,063	83,909	56,369	29,857	32,312	3,739	1,785	47,156	14,294	20,023	1,855	580
AP	17	7. Hepatitis	152,601	89,807	62,793	49,545	6,551	23,761	7,250	2,700	31,798	3,752	20,181	4,489	2,574
AP	18	8. Malaria	49,654	28,344	21,310	5,227	4,514	16,178	1,919	506	3,878	3,860	11,725	1,461	385
AP	19	9. Tropical Cluster	39,766	25,176	14,590	0	0	10,227	13,789	1,160	0	0	0	12,434	2,156
AP	20	a. Lymphatic Filariasis	39,766	25,176	14,590	0	0	10,227	13,789	1,160	0	0	0	12,434	2,156
AP	21	10. Leprosy	39,510	19,370	20,140	2,071	15,900	1,121	254	24	2,032	16,855	1,094	131	27
AP	22	11. Trachoma	24,501	8,715	15,786	0	0	3,880	2,826	2,008	0	0	7,494	1,328	6,965
AP	23	12. Intestinal Helminths	150,564	76,063	74,501	306	61,471	12,491	1,254	541	301	59,571	12,959	1,110	560
AP	24	a. Ascaris	81,267	41,290	39,977	306	40,984	0	0	0	301	39,676	0	0	0
AP	25	b. Trichuris	36,741	18,677	18,064	0	18,383	225	70	0	0	17,859	139	65	0
AP	26	c. Hookworm	32,555	16,096	16,460	0	2,104	12,266	1,184	541	0	2,035	12,820	1,044	560
AP	27	13. Japanese encephalitis	57,766	37,501	20,265	25,379	4,755	5,911	1,000	456	13,974	2,216	3,018	495	562
AP	28	B. Respiratory Infections	1,825,738	921,613	904,125	649,584	60,325	100,751	30,221	80,731	646,956	68,843	83,300	31,365	73,662
AP	29	1. Acute Respiratory Infections	1,764,354	890,665	873,689	618,637	60,325	100,751	30,221	80,731	616,520	68,843	83,300	31,365	73,662

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AP	30	2. Otitis Media	61,384	30,947	30,436	30,947	0	0	0	0	30,436	0	0	0	0
AP	31	C. Maternal Conditions	498,163	0	498,163	0	0	0	0	0	0	0	464,622	29,163	4,378
AP	32	1. Hemmorhage	27,245	0	27,245	0	0	0	0	0	0	0	25,811	1,434	0
AP	33	2. Sepsis	169,389	0	169,389	0	0	0	0	0	0	0	156,273	13,115	0
AP	34	3. Eclampsia	4,623	0	4,623	0	0	0	0	0	0	0	4,552	72	0
AP	35	4. Hypertension	6,308	0	6,308	0	0	0	0	0	0	0	6,308	0	0
AP	36	5. Obstructed Labor	125,808	0	125,808	0	0	0	0	0	0	0	115,518	10,290	0
AP	37	6. Abortion	37,012	0	37,012	0	0	0	0	0	0	0	35,820	1,192	0
AP	38	D. Perinatal Conditions	1,778,021	937,262	840,759	937,262	0	0	0	0	840,759	0	0	0	0
AP	39	D. Nutritional/Endocrine	912,593	422,083	490,510	267,630	62,539	55,470	25,235	11,209	262,213	79,907	103,867	30,130	14,393
AP	40	1. Protein-Energy Malnutrition	374,260	188,358	185,903	178,789	1,800	4,738	1,257	1,773	177,529	2,682	2,856	677	2,159
AP	41	2. Iodine Deficiency	91,683	46,383	45,299	40,510	1,702	2,961	824	387	39,728	1,973	3,031	329	239
AP	42	3. Vitamin A	37,660	19,324	18,336	19,324	0	0	0	0	18,336	0	0	0	0
AP	43	4. Anemias	408,990	168,018	240,972	29,007	59,037	47,771	23,154	9,048	26,620	75,252	97,980	29,125	11,995
AP	44	II. Noncommunicable	5,288,634	2,849,878	2,438,757	301,009	119,392	821,191	791,123	817,163	260,576	102,481	745,160	552,500	778,041
AP	45	A. Malignant Neoplasms	595,259	304,933	290,326	7,645	6,336	102,889	120,194	67,869	2,274	2,366	108,414	132,726	44,546
AP	46	1. Mouth and Oropharynx	48,307	32,205	16,103	0	0	9,571	14,191	8,442	0	0	6,270	7,115	2,718
AP	47	2. Esophagus	67,634	40,196	27,439	0	0	12,683	18,453	9,060	0	0	10,148	11,988	5,302
AP	48	3. Stomach	59,861	40,579	19,282	2	6	13,868	16,734	9,970	0	0	7,236	9,137	2,908
AP	49	4. Colon/Rectum	26,296	15,121	11,175	0	24	3,122	7,528	4,447	29	71	1,810	6,125	3,140
AP	50	5. Liver	22,310	15,779	6,530	126	190	3,933	8,774	2,755	28	94	1,593	3,231	1,585
AP	51	6. Pancreas	13,021	8,259	4,761	0	0	1,850	4,058	2,351	0	26	1,454	2,376	906
AP	52	7. Trachea/Bronchus/Lung	64,529	55,845	8,684	30	24	17,687	27,856	10,248	28	28	921	5,648	2,060
AP	53	8. Melanoma and Other Skin	1,663	934	729	13	31	196	407	287	52	6	210	316	145
AP	54	9. Breast	56,808	0	56,808	0	0	0	0	0	1	2	23,913	27,210	5,683
AP	55	10. Cervix	84,364	0	84,364	0	0	0	0	0	0	0	32,830	42,727	8,806
AP	56	11. Corpus Uteri	5,545	0	5,545	0	0	0	0	0	0	0	2,394	1,539	1,612
AP	57	12. Ovary	12,349	0	12,349	0	0	0	0	0	72	72	5,184	5,715	1,305
AP	58	13. Prostate	11,903	11,903	0	0	0	190	2,715	8,998	0	0	0	0	0
AP	59	14. Bladder	11,111	6,899	4,212	0	24	1,362	2,659	2,854	29	70	317	1,139	2,658
AP	60	15. Lymphoma	83,864	59,962	23,902	7,473	6,037	34,399	7,765	4,287	2,036	1,997	11,816	4,456	3,596
AP	61	16. Larynx	25,694	17,251	8,443	0	0	4,029	9,053	4,169	0	0	2,316	4,004	2,123
AP	62	B. Other Neoplasm	11,142	7,357	3,785	731	639	5,054	558	374	259	96	2,653	522	254
AP	63	C. Diabetes Mellitus	118,907	67,165	51,743	66	115	17,100	21,830	28,053	0	30	13,990	12,108	25,614

AP	64	D. Other Endocrine	1,091	663	428	66	38	337	150	71	0	0	153	119	156
AP	65	E. Neuro-Psychiatric	915,987	478,911	437,076	14,619	40,002	273,818	83,230	67,243	13,532	26,704	286,262	52,890	57,688
AP	66	1. MAD	255,457	85,506	169,950	0	0	73,194	10,128	2,185	0	0	145,187	20,122	4,641
AP	67	2. BAD	17,122	8,660	8,462	0	0	7,528	928	204	0	0	7,311	921	230
AP	68	3. Psychoses	178,392	82,404	95,988	23	116	76,448	3,708	2,109	25	139	93,003	733	2,088
AP	69	4. Epilepsy	152,529	90,673	61,856	9,917	36,200	38,718	3,641	2,198	6,757	24,260	26,823	2,653	1,362
AP	70	5. Alcohol Dependence	142,976	125,106	17,869	0	0	69,954	38,657	16,496	0	0	9,904	5,551	2,415
AP	71	6. Alzheimer's and other dementia	149,503	74,141	75,362	4,668	3,455	3,727	22,906	39,385	6,724	2,232	2,502	20,355	43,549
AP	72	7. Parkinson's Disease	13,272	7,428	5,844	11	21	80	2,743	4,573	25	0	64	2,379	3,376
AP	73	8. Drug Dependence	6,737	4,993	1,745	0	211	4,169	520	93	0	73	1,469	176	27
AP	74	F. Sense Organ	160,080	81,232	78,848	843	0	8,460	40,946	30,983	823	0	6,660	36,969	34,396
AP	75	1. Glaucoma-related Blindness	32,916	18,860	14,056	0	0	1,513	14,204	3,143	0	0	0	10,405	3,651
AP	76	2. Cataract-related Blindness	127,164	62,372	64,792	843	0	6,947	26,742	27,840	823	0	6,660	26,564	30,745
AP	77	G. Cardiovascular Diseases	1,855,050	959,952	895,098	19,820	13,196	131,374	305,706	489,857	23,341	21,553	120,433	199,344	530,427
AP	78	1. Rheumatic Heart Disease	169,503	58,929	110,573	981	6,274	20,598	15,729	15,348	1,481	7,332	27,801	35,286	38,673
AP	79	2. Ischemic Heart Disease	796,479	487,627	308,853	250	121	64,251	171,388	251,617	157	134	16,473	64,919	227,169
AP	80	3. Cerebrovascular Disease	622,440	282,178	340,262	4,331	2,850	40,568	65,954	168,475	4,331	5,138	45,426	69,837	215,530
AP	81	4. PEMC	266,628	131,218	135,410	14,259	3,952	5,957	52,635	54,416	17,372	8,949	30,734	29,302	49,053
AP	82	H. Chronic Respiratory Diseases	291,341	160,364	130,976	13,625	24,564	34,615	31,438	56,121	12,240	18,729	37,126	31,046	31,836
AP	83	1. COPD	155,604	93,051	62,553	8,157	2,192	6,140	23,655	52,907	7,135	1,596	4,673	21,141	28,008
AP	84	2. Asthma	135,737	67,314	68,423	5,468	22,372	28,476	7,784	3,215	5,105	17,132	32,453	9,905	3,828
AP	85	I. Diseases of the Digestive System	475,609	333,473	142,136	12,136	4,544	158,975	118,414	39,404	5,751	3,757	66,677	41,147	24,804
AP	86	1. Peptic Ulcer Disease	94,457	62,512	31,944	339	826	33,503	20,107	7,737	458	666	16,919	9,538	4,364
AP	87	2. Cirrhosis of the Liver	263,570	189,000	74,570	2,432	1,436	82,954	76,062	26,117	2,983	2,652	31,755	26,505	10,676
AP	88	J. Diseases of the Genito-Urinary System	202,769	121,319	81,450	4,411	21,411	23,143	46,982	25,372	2,702	21,508	27,608	15,697	13,935
AP	89	1. Nephritis/Nephrosis	169,131	87,681	81,450	4,411	21,402	23,136	21,420	17,312	2,702	21,508	27,608	15,697	13,935
AP	90	2. Benign Prostatic Hypertrophy	33,638	33,638	0	0	8	7	25,562	8,060	0	0	0	0	0
AP	91	K. Diseases of the Musculo-Skeletal System	54,242	18,296	35,946	0	0	11,565	5,304	1,426	0	0	20,772	12,490	2,684

AP	92	1. Rheumatoid Arthritis	18,074	8,411	9,663	0	0	7,023	854	533	0	0	6,829	2,287	547
AP	93	2. Osteoarthritis	36,168	9,885	26,283	0	0	4,542	4,450	893	0	0	13,942	10,203	2,137
AP	94	L. Congenital Abnormalities	461,397	243,084	218,313	225,752	5,947	11,119	229	37	198,390	5,249	13,476	1,131	68
AP	95	M. Oral Health	145,760	73,128	72,632	1,294	2,601	42,741	16,139	10,353	1,264	2,489	40,936	16,311	11,632
AP	96	1. Dental Caries	25,356	12,807	12,549	1,294	2,601	5,500	2,170	1,243	1,264	2,489	5,267	2,151	1,378
AP	97	2. Periodontal Disease	90,382	45,889	44,493	0	0	37,241	6,491	2,157	0	0	35,668	6,434	2,391
AP	98	3. Edentulism	30,022	14,432	15,590	0	0	0	7,479	6,953	0	0	0	7,727	7,863
AP	99	III. Injuries	2,840,781	1,457,715	1,383,066	214,204	240,588	736,223	151,421	115,278	367,132	170,745	584,575	89,098	171,516
AP	100	A. Unintentional	2,343,779	1,181,261	1,162,517	210,652	221,230	526,176	115,479	107,724	363,910	163,174	407,334	60,741	167,358
AP	101	1. Motor Vehicle Accidents	279,704	210,234	69,470	18,012	40,299	128,455	18,388	5,081	9,288	19,896	23,817	6,783	9,686
AP	102	2. Poisonings	34,361	14,178	20,183	2,989	1,971	7,699	1,262	256	2,228	1,319	14,252	1,873	511
AP	103	3. Falls	899,015	371,961	527,054	70,974	68,502	107,781	41,803	82,901	282,524	61,831	34,593	15,001	133,104
AP	104	4. Fires	394,584	124,944	269,640	36,833	13,412	64,417	7,870	2,411	7,673	28,152	213,779	14,061	5,976
AP	105	5. Drowning	200,649	129,193	71,456	29,070	43,586	48,175	6,018	2,345	8,801	25,960	28,106	4,035	4,553
AP	106	6. Venamous animals and plants as cause of poisoining	120,249	79,214	41,036	3,334	27,345	39,658	8,348	529	0	11,642	21,902	5,644	1,848
AP	107	7. Foreign body and accidental aspiration	35,394	21,341	14,053	17,780	3,560	0	0	0	14,053	0	0	0	0
AP	108	8. Electric Shock	65,439	65,439	0	0	0	49,436	13,435	2,568	0	0	0	0	0
AP	109	B. Intentional	497,003	276,454	220,549	3,552	19,358	210,047	35,942	7,554	3,223	7,571	177,241	28,357	4,158
AP	110	1. Self-inflicted	371,196	199,855	171,341	101	14,064	155,610	24,471	5,609	34	6,925	148,740	12,715	2,926
AP	111	2. Homicide and Violence	113,630	68,274	45,356	2,596	4,608	48,170	10,980	1,920	2,307	178	26,245	15,424	1,202
AP	112	3. Legal intervention	12,177	8,325	3,852	855	687	6,266	492	24	881	468	2,256	218	29

REGION	N	DISEASE	ALL	ALLM	ALLF	M0	M5	M15	M45	M60	F0	F5	F15	F45	F60
Rural	0	Sum	14,037,909	7,184,267	6,853,642	2,688,456	612,608	1,911,313	1,008,885	963,005	2,720,956	573,104	1,932,551	737,666	889,365
Rural	1	I. Communicable, Maternal & Perinatal	7,781,109	3,921,409	3,859,700	2,320,412	324,217	769,944	301,541	205,295	2,191,767	340,807	952,455	229,014	145,657
Rural	2	A. Infectious & Parasitic	3,805,990	2,137,602	1,668,388	881,835	222,379	646,586	257,194	129,608	806,747	210,391	419,525	155,826	75,900
Rural	3	1. Tuberculosis	1,137,636	743,935	393,701	10,369	39,279	397,492	205,334	91,461	7,023	33,328	203,783	112,278	37,288
Rural	4	2. STD's Excluding HIV	70,950	24,170	46,780	882	198	22,768	296	26	781	402	45,090	460	47
Rural	5	a. Syphilis	46,614	21,881	24,732	834	170	20,610	247	20	749	221	23,449	287	26
Rural	6	b. Chlamydia	18,654	1,984	16,670	3	23	1,914	38	6	5	146	16,331	168	20
Rural	7	c. Gonorrhea	5,682	305	5,377	45	5	244	11	1	28	35	5,310	4	1
Rural	8	3. HIV	12,020	7,674	4,345	201	35	7,080	311	48	214	47	4,050	26	8
Rural	9	4. Diarrhoeal Diseases	1,024,113	531,358	492,755	413,358	32,015	55,835	12,396	17,753	380,519	34,424	51,159	11,158	15,495
Rural	10	5. Childhood Cluster	739,942	379,914	360,027	303,700	35,343	35,394	4,021	1,456	282,318	40,455	32,165	3,764	1,327
Rural	11	a. Pertussis	104,456	54,109	50,347	49,646	4,463	0	0	0	45,839	4,508	0	0	0
Rural	12	b. Polio	75,725	40,034	35,691	39,113	796	125	0	0	34,869	707	115	0	0
Rural	13	c. Diptheria	7,208	3,667	3,542	2,850	702	114	0	0	2,674	724	144	0	0
Rural	14	d. Measles	343,644	168,832	174,813	148,920	19,911	0	0	0	150,770	24,043	0	0	0
Rural	15	e. Tetanus	208,908	113,273	95,636	63,171	9,471	35,154	4,021	1,456	48,166	10,473	31,906	3,764	1,327
Rural	16	6. Meningitis	181,016	106,627	74,389	48,677	25,057	28,092	3,197	1,603	41,213	13,224	17,866	1,602	484
Rural	17	7. Hepatitis	137,261	79,399	57,862	47,113	5,583	18,983	5,639	2,081	30,843	3,574	17,748	3,794	1,903
Rural	18	8. Malaria	46,368	26,360	20,009	5,046	4,092	14,997	1,755	471	3,723	3,643	10,961	1,336	345
Rural	19	9. Tropical Cluster	27,726	17,292	10,434	0	0	6,745	9,672	875	0	0	0	8,847	1,587
Rural	20	a. Lymphatic Filariasis	27,726	17,292	10,434	0	0	6,745	9,672	875	0	0	0	8,847	1,587
Rural	21	10. Leprosy	28,820	14,086	14,734	1,510	11,564	802	192	19	1,498	12,327	787	100	21
Rural	22	11. Trachoma	18,375	6,513	11,862	0	0	2,777	2,129	1,607	0	0	5,391	1,012	5,459
Rural	23	12. Intestinal Helminths	116,567	58,465	58,102	240	47,033	9,713	995	485	238	46,036	10,464	864	501
Rural	24	a. Ascaris	63,716	32,223	31,493	240	31,983	0	0	0	238	31,255	0	0	0
Rural	25	b. Trichuris	26,975	13,622	13,353	0	13,407	163	52	0	0	13,189	115	49	0
Rural	26	c. Hookworm	25,876	12,620	13,256	0	1,643	9,550	943	485	0	1,592	10,348	815	501
Rural	27	13. Japanese encephalitis	42,310	27,132	15,178	18,451	3,267	4,406	682	326	10,326	1,826	2,346	337	344
Rural	28	B. Respiratory Infections	1,409,260	703,767	705,493	495,509	43,658	76,188	22,582	65,829	505,255	58,291	65,002	23,715	53,230
Rural	29	1. Acute Respiratory Infections	1,363,428	680,843	682,584	472,586	43,658	76,188	22,582	65,829	482,346	58,291	65,002	23,715	53,230

Rural	30	2. Otitis Media	45,833	22,923	22,909	22,923	0	0	0	0	22,909	0	0	0	0
Rural	31	C. Maternal Conditions	411,882	0	411,882	0	0	0	0	0	0	0	385,018	22,486	4,378
Rural	32	1. Hemmorhage	20,015	0	20,015	0	0	0	0	0	0	0	18,944	1,072	0
Rural	33	2. Sepsis	130,816	0	130,816	0	0	0	0	0	0	0	121,013	9,803	0
Rural	34	3. Eclampsia	3,342	0	3,342	0	0	0	0	0	0	0	3,288	54	0
Rural	35	4. Hypertension	5,767	0	5,767	0	0	0	0	0	0	0	5,767	0	0
Rural	36	5. Obstructed Labor	96,138	0	96,138	0	0	0	0	0	0	0	88,447	7,691	0
Rural	37	6. Abortion	31,649	0	31,649	0	0	0	0	0	0	0	30,758	891	0
Rural	38	D. Perinatal Conditions	1,387,682	725,972	661,710	725,972	0	0	0	0	661,710	0	0	0	0
Rural	39	E. Nutritional	766,295	354,068	412,227	217,094	58,180	47,171	21,765	9,858	218,056	72,125	82,910	26,987	12,149
Rural	40	1. Protein-Energy Malnutrition	312,139	154,391	157,747	147,584	1,139	3,754	536	1,379	151,507	2,516	2,115	356	1,253
Rural	41	2. Iodine Deficiency	67,524	33,926	33,599	29,582	1,236	2,176	616	316	29,362	1,532	2,280	250	174
Rural	42	3. Vitamin A	26,810	13,808	13,001	13,808	0	0	0	0	13,001	0	0	0	0
Rural	43	4. Anemias	359,822	151,943	207,880	26,120	55,804	41,241	20,614	8,163	24,185	68,077	78,514	26,382	10,721
Rural	44	II. Noncommunicable	3,960,604	2,104,230	1,856,374	204,066	79,738	581,702	585,469	653,255	191,764	78,735	566,635	435,762	583,478
Rural	45	A. Malignant Neoplasms	457,662	222,954	234,708	4,361	4,060	68,544	89,706	56,283	1,526	1,946	87,988	109,161	34,087
Rural	46	1. Mouth and Oropharynx	36,707	24,058	12,648	0	0	6,804	10,505	6,749	0	0	4,620	5,622	2,406
Rural	47	2. Esophagus	52,163	30,237	21,926	0	0	9,130	13,801	7,306	0	0	8,359	9,611	3,956
Rural	48	3. Stomach	45,432	30,146	15,286	1	4	9,815	12,359	7,966	0	0	5,887	7,250	2,149
Rural	49	4. Colon/Rectum	20,205	11,365	8,840	0	23	2,218	5,715	3,409	29	55	1,454	4,840	2,462
Rural	50	5. Liver	16,871	11,721	5,150	60	113	2,819	6,519	2,210	28	78	1,299	2,576	1,170
Rural	51	6. Pancreas	9,918	6,160	3,758	0	0	1,291	2,991	1,878	0	26	1,181	1,888	662
Rural	52	7. Trachea/Bronchus/Lung	45,384	38,470	6,914	30	24	7,352	21,000	10,065	28	27	758	4,552	1,549
Rural	53	8. Melanoma and Other Skin	1,263	696	567	7	19	139	301	229	33	5	171	251	107
Rural	54	9. Breast	44,520	0	44,520	0	0	0	0	0	0	1	18,394	22,401	3,723
Rural	55	10. Cervix	71,762	0	71,762	0	0	0	0	0	0	0	27,623	36,793	7,347
Rural	56	11. Corpus Uteri	4,519	0	4,519	0	0	0	0	0	0	0	2,064	1,239	1,216
Rural	57	12. Ovary	9,995	0	9,995	0	0	0	0	0	29	56	4,281	4,533	1,097
Rural	58	13. Prostate	9,555	9,555	0	0	0	140	2,007	7,407	0	0	0	0	0
Rural	59	14. Bladder	8,333	5,197	3,137	0	23	958	1,966	2,249	29	54	246	836	1,972
Rural	60	15. Lymphoma	61,559	42,487	19,072	4,262	3,853	25,021	5,869	3,483	1,350	1,644	9,775	3,595	2,708

Rural	61	16. Larynx	19,476	12,862	6,615	0	0	2,857	6,673	3,332	0	0	1,876	3,174	1,565
Rural	62	B. Other Neoplasm	8,690	5,623	3,067	462	443	3,985	435	298	172	80	2,227	409	178
Rural	63	C. Diabetes Melltus	87,116	48,202	38,913	0	0	12,404	13,557	22,241	0	0	12,195	8,097	18,622
Rural	64	D. Other Endocrine	0	0	0	0	0	0	0	0	0	0	0	0	0
Rural	65	E. Neuro-Psychiatric	670,817	349,027	321,790	9,698	28,588	196,423	61,656	52,662	9,335	19,775	207,824	40,216	44,640
Rural	66	1. MAD	185,190	61,765	123,425	0	0	52,387	7,630	1,748	0	0	104,449	15,338	3,638
Rural	67	2. BAD	12,394	6,248	6,146	0	0	5,387	697	163	0	0	5,265	704	178
Rural	68	3. Psychoses	128,493	59,190	69,303	12	71	54,688	2,735	1,685	16	114	67,059	584	1,530
Rural	69	4. Epilepsy	112,245	65,678	46,567	7,128	26,271	27,790	2,735	1,755	4,950	17,772	20,765	2,037	1,042
Rural	70	5. Alcohol Dependence	104,518	91,405	13,114	0	0	51,024	28,292	12,088	0	0	7,280	4,070	1,764
Rural	71	6. Alzheimer's and other dementia	113,689	55,992	57,697	2,552	2,105	2,642	17,188	31,505	4,353	1,835	2,049	15,556	33,904
Rural	72	7. Parkinson's Disease	10,241	5,787	4,454	6	13	57	2,057	3,655	16	0	52	1,819	2,567
Rural	73	8. Drug Dependence	4,046	2,962	1,084	0	130	2,448	321	62	0	53	906	108	17
Rural	74	F. Sense Organ	128,167	64,905	63,262	609	0	6,415	32,040	25,841	602	0	5,133	29,333	28,194
Rural	75	1. Glaucoma-related Blindness	25,087	14,296	10,791	0	0	1,083	10,700	2,514	0	0	0	7,931	2,860
Rural	76	2. Cataract-related Blindness	103,080	50,608	52,472	609	0	5,332	21,340	23,327	602	0	5,133	21,402	25,334
Rural	77	G. Cardiovascular Diseases	1,411,033	730,950	680,084	11,022	8,825	93,323	226,382	391,398	15,215	17,017	96,366	157,540	393,945
Rural	78	1. Rheumatic Heart Disease	128,610	43,570	85,040	580	4,479	14,645	11,607	12,259	980	5,541	22,082	28,091	28,346
Rural	79	2. Ischemic Heart Disease	607,506	373,934	233,571	143	78	45,634	127,029	201,050	104	106	13,108	51,141	169,112
Rural	80	3. Cerebrovascular Disease	475,112	216,603	258,508	2,469	1,835	28,811	48,873	134,615	2,865	4,073	36,193	55,041	160,337
Rural	81	4. PEMC	199,806	96,842	102,964	7,830	2,433	4,233	38,872	43,473	11,266	7,297	24,984	23,266	36,151
Rural	82	H. Chronic Respiratory Diseases	216,529	117,314	99,214	7,856	16,608	24,666	23,339	44,845	8,092	14,361	28,611	24,386	23,765
Rural	83	1. COPD	117,293	70,018	47,276	4,497	1,363	4,355	17,527	42,276	4,639	1,295	3,784	16,669	20,889
Rural	84	2. Asthma	99,235	47,296	51,939	3,359	15,246	20,310	5,812	2,569	3,453	13,066	24,827	7,717	2,876
Rural	85	I. Diseases of the Digestive System	336,694	232,575	104,119	1,542	1,480	112,745	86,849	29,960	2,379	2,710	49,271	31,459	18,301
Rural	86	1. Peptic Ulcer Disease	70,420	45,726	24,694	190	572	23,848	14,935	6,182	297	522	13,168	7,482	3,224
Rural	87	2. Cirrhosis of the Liver	196,770	138,388	58,382	1,352	908	58,890	56,368	20,869	1,948	2,127	25,450	20,889	7,968
Rural	88	J. Diseases of the Genito-Urinary System	151,577	88,733	62,844	2,593	14,224	16,459	35,180	20,277	1,812	16,712	21,563	12,278	10,478

Rural	89	1. Nephritis/Nephrosis	125,871	63,027	62,844	2,593	14,219	16,454	15,925	13,836	1,812	16,712	21,563	12,278	10,478
Rural	90	2. Benign Prostatic Hypertrophy	25,706	25,706	0	0	5	5	19,255	6,441	0	0	0	0	0
Rural	91	K. Diseases of the Musculo-Skeletal System	40,025	13,412	26,613	0	0	8,276	3,995	1,141	0	0	14,970	9,545	2,098
Rural	92	1. Rheumatoid Arthritis	13,224	6,094	7,130	0	0	5,025	643	426	0	0	4,940	1,767	423
Rural	93	2. Osteoarthritis	26,801	7,318	19,483	0	0	3,251	3,352	714	0	0	10,030	7,777	1,675
Rural	94	L. Congenital Abnormalities	344,674	176,668	168,006	164,980	3,618	7,872	173	26	151,698	4,313	11,038	906	51
Rural	95	M. Oral Health	107,620	53,868	53,753	943	1,891	30,591	12,159	8,283	932	1,820	29,450	12,433	9,117
Rural	96	1. Dental Caries	18,661	9,400	9,261	943	1,891	3,936	1,635	994	932	1,820	3,789	1,640	1,080
Rural	97	2. Periodontal Disease	65,709	33,270	32,438	0	0	26,655	4,890	1,726	0	0	25,660	4,904	1,874
Rural	98	3. Edentulism	23,250	11,197	12,053	0	0	0	5,634	5,563	0	0	0	5,890	6,163
Rural	99	III. Injuries	2,296,196	1,158,628	1,137,568	163,978	208,653	559,666	121,874	104,455	337,424	153,563	413,461	72,891	160,230
Rural	100	A. Unintentional	1,827,902	900,492	927,410	163,561	190,128	361,711	87,630	97,462	336,987	146,483	241,475	45,670	156,796
Rural	101	1. Motor Vehicle Accidents	236,574	176,699	59,875	13,728	37,523	107,191	14,419	3,838	8,190	18,958	18,859	5,187	8,680
Rural	102	2. Poisonings	24,795	7,556	17,239	1,578	1,082	4,088	675	132	1,577	970	12,568	1,658	466
Rural	103	3. Falls	816,344	310,866	505,478	58,432	59,818	77,678	35,516	79,421	275,927	58,594	28,147	12,768	130,041
Rural	104	4. Fires	210,280	71,723	138,558	26,482	8,747	30,787	4,083	1,623	0	22,091	106,083	7,976	2,408
Rural	105	5. Drowning	189,028	120,294	68,734	27,554	42,116	43,126	5,319	2,179	8,251	25,658	26,555	3,878	4,392
Rural	106	6. Venamous animals and plants as cause of poisoining	120,249	79,214	41,036	3,334	27,345	39,658	8,348	529	0	11,642	21,902	5,644	1,848
Rural	107	7. Foreign body and accidental aspiration	35,394	21,341	14,053	17,780	3,560	0	0	0	14,053	0	0	0	0
Rural	108	8. Electric Shock	65,439	65,439	0	0	0	49,436	13,435	2,568	0	0	0	0	0
Rural	109	B. Intentional	468,294	258,136	210,158	418	18,525	197,955	34,244	6,994	437	7,080	171,987	27,221	3,433
Rural	110	1. Self-inflicted	364,121	195,226	168,895	0	14,026	151,690	24,021	5,489	0	6,850	146,703	12,491	2,853
Rural	111	2. Homicide and Violence	98,439	59,005	39,433	0	4,165	43,460	9,888	1,493	0	0	24,265	14,600	567
Rural	112	3. Legal intervention	5,734	3,905	1,829	418	334	2,806	335	12	437	230	1,019	130	13

Preliminary results of Disease Burden - NOT FOR QUOTATION 18 May 1995

REGION	N	DISEASE	ALL	ALLM	ALLF	M0	M5	M15	M45	M60	F0	F5	F15	F45	F60
Urban	0	Sum	3,619,609	1,975,375	1,644,235	706,915	141,941	600,395	309,942	216,182	576,634	91,994	543,875	177,674	254,058
Urban	1	I. Communicable, Maternal & Perinatal	1,746,993	930,639	816,354	559,747	70,351	184,349	74,742	41,451	478,114	51,066	194,237	44,728	48,209
Urban	2	A. Infectious & Parasitic	707,598	433,489	274,108	143,847	49,325	151,486	63,633	25,197	113,206	32,732	75,378	27,259	25,533
Urban	3	1. Tuberculosis	232,847	166,595	66,252	1,787	7,471	91,602	47,651	18,083	1,350	4,640	29,784	16,227	14,251
Urban	4	2. STD's Excluding HIV	20,205	7,606	12,599	262	86	7,142	98	18	220	98	11,909	334	39
Urban	5	a. Syphilis	13,097	6,677	6,420	223	74	6,285	79	16	195	39	5,874	279	33
Urban	6	b. Chlamydia	5,572	785	4,787	3	9	760	12	1	3	46	4,680	53	6
Urban	7	c. Gonorrhea	1,536	144	1,392	37	3	97	7	0	22	13	1,355	2	0
Urban	8	3. HIV	9,383	5,265	4,118	66	17	4,972	190	20	60	9	4,030	15	4
Urban	9	4. Diarrhoeal Diseases	183,875	100,930	82,945	76,713	7,841	11,343	2,633	2,399	63,578	4,570	8,857	2,246	3,694
Urban	10	5. Childhood Cluster	78,865	44,181	34,684	30,789	5,131	7,125	923	213	25,233	2,991	5,279	830	351
Urban	11	a. Pertussis	13,931	7,605	6,326	6,339	1,266	0	0	0	5,310	1,017	0	0	0
Urban	12	b. Polio	21,096	11,568	9,528	11,309	225	35	0	0	9,308	194	27	0	0
Urban	13	c. Diptheria	1,294	691	604	461	139	91	0	0	419	111	74	0	0
Urban	14	d. Measles	14,386	8,045	6,341	6,968	1,077	0	0	0	5,782	559	0	0	0
Urban	15	e. Tetanus	28,157	16,272	11,885	5,713	2,424	7,000	923	213	4,414	1,110	5,179	830	351
Urban	16	6. Meningitis	26,956	17,436	9,519	7,692	4,801	4,220	542	182	5,942	1,070	2,157	254	97
Urban	17	7. Hepatitis	15,340	10,409	4,931	2,431	969	4,778	1,611	620	956	177	2,433	694	671
Urban	18	8. Malaria	3,285	1,984	1,301	182	422	1,180	164	36	155	218	764	124	41
Urban	19	9. Tropical Cluster	12,040	7,883	4,156	0	0	3,483	4,117	284	0	0	0	3,587	569
Urban	20	a. Lymphatic Filariasis	12,040	7,883	4,156	0	0	3,483	4,117	284	0	0	0	3,587	569
Urban	21	10. Leprosy	10,689	5,283	5,406	561	4,336	319	63	5	534	4,528	307	31	6
Urban	22	11. Trachoma	6,125	2,201	3,924	0	0	1,103	697	401	0	0	2,103	316	1,506
Urban	23	12. Intestinal Helminths	33,997	17,598	16,399	67	14,438	2,778	259	56	64	13,535	2,495	246	59
Urban	24	a. Ascaris	17,552	9,067	8,485	67	9,000	0	0	0	64	8,421	0	0	0
Urban	25	b. Trichuris	9,766	5,055	4,711	0	4,976	62	18	0	0	4,670	24	17	0
Urban	26	c. Hookworm	6,679	3,476	3,203	0	462	2,716	241	56	0	444	2,471	229	59
Urban	27	13. Japanese encephalitis	15,456	10,369	5,087	6,927	1,488	1,505	318	130	3,648	390	672	158	218
Urban	28	B. Respiratory Infections	416,477	217,846	198,632	154,075	16,667	24,564	7,639	14,902	141,701	10,552	18,298	7,649	20,432
Urban	29	1. Acute Respiratory Infections	400,927	209,822	191,105	146,051	16,667	24,564	7,639	14,902	134,174	10,552	18,298	7,649	20,432

Urban	30	2. Otitis Media	15,551	8,024	7,527	8,024	0	0	0	0	7,527	0	0	0	0
Urban	31	C. Maternal Conditions	86,281	0	86,281	0	0	0	0	0	0	0	79,604	6,677	(0)
Urban	32	1. Hemmorhage	7,230	0	7,230	0	0	0	0	0	0	0	6,868	362	0
Urban	33	2. Sepsis	38,572	0	38,572	0	0	0	0	0	0	0	35,260	3,312	0
Urban	34	3. Eclampsia	1,281	0	1,281	0	0	0	0	0	0	0	1,263	18	0
Urban	35	4. Hypertension	541	0	541	0	0	0	0	0	0	0	541	0	0
Urban	36	5. Obstructed Labor	29,670	0	29,670	0	0	0	0	0	0	0	27,071	2,599	0
Urban	37	6. Abortion	5,363	0	5,363	0	0	0	0	0	0	0	5,062	301	0
Urban	38	D. Perinatal Conditions	390,339	211,289	179,049	211,289	0	0	0	0	179,049	0	0	0	0
Urban	39	D. Nutritional/Endocrine	146,299	68,015	78,284	50,535	4,360	8,299	3,470	1,351	44,158	7,782	20,957	3,143	2,244
Urban	40	1. Protein-Energy Malnutrition	62,122	33,966	28,156	31,205	661	984	722	394	26,023	166	741	321	906
Urban	41	2. Iodine Deficiency	24,159	12,458	11,701	10,928	466	785	208	72	10,365	441	750	79	65
Urban	42	3. Vitamin A	10,850	5,516	5,335	5,516	0	0	0	0	5,335	0	0	0	0
Urban	43	4. Anemias	49,168	16,075	33,093	2,887	3,233	6,530	2,540	886	2,435	7,175	19,466	2,743	1,274
Urban	44	II. Noncommunicable	1,328,031	745,648	582,383	96,943	39,654	239,488	205,653	163,909	68,812	23,746	178,525	116,738	194,563
Urban	45	A. Malignant Neoplasms	137,597	81,979	55,617	3,284	2,276	34,345	30,489	11,586	748	420	20,425	23,565	10,459
Urban	46	1. Mouth and Oropharynx	11,601	8,146	3,455	0	0	2,767	3,686	1,693	0	0	1,650	1,492	312
Urban	47	2. Esophagus	15,472	9,959	5,513	0	0	3,553	4,652	1,754	0	0	1,789	2,378	1,347
Urban	48	3. Stomach	14,430	10,434	3,996	0	2	4,052	4,375	2,004	0	0	1,349	1,887	760
Urban	49	4. Colon/Rectum	6,091	3,756	2,335	0	0	904	1,814	1,037	0	16	356	1,285	678
Urban	50	5. Liver	5,439	4,059	1,380	66	77	1,114	2,255	546	0	16	295	655	415
Urban	51	6. Pancreas	3,103	2,099	1,004	0	0	559	1,067	473	0	0	272	488	244
Urban	52	7. Trachea/Bronchus/Lung	19,145	17,375	1,770	0	0	10,335	6,856	184	0	0	163	1,095	511
Urban	53	8. Melanoma and Other Skin	401	239	162	6	12	57	106	58	18	1	39	65	39
Urban	54	9. Breast	12,288	0	12,288	0	0	0	0	0	0	0	5,519	4,809	1,959
Urban	55	10. Cervix	12,602	0	12,602	0	0	0	0	0	0	0	5,207	5,935	1,460
Urban	56	11. Corpus Uteri	1,026	0	1,026	0	0	0	0	0	0	0	330	300	395
Urban	57	12. Ovary	2,354	0	2,354	0	0	0	0	0	43	17	903	1,183	209
Urban	58	13. Prostate	2,348	2,348	0	0	0	49	707	1,591	0	0	0	0	0
Urban	59	14. Bladder	2,778	1,702	1,076	0	0	404	694	604	0	16	71	302	686
Urban	60	15. Lymphoma	22,304	17,474	4,830	3,211	2,184	9,378	1,897	805	686	353	2,042	861	889
Urban	61	16. Larynx	6,218	4,389	1,829	0	0	1,172	2,380	837	0	0	441	830	558

Urban	62	B. Other Neoplasm	2,453	1,735	718	270	196	1,069	123	77	87	16	426	113	76
Urban	63	C. Diabetes Melltus	31,792	18,962	12,829	66	115	4,696	8,273	5,812	0	30	1,796	4,011	6,992
Urban	64	D. Other Endocrine	1,091	663	428	66	38	337	150	71	0	0	153	119	156
Urban	65	E. Neuro-Psychiatric	245,170	129,884	115,286	4,921	11,413	77,396	21,574	14,581	4,197	6,929	78,438	12,674	13,048
Urban	66	1. MAD	70,266	23,742	46,525	0	0	20,807	2,498	437	0	0	40,737	4,784	1,003
Urban	67	2. BAD	4,728	2,412	2,316	0	0	2,141	230	41	0	0	2,046	217	52
Urban	68	3. Psychoses	49,899	23,214	26,685	10	45	21,761	973	424	9	25	25,945	149	558
Urban	69	4. Epilepsy	40,284	24,995	15,289	2,789	9,929	10,928	906	443	1,807	6,488	6,058	616	320
Urban	70	5. Alcohol Dependence	38,457	33,702	4,756	0	0	18,930	10,364	4,407	0	0	2,625	1,480	651
Urban	71	6. Alzheimer's and other dementia	35,814	18,149	17,665	2,116	1,350	1,085	5,718	7,880	2,372	396	453	4,799	9,644
Urban	72	7. Parkinson's Disease	3,030	1,640	1,390	5	8	23	686	918	9	0	12	560	810
Urban	73	8. Drug Dependence	2,691	2,031	660	0	81	1,720	199	31	0	20	563	68	9
Urban	74	F. Sense Organ	31,912	16,327	15,585	234	0	2,045	8,906	5,142	221	0	1,527	7,636	6,201
Urban	75	1. Glaucoma-related Blindness	7,828	4,563	3,265	0	0	430	3,504	629	0	0	0	2,474	791
Urban	76	2. Cataract-related Blindness	24,084	11,764	12,320	234	0	1,615	5,402	4,513	221	0	1,527	5,162	5,411
Urban	77	G. Cardiovascular Diseases	444,017	229,003	215,015	8,798	4,371	38,051	79,324	98,459	8,126	4,535	24,068	41,805	136,481
Urban	78	1. Rheumatic Heart Disease	40,893	15,359	25,534	401	1,795	5,953	4,122	3,089	501	1,790	5,719	7,195	10,328
Urban	79	2. Ischemic Heart Disease	188,974	113,692	75,282	107	43	18,616	44,359	50,567	53	28	3,365	13,778	58,057
Urban	80	3. Cerebrovascular Disease	147,329	65,575	81,754	1,861	1,015	11,757	17,081	33,860	1,466	1,065	9,233	14,796	55,194
Urban	81	4. PEMC	66,822	34,377	32,445	6,429	1,518	1,724	13,762	10,943	6,105	1,652	5,750	6,035	12,903
Urban	82	H. Chronic Respiratory Diseases	74,812	43,050	31,762	5,769	7,956	9,949	8,100	11,276	4,148	4,368	8,515	6,661	8,071
Urban	83	1. COPD	38,310	23,033	15,277	3,660	830	1,784	6,128	10,631	2,496	301	889	4,472	7,119
Urban	84	2. Asthma	36,502	20,017	16,485	2,109	7,126	8,165	1,972	646	1,652	4,067	7,626	2,188	951
Urban	85	I. Diseases of the Digestive System	138,915	100,898	38,017	10,593	3,064	46,230	31,566	9,444	3,372	1,047	17,407	9,687	6,503
Urban	86	1. Peptic Ulcer Disease	24,037	16,786	7,251	149	254	9,656	5,171	1,556	160	144	3,751	2,056	1,140
Urban	87	2. Cirrhosis of the Liver	66,801	50,612	16,188	1,079	528	24,064	19,694	5,247	1,035	525	6,305	5,616	2,708
Urban	88	J. Diseases of the Genito-Urinary System	51,192	32,586	18,606	1,818	7,187	6,685	11,802	5,095	890	4,796	6,045	3,418	3,457
Urban	89	1. Nephritis/Nephrosis	43,261	24,655	18,606	1,818	7,183	6,683	5,495	3,476	890	4,796	6,045	3,418	3,457

Urban	90	2. Benign Prostatic Hypertrophy	7,932	7,932	0	0	3	2	6,307	1,619	0	0	0	0	0
Urban	91	K. Diseases of the Musculo-Skeletal System	14,217	4,884	9,333	0	0	3,289	1,309	286	0	0	5,802	2,945	586
Urban	92	1. Rheumatoid Arthritis	4,850	2,317	2,533	0	0	1,998	212	107	0	0	1,890	520	124
Urban	93	2. Osteoarthritis	9,367	2,567	6,800	0	0	1,291	1,098	179	0	0	3,912	2,426	462
Urban	94	L. Congenital Abnormalities	116,723	66,416	50,308	60,773	2,330	3,246	56	10	46,692	936	2,438	225	17
Urban	95	M. Oral Health	38,140	19,260	18,879	351	709	12,150	3,981	2,070	332	669	11,486	3,878	2,515
Urban	96	1. Dental Caries	6,695	3,407	3,288	351	709	1,563	535	248	332	669	1,478	511	298
Urban	97	2. Periodontal Disease	24,673	12,619	12,055	0	0	10,587	1,601	431	0	0	10,008	1,530	517
Urban	98	3 Edentulism	6,772	3,235	3,537	0	0	0	1,845	1,390	0	0	0	1,837	1,700
Urban	99	III. Injuries	544,585	299,087	245,498	50,225	31,935	176,557	29,547	10,823	29,706	17,183	171,114	16,207	11,286
Urban	100	A. Unintentional	515,877	280,770	235,107	47,091	31,102	164,465	27,849	10,263	26,922	16,692	165,859	15,071	10,562
Urban	101	1. Motor Vehicle Accidents	43,130	33,536	9,595	4,285	2,775	21,264	3,969	1,243	1,098	938	4,957	1,596	1,005
Urban	102	2. Poisonings	9,566	6,622	2,944	1,411	889	3,610	587	125	651	349	1,684	215	45
Urban	103	3. Falls	82,670	61,095	21,575	12,542	8,683	30,104	6,287	3,479	6,597	3,237	6,446	2,233	3,062
Urban	104	4. Fires	184,303	53,221	131,082	10,351	4,665	33,630	3,787	788	7,673	6,060	107,696	6,085	3,568
Urban	105	5. Drowning	11,621	8,900	2,722	1,516	1,470	5,049	699	166	550	303	1,551	157	161
Urban	106	6. Venamous animals and plants as cause of poisoining	0	0	0	0	0	0	0	0	0	0	0	0	0
Urban	107	7. Foreign body and accidental aspiration	0	0	0	0	0	0	0	0	0	0	0	0	0
Urban	108	8. Electric Shock	0	0	0	0	0	0	0	0	0	0	0	0	0
Urban	109	B. Intentional	28,709	18,318	10,391	3,135	833	12,092	1,698	560	2,785	491	5,254	1,136	724
Urban	110	1. Self-inflicted	7,075	4,629	2,446	101	38	3,920	449	121	34	76	2,037	224	74
Urban	111	2. Homicide and Violence	15,191	9,269	5,923	2,596	443	4,711	1,092	427	2,307	178	1,980	823	634
Urban	112	3. Legal intervention	6,443	4,420	2,023	438	352	3,461	156	13	444	237	1,237	88	16

Annexure VII

TUBERCULOSIS

Tuberculosis is one of the major infectious diseases in India. A wealth of epidemilogical data is avaialble in the country due to significant contributions made by two pioneering institutions the National Tuberculosis Institute (NTI) and the Tuberculosis Research Centre (TRC). In addition to the wide ranging studies undertaken by these institutions, longitudianl studies have been undertaken by Pamra et al in New Delhi and Fromot Moller et al in Andhra Pradesh. Few cross sectional studis undertaken in different parts of AP provide useful information on TB prevalence in the State.

Natural History

Tuberculosis is caused by Mycobacterium tuberculosis, which most commonly affects the lungs. The infection is usually transmitted from persons with pulmonary tuberculosis to other persons by droplets . The bacilli reaching the lungs cause a local non-specific inflammatory response known as primary complex in the lung and in the corresponding lymph nodes. In most instances both the lesions of the primary complex heal spontaneously leaving dormant bacteria which may get reactivated during the later part of the life. Thus, the clinical disease may occur weeks to years after primary infection. The usual incubation period from infection to primary lesion is between 4-12 weeks. Allergy and immunity against tuberculosis are produced within 6-8 weeks. This results in formation of granulomas around the focus of bacilli. The most important aspect of the natural history of the tuberculosis is that infection may lead to relatively small proportion of cases at a later date. Occasionally, in case of new borne and small children, the infection may progress resulting in serious forms of tuberculosis such as milliary tuberculosis or tuberculous meningitis. Rarely the infection is through the digestive tract due to consumption of contaminated milk containing Mycobacterium bovis from cows suffering from tuberculosis

I. Steps for the estimation:

To beginwith a detailed review of epidemilogical studies on Tuberulosis was undertaken and core expert was identified This is followed by a two day workshop. Participants included Core expert, Disease experts, Programme managers and Public health Specialists. The following

steps have been followed to estimate the incidence , duration and case fatality rates of tuberculosis in Andhra Pradesh.

1. Case definition for adult pulmonary and extrapumonary tuberculosis was arrived at.
2. The age specific incidence pattern of tuberculosis (but not necessarily the magnitude) was determined using the data from cohort stuides undertaken in India.
3. A review of trends of Tuberculosis over the last 30 years was undertaken.
4. Adjustment factors for screening method were arrived after establishing relationship of true prevalence to different screening methods.
5. Adjustment factor for extrapulmonary tuberculosis were arrived after establishing relationship between prevalence of pulmonary tuberculosis and extrapulmonary tuberculosis.
6. Prevalence of pulmonary tuberculosis in rural AP was estimated from studies after adjusting for deficiency in screening method.
7. Estimates of age specific remission (or duration) and case fatality rates were made using Madanapalle data after adjusting for improved remission rates reported from recent evaluation study of district TB control programme.
8. Cause specific deaths due to TB were estimated from SCD and MCCD data sets.
9. The age sex specific incidence pattern (step 2), remission & case fatality rate (step 7) and cause specific deaths (step 8) were used as inputs to DISMOD. By an Iterative process the incidence rates were adjusted to match close to the estimated prevalence and cause specific mortality for urban and rural AP.

Case definition

1. Pulmonary tuberculosis:

In epidemiological surveys a case of pulmonary tuberculosis is identified on the basis of smear positivity (either on direct microscopy or culture) and or X-ray abnormality suggestive of tuberculosis. All the cases diagnosed on the basis of X-ray abnormality need not be due to tuberculosis. Reliability and validity of X-ray readings have been demonstrated to be low by various epidemilogical studies. The cohort studies undertaken by Tuberculosis Research Centre (BCG trial), and National Tuberculosis Institute included only the bacillary cases for arriving at the incidence of tuberculosis. In addition to satisfying Koch's postuales, a smear positive case requires identification and treatment on a priority basis to reduce the chances of further spread. Also, untreated smear negative cases would eventually become smear positive. Hence, only the bacillary cases were included for estimation of incidence and prevalence of pulmonary

tuberculosis among the adults in A.P. However, in case of children suffering from pulmonary tuberculosis, due to difficulty in obtaining sputum samples, bacillary cases alone may not reflect the true burden.

The BCG trial , after undertaking a detailed review, has defined bacillary case of tuberculosis as : a) cases positive on two cultures b) cases positive on one culture only and c) cases positive on smear only, excluding those showing 1-3 Acid Fast Bacilli on entire smear

The BCG trial classified an individual whose sputum is positive on smear and negative on culture as a bacillary case of tuberculosis. The ICMR-National Sample Survey and NTI studies did not classify individuals who are positive on direct smear and negative on culture as cases of tuberculosis. We have used the BCG trial definition for the bacillary cases for the following two reasons. If the the time lag between the collection of the sample and setting up the culture is longer, the chances of getting a negative culture will be more even in the presence of bacilli. The second factor is the strength of NaoH used for preparing the sputum for culture. A stronger NaoH may destroy the live bacilli and hence may not yield a positive culture. Since the definition of the bacillary case already excludes the sputum samples demonstrating 1-3 bacilli in the entire smear, it is less likely that there is a reading error in smear examination. Hence, it is desirable to include the smear positive and culture negative cases for epidemiological estimates.

2. Extrapulmonary tuberculosis:

All cases diagnosed on clinical and or X-ray basis as suffering from active extrapulmonary tuberculosis have been included in this group.

Age sex distribution of Tuberculosis incidence:

The four cohort studies provide information on incidence of tuberculosis in India have been summerised in Table 1. These include Tuberculosis Prevention Trial undertaken by Tuberculosis Research Centre (TRC), Madras, NTI study near Bangalore (1961-68)[1], Frimodt Moller's study in Madanapalle[2] (1950-55) and Pamra's study in Delhi[3]. A summary of these studies is presented in the Table 2.1

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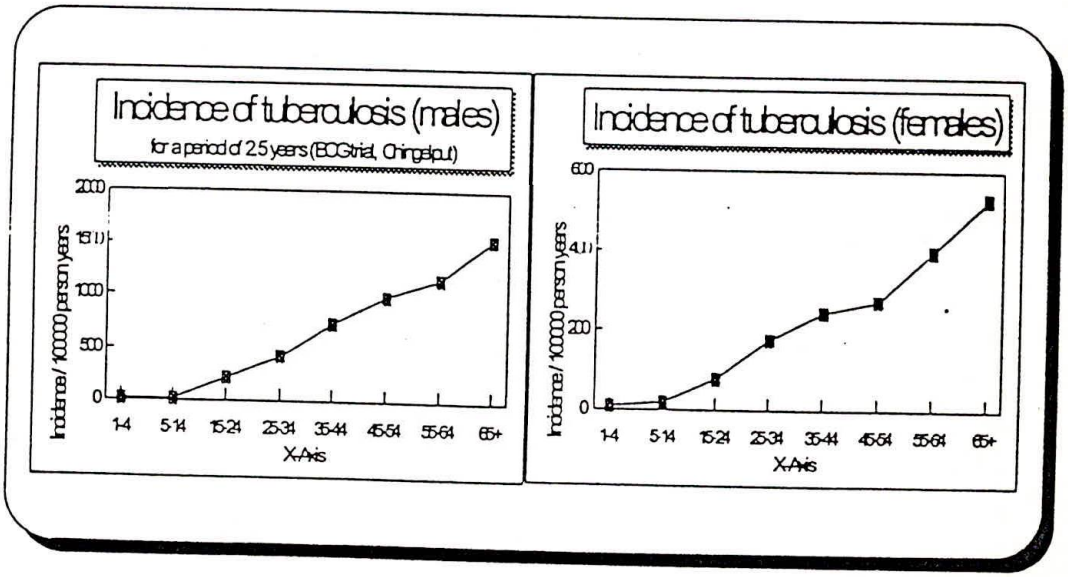
1 Tuberculosis In a rural population of South India: a five year epidemiological study, NTI, Bangalore; Bull. WHO 1974, 51. pp. 473-487

2 J.Frimodt Moller; A community wide tuberculosis study in a south Indian rural population, 1950-55; Bull WHO 1960, 22. PP.61-170

3 S.P.Pamra et al; Changes in prevalence and incidence of pulmonary tuberculosis in Delhi in recent years; Ind. J. Tuberculosis vol., No.2. pp.57-64

Table 2.1 Review of Tuberculosis incidence studies undertaken in India				
Study	BCG trial	NTI	Madanapalli	Pamra
Year	1968	1961-68	1950-55	1962-70
Study location	Tamil Nadu	Karnataka	Andhra Pradesh	Delhi
Area	Chingleput district	119 randomly selected villages from three taluks of Banglore district	Population residing within 10 miles of Madanapalli town including accessible villages and small towns	Urban Population under surveillance of New Delhi Tuberculosis centre
Population covered	360000	62000	60,000	30,0000
Duration	7.5	5	6	8
No. of follow-up rounds	3	3	4	3
Duration between two follow-up rounds (yrs.)	2.5	1.5-2	0.7-1.6	2-2.5
Eligibility criteria	All individuals >10 yrs	All individuals > 5 yrs	All individuals > 5 yrs	All individuals > 5 years
Methodology	Initial X ray. Film read by two readers From individuals whose films interpreted as abnormal by either of two readers sputum specimens were collected and subjected to direct microscopy and two cultures	Initial X ray. Film read by two independent readers From individuals whose films interpreted as abnormal by two, any of two and technically inadequate two samples of sputum collected and subjected to direct microscopy and culture	Initial MMR Film read by one experienced reader X ray abnormals subjected for larger X ray and smear direct microscopy Sputum culture only for admitted cases	Initial X ray. Film read by two independent readers From Individuals whose films interpreted abnormal by either of readers sputum samples collected and subjected for direct microscopy and culture.
Definition of a case	Eligible individual with a normal X-ray at the intake and becomes smear / culture positivelater	Eligible individual who was culture negative with normal or abnormal X ray in all the preceding surveys and who becomes culture positive with X ray abnormality in current survey	Fresh cases detected after an initial normal MMR. Separate analysis done for bacillary (direct smear) and X ray abnormals.	Fresh case among previously X ray negative. Separate analysis done for bacillary (direct smear & culture) and X ray abnormals.
Crude incidence/1000	131-366	131-176	16-49	90-100

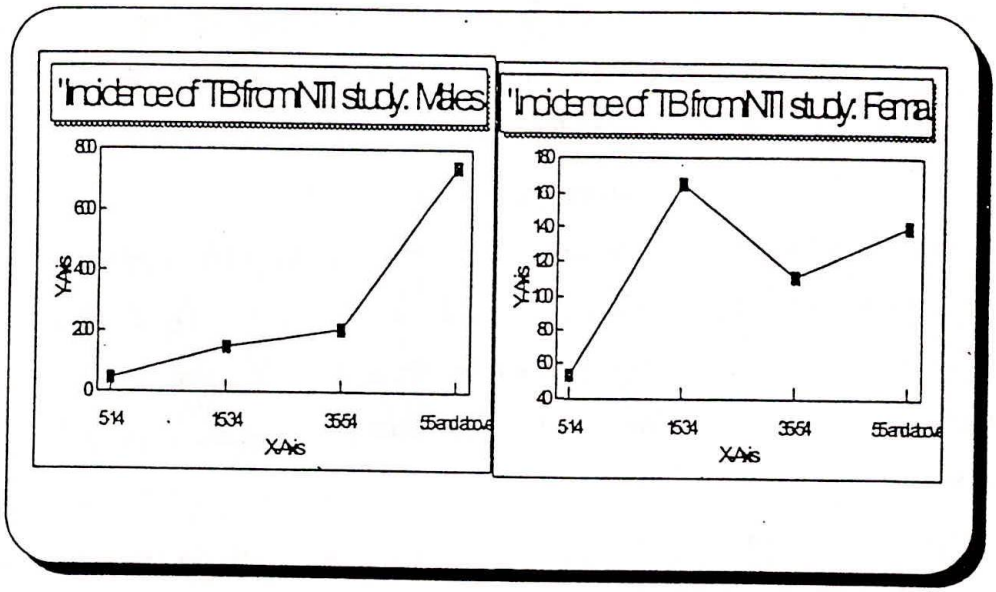
In all the studies reviewed (except Pamra's study) the incidence tended to increase with age. This is in sharp contrast with the total absence of peak in young adulthood (between 25-30 yrs) generally noticed in the west[4,5]. This brings out the issue to what extent the new cases occurring in the later parts of adult life are due to new infection or due to flare up of old endogenous infection acquired earlier. Fimodt Moller observed that 66% of the new cases detected at Madanapalle had an earlier tuberculin reaction of 10 mm or more suggesting that majority of the new cases could be due to reactivation of old infection. Review of NTI data by VV Krishnamurthy et al[6] also had shown that 72% of the new cases came from a reservoir of previously infected population. Since a large reservoir of infected cases are existing in the community, it is not surprising to notice that most of the incidence cases occur with advancing age when the resistance of an individual is likely to go down there by resulting in reactivation of existing infection. Though Pamra's study shows a peak in the younger age groups, the study covered a population residing in urban slums of Delhi which is more likely to be biased towards younger and fit individuals. Hence, we have decided to follow the incidence pattern and need not necessarily the magnitude of TRC, NTI and Madanapalli studies.



4 Cochrane AL Cox J G and Jarman T F; 1955 British Medical Journal 1., 371.

5 Groth Peterson,E, Knudsen J et al 1957 Nord Med 58 1361

6 VV Krishna Murthy et al. Incidence of Tuberculosis among newly infected population and in relation to the duration of infected status; Indian J Tuberculosis Vol. XXIII No.1.



Though Madanapalle study was from A.P. the population covered in each age group is small and nearly four decades have passed since the survey. Pamra's study is also confined to a small urban population of 30,000 which is influenced by urban migration. In the NTI study the incidence was calculated from difference noticed between two prevalence surveys and hence missed the new cases occurring between the surveys which either got cured or died. The TRC study covered a large population and also ensured that new cases appearing between the surveys are not missed. It is also more recent and hence provides a more realistic estimate of incidence. We have used the age and sex distribution of incidence cases reported from the BCG trial.

Tuberculosis Trends:

It is difficult to get correct data on occurrence of new cases of adult tuberculosis from the same area on a continuous basis. Hence, prevalence of tuberculosis infection obtained through repeated tuberculin testings in children, over a period of time, is recognised to be a reliable indicator of tuberculosis incidence and its trend in a community[7]. This is considered to be independent of efficiency of tuberculosis control programme. A WHO study group [8] has recommended that such survey can be undertaken once in five years.

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7 Styblo.K., Recent advances in epidemiological research in tuberculosis. Adv. Tuberc. Res. 20; 1980. 1.

8 WHO Report of the South East Asian Research Study Group on tuberculosis 1981 p.11.

Recently the TRC has undertaken a study which followed up two panchayat unions covered in the BCG trial and repeated tuberculin testing among the children aged 1-9 yrs. Tuberculin testing was done twice at intervals of 10 and 15 yrs[9]. The results of the study have clearly shown that risk of tuberculosis infection remained unchanged over a period of 15 yr. Risk of new infection experienced by a child aged 1-9 yr. in 1984 was same as that experienced by his counterpart 15 yr. Studies carried out in other parts of the country also suggest that the tuberculosis incidence remained more or less constant. Gothi et al have reported that the prevalence of tuberculosis infection remained constant over a twelve year period (1961-73)[10]. No decline in prevalence of infection was noticed among the children aged 0-9 yrs over a period of five years (1974-79) in a study undertaken by Chakraborty et al in Bangalore district of Karnataka state [11]. No appreciable change in tuberculosis situation was noticed over a period of 15 yrs (1962-77) in another study undertaken at Delhi[12] . In the state of Andhra Pradesh no such studies were undertaken. However, considering the similarities in population characteristics, socio-economic situation and geographical proximity of A.P. to Tamil Nadu and Karnataka, we have assumed that the tuberculosis situation in A.P. also remained constant. This assumption permitted us to compare the different studies undertaken in AP.

Adjustment for Screening methods:

Conventionally two screening methods are used to detect a case of tuberculosis in the surveys. The yield of the tuberculosis cases in population based surveys is determined by the type of screening method adopted. These screening methods are summarised herewith.

1. Initial screening of all eligible persons is done with X-ray. All those with X-rays read as abnormal are subjected to sputum and/or culture examination. This approach will miss the sputum positive cases which do not exhibit any radiological abnormalities.
2. The second approach, which is currently being followed in the National programme, identifies the symptomatics first. The symptomatics are then subjected to sputum examination followed by an X-ray. Since all the cases suffering from tuberculosis need not be symptomatic, this approach will miss the asymptomatic cases.

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9 Mayurnath S. et al. Prevalence study of tuberculosis infection over fifteen years in a rural population in Chingleput district (south India); Indian J Med. Res. (A) 93, March 1991, pp 74-80

10 Gothi.G.D., A.K.Chakraborty et al., Prevalence of tuberculosis in a south Indian district- Twelve years after initial survey. Indian J Tuberc. 26 (1979), pp 121.

11 Chakraborthy A.K. et al, Tuberculosis in rural population of south India: Report on five surveys. Indian J Tuberc. 29 (1982), pp 152

12 Goyal SS et al Tuberculosis trends in an urban community. Indian J Tuberc 25 (1978) pp..

3. Another screening method used in few studies screened the symptomatics first and subjected them to X-ray. Only symptomatics having abnormal X-rays were subjected to on spot sputum microscopy. This screening method will miss the cases among asymptomatics and also the symptomatic cases with normal X-rays.

If the relationship of cases to different screening methods is known, it will be possible to derive more accurate estimates of prevalence from almost all studies. A recent TRC study from North Arcot district, Tamil Nadu[13] provides useful data to estimate this relationship. The results of this study help to estimate the missing cases.

About 25,688 individuals were included in the study out of whom sputum samples were collected from 6007 on the basis of symptomatic status or X-ray abnormality. The 205 sputum positive cases detected from this study gives a prevalence of 800 per 100,000. If only X ray is used for screening, 144 cases would have been identified which gives a prevalence of 560/100,000. Similarly if screening is confined only to detection of symptomatics it would yield 135 cases which gives a prevalence of 526/100,000. Thus, either methods of screening would miss about a third of the existing tuberculosis cases. About a half of the smear positive cases did not show any bacilli on direct microscopy and were detected on the basis of positive culture. About 15% of the smear positive cases, though positive on direct microscopy, did not yield any positive culture. Based on these relationships we have arrived at adjustment factors to correct for cases missed by each of the screening method.

Adjustment factor for type of screening procedure

Screening method	No. of +ve cases	Adjustment factor[1]
Symptom survey followed by smear examination	73	2.8
Symptom survey followed by smear examination and culture	112	1.8
X-ray survey followed by smear examination for X-ray abnormals	73	2.8
X-ray survey followed by smear examination and culture for X-ray abnormals	133	1.5
Symptom survey followed by X-ray and smear examination for X-ray abnormals	47	4.4
Symptom survey followed by X-ray, smear examination & culture for X-ray abnormals	71	2.9
Total smear and culture positive cases	205	
Total population	25688	

[1] Total smear & culture positive cases/Cases detected by screening method

[13] Tuberculosis prevalence survey in North Arcot District, Annual Report of TRC 1990 pp 107--118.

Establishing relationship between pulmonary and extrapulmonary tuberculosis:

Very little population based data is available on the prevalence of extrapulmonary tuberculosis. The intensified case detection camp held in Bhadrachalam (A.P.) in 1982 shows that out of the total tuberculosis cases detected, 15% were constituted by persons suffering from extrapulmonary tuberculosis. An analysis of all tuberculosis patients attending different departments at Gandhi Hospital, Hyderabad[14] indicated that 16% of the total cases were extrapulmonary. This, however, may not reflect the community situation. The pulmonary tuberculosis patients are more likely to receive domicilliary treatment and only more complicated cases tend to come to hospitals. On the contrary, higher proportion of extrapulmonary tuberculosis patients will attend hospitals. We may not be far off from truth if we assume that one out of three cases of pulmonary tuberculosis will attend hospital. In case of extrapulmonary tuberculosis we can assume that either all the affected or at least half of the affected will attend hospital. We have taken average of these two and applied this relationship to arrive at the adjustment factor for extrapulmonary tuberculosis.

Adjustment factor for Extrapulmonary tuberculosis			
Place	Pulmonary cases	Extra pulmonary cases	Total cases
Hospital	84	16	100[1]
Community with higher prevalence of extrapulmonary TB	252[2]	32[3]	284
Community with lower prevalence of extrapulmonary TB	252	16	268
Community average	252	24	276
Adjustment factor for extrapulmonary tuberculosis			1.1
[1] Total cases were assumed to be 100			
[2] Pulmonary cases in hospital X 3			
[3] Extrapulmonary cases in hospital X 2			

Review of TB prevalence studies from A.P.

Out of the published studies, the National sample survey (ICMR in 1953-58) is a large scale study which followed a well standardised protocol. Recently, two population based surveys were undertaken in the districts of Khammam and Medak by the TB control programme officers.

[14] Personal communication from Dr.Eswariah, State TB Officer, Govt. of Andhra Pradesh

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The emphasis of the Khammam study was on tribal population while the Medak study covered the rural population. We have summerised these studies herewith.We, however, restricted the data from these studies only to population above 15 yrs. to make them comparable with other studies. This is also influenced by the fact that pulmonary tuberculosis is less common below 15 yrs.

1. ICMR National Sample Survey (1955-59):

The first major attempt to assess the magnitude of tuberculosis in the community was undertaken by ICMR in 1955-59. The survey covered a population of 116,539,000 aged above five years. Two zones (Hyderabad & Madanapalle) out of the total six zones covered in the study included parts of A.P. Each zone was further stratified in to city, towns and villages. Entire population residing at the selected sampling unit was listed. All those above the age of five years constituted the eligibles and were subjected to a miniature radiogram. Each X-ray film was read by two independent readers. A sample of the abnormals was sent to a central reader for consistency check. Bacteriological examination (on spot specimen) was carried out in all cases which were considered abnormal by one or both readers. The material collected for bacteriological examination consisted of sputum (two slides) for direct smear examination, sputum (2 tubes) for culture. If sputum was not available laryngeal swabs (2 tubes) were collected for culture. The group that undertook the survey in Madanapalli zone was involved in the tuberculosis control activities for a long time. Hence, the bacillary case yield was noticed to be higher compared to Hyderabad zone. The reported prevalence of bacillary cases in Madanapalle zone was 1144/100000 and 850/100000 in towns and villages respectively.

2. Tuberculosis prevalence survey in Rural Medak district 1992:

To assess the prevalence of tuberculosis in the rural community a survey was undertaken in Medak district during the year 1992. The study also aimed to understand the epidemiological pattern of the disease and assess extent of utilisation of health services available for TB control.

The study was undertaken in thirty three villages selected by random sampling method. A door to door survey was undertaken covering all the residents aged above five years in the selected villages to identify chest symptomatics. NTI protocol which is standardised for health workers bias was used for symptomatic survey. The proportion of symptomatics above the age of 15 yrs. reported in the study is comparable to that of North Arcot and Raichur studies undertaken by TRC. On the spot sputum was collected and a single sputum examination done to

detect Acid Fast Bacillus (AFB) by Zeihl Nelson's stain. No culture or concentration techniques have been used. During the second phase chest symptomatics identified were subjected to MMR. The MMR was read by a single reader trained at National Tuberculosis Institute (NTI).

A total of 48,223 individuals were listed from the 31 villages covered. The total population above 15 yrs was 30,863. Out of the population above 15 yrs. 1196 symptomatics were identified. Out of the chest symptomatics identified 847 (70.82%) could be subjected for sputum examination and successful MMRs could be taken for 662 (55%). A total of 50 smear positive cases were detected. This gives a prevalence rate of 162/100,000 for sputum positive cases. The prevalence rates were higher among males (male female ratio = 7:3).

Summary of Medak study findings		
Description	**Number**	**Percent**
Total population enumerated	48223	
Population above 15 yrs.	30863	100
Chest symptomatics listed	1196	3.9
No. of symptomatics subjected to sputum examination	847	70.82*
Prevalence of smear positives	50	0.2
No. of symptomatics subjected to MMR	712	59.53*
No.of MMRs technically adequate	631	52.76*
MMR Positives	129	0.4
Extra pulmonary tuberculosis	2	0
* Expressed as percent of symptomatics listed		

3. Intensified TB case finding in Bhadrachalam Division, Khammam District (1982):

An intensified case finding activity was undertaken in Bhadrachalam division of Khammam district in 1982 by the TB control programme of A.P. Initial enumeration of population was done to list the population aged above five years. A door to door survey was undertaken by the paramedics to identify the chest symptomatics among the listed population. The symptomatics listed were subjected to MMR. The films were read by one reader trained at NTI. Only the individuals diagnosed to be having abnormal MMR were subjected to sputum examination which included direct microscopy of on the spot sputum sample. Out of the total 1,46,449 population surveyed, 92,263 individuals above the age of fifteen years were listed. The screening for symptomatics yielded 5,189 symptomatics. Out of the symptomatics listed 5,183 were subjected

for MMR. Among the individuals subjected for MMR, 1465 were diagnosed as radiologically abnormal. Out of the 1465 radiologically abnormal individuals identified, sputum examination was done for 1267 and 473 persons were detected to be smear positives. The study gives a prevalence rate of 513/100,000. Out of the detected cases the male female ratio was around 2:1. The prevalence of tuberculosis among tribals and non tribals was similar.

Summary of Bhadrachalam study findings		
Description	Number	Percent
Total population	146449	
Population above 15 yrs.	92263	100
Chest symptomatics listed	5189	5.6
No. of symptomatics subjected to MMR	5183	99.9*
MMR Positives	1465	1.6
No. of symptomatics subjected to onspot sputum exam	1267	24.42*
Sputum positives	473	0.5
Extra pulmonary tuberculosis	84	0.1
* percent of symptomatics listed		

4. Prevalence of Tuberculosis after adjusting for screening methods in rural AP:

As a first step we have applied the adjustment factor appropriate for the type of screening method used to estimate the true prevalence of TB .

Prevalence of Tuberculosis/1000 population		
Survey	Before adjustment	After adjustment
ICMR Sample Survey	850	1642
Medak survey	162	706
Bhadrachalam survey	513	2832

5. Estimates for current prevalence of tuberculosis in rural A.P.

Out of the three studies, Medak study is most recent. The ICMR sample survey was conducted nearly four decades back when there was no National programme for tuberculosis control and anti tuberculosis drugs were not freely available. This makes it inconsistent with the burden of disease methodology which estimates the burden at the current operational efficiency of the intervention programme. The Bhadrachalam study was undertaken in tribal area. As the tribal population constitutes about 6% of the total population of the State, the results of this study can

not be applied for the entire State. The population residing in tribal areas are included in the rural population in census data. The rural population constitutes about 73% of the total State's population. Out of the rural population, 8.65% was constituted by Scheduled tribes. We have arrived at the mean prevalence of tuberculosis for rural population by applying prevalence rates of Medak study to the non tribal rural population (91.35%) and prevalence rates of Bhadrachalam to the tribal population (8.65%).

Estimated prevalence of TB in rural A.P. = (706 X 0.9135) + (2832 X 0.0865)

= 890/100,000 adults

This estimate is close to the results of recent survey undertaken by TRC at Raichur district in Karnataka[15] (1090/100,000 population).

6. Deriving age & sex specific incidence of Tuberculosis in rural and urban A.P. using DISMOD

The burden of disease methodology requires estimation of age specific incidence and duration of disability to estimate the DALYs lost. In addition, the consistency of epidemiological estimates need to be checked. A disease model built on known relationships between different epidemiological parameters by the Burden of Disease Unit (DISMOD) helps in achieving these objectives. The model requires instantaneous remission and case fatality rates of the disease to be used as inputs. Estimation of these instantaneous rates requires follow-up studies. Out of three studies undertaken in rural south India, Madanapalle study was from Andhra Pradesh. It also provides age specific data on remission and case fatality. The results of the study are presented in the table.

Out come of the newly diagnosed cases on Tuberculosis from Madanapally study

Age group	Initial cases	1st Year			5th year		
		No.died	No.TB+	No.TB-	No.died	No.TB+	No.TB-
15-24	167	14	54	99	40	34	93
25-34	337	22	129	186	93	78	166
35-44	298	26	110	162	108	52	138
45-54	210	29	86	95	90	33	87
55+	144	19	53	72	74	26	44

[15] Tuberculosis prevalence in Raichur District. Annual report of Tuberculosis Research Institute (ICMR) 1989 pp 120-131.

Out come of the newly diagnosed cases on Tuberculosis from Madanapalle study (percent)							
Age group	Initial cases	1st Year			5th year		
		Mortality rate	Persistance rate	Remission rate	Mortality rate	Persistance rate	Remission rate
15-24	167	8.38	32.34	59.28	23.95	20.36	55.69
25-34	337	6.53	38.28	55.19	27.6	23.15	49.26
35-44	298	8.72	36.91	54.37	36.24	17.45	46.31
45-54	210	13.81	40.95	45.24	42.86	15.71	41.43
55+	144	13.19	36.81	50	51.38	18.06	30.56

Instantaneous remission and case fatality rates were calculated from this data using the outcome at fifth year.

Age specific instantaneous rates from Madanapalle study		
Age group	Instantaneous remission	Instantaneous case fatality rate
15-24	0.23	0.1
25-34	0.19	0.11
35-44	0.2	0.15
45-54	0.18	0.18
55+	0.13	0.21
All	0.19	0.14

The Madanapalle study was undertaken in early sixties and subsequently there has been a phenomenal change in Tuberculosis chemotherapy which may influence the outcome. Hence, we have reviewed recent studies which assessed the outcome of newly detected tuberculosis cases. Dr.Manjula datta et al[16] have assessed the outcome of 2257 smear positive cases registered for treatment under District Tuberculosis Control programme in North Arcot district, Tamil Nadu. This study also captures the outcome of the defaulters and hence consistent with the burden of disease approach of estimating the disability and mortality at the current operational efficiency of the intervention programmes. When we compared the aggregate remission and case fatality (after excluding general mortality rate), we found that mortality rates of Madanapalle are comparable with North Arcot while remission rates in North Arcot are 2.5 times higher. Though both cohorts received treatment, the North Arcot patients had access to better Chemotherapy (69% received

[16] Manjula Datta et al. Critical assessment of smear-positive pulmonary tuberculosis patients after chemotherapy under the district tuberculosis programme, Tubercle and Lung Disease 74, 1993 pp 180-186.

Short Course Chemotherapy) which explains better remission. The marginal difference between mortality rates could be due to the known observation that even INAH mono therapy has favourable impact on mortality reduction. Considering the fact that Madanapalle study was undertaken in Andhra Pradesh and provides age specific follow-up data we have used it as an input to DISMOD after applying an adjustment factor of 2.5 to correct for current treatment practices and patient compliance. While Madanapalle data on outcome is not available by sex , North Arcot study gives only information on deaths by sex. Hence, we have used NTI data to arrive at adjustment factors for sex.

Using these instantaneous rates as inputs we have adjusted the instantaneous incidence rates to get the best match for the estimated prevalence and deaths.

DISMOD outputs for Rural AP								
Age group	Male				Female			
	Annual incidence/ 100000	Annual prevalence/ 100000	Annual age specific deaths	SCD estimated deaths	Annual incidence/ 100000	Annual prevalence/ 100000	Annual age specific deaths	SCD estimated deaths
0-4	15.8	15.2	34	509	11.9	13.6	27	218
5-14	20	28	131	185	19	28.9	115	316
15-44	439.5	617.8	7775	6268	233	45.7	4166	4199
45-59	1227.5	1846.8	9582	14296	655.2	1298.5	5627	10590
60+	1555.5	2918.2	8385	9784	735.2	2078.4	3819	5296
All	465.1	714.7	25907	31042	248.2	532.3	13754	20619

The DISMOD outputs suggest that we have to go for higher age specific incidence rates than reported to arrive closer to the estimated deaths and prevalence. Even than the estimated deaths are lower than the deaths estimated from Survey of Cause of Death surveys. Considering the fact that SCD data is based on lay reporting there is more likelihood of overestimating the tuberculosis deaths we felt the DISMOD outputs are fairly representative of prevailing cause specific mortality due to tuberculosis.

When we applied the same rates in urban areas, the death estimates were found to be very high. Our estimates of prevalence are based on surveys undertaken in rural areas. Though the National Sample Survey reported higher prevalence in urban areas, we felt that the urban residents have better access to treatment and hence better remission rates. Hence, we have adjusted the remission rates of the rural areas by a factor of 1.25 and then adjusted the incidence rates to match the deaths estimated from MCCD data. These results are presented in table.

DISMOD outputs for Urban AP								
Age group	Male				Female			
	Annual incidence/ 100000	Annual prevalence/ 100000	Annual age specific deaths	MCCD estimated deaths	Annual incidence/ 100000	Annual prevalence/ 100000	Annual age specific deaths	MCCD estimated deaths
0-4	14.3	12.2	10	479	10.7	11.1	8	257
5-14	18	20.7	36	136	13.5	21.7	32	72
15-44	398.6	470.3	2354	2370	141	233.1	840	837
45-59	1019.2	1301.3	2231	2211	384	616.9	730	651
60+	1666.1	2683	1881	1867	881.9	211.5	1054	1119
All	388.4	498.6	6512	7063	163.2	301.7	2664	2936

The estimated age specific incidence rates in urban areas are comparable with the incidence rates reported from BCG trial. It is, however, evident that in both urban and rural areas, the number of deaths reported in the less than 15 years are less than the reported deaths. In fact, we tried to match the annual incidence rates in these two age groups as close as possible to the age specific incidence reported from the longitudinal studies reviewed. Even then the DISMOD estimated deaths remained much lower than the deaths estimated from registration schemes. Tuberculosis experts often argue that it is difficult to get samples of sputum from this group. Also, the proportion of extra-pulmonary forms of tuberculosis would be higher in this group which are not captured by the community based surveys.

The outputs from DISMOD were used as inputs to the worksheets to estimate the Years of Life Lost and Years Lived with Disability due to Tuberculosis.

DIABETES MELLITUS

Diabetes mellitus is a common endocrinal disease resulting in several complications. Our estimates are for Non-insulin dependent diabetes (NIDDM) which accounts for 80-90% of all diabetes world-wide. While Insulin dependent diabetes (IDM) is considered to be relatively rate in most developing countries the epidemiology of third form of diabetes, the malnutrition related diabetes mellitus is poorly understood. The WHO case definition of diabetes is based on biochemical criteria.

Case of Diabetes[1]

Nature of sample	Glucose (mg/dl)			
	Whole Blood		Plasma	
	Venous	Capillary	Venous	Capillary
Fasting	>120	>120	>140	>140
2 hr after glucose load	>180	>200	>200	>200

[1] WHO 1985; Technical Report Series No.727

ICD Codes:

The ICD 9 classifies the Diabetes Mellitus as adult onset type and juvenile onset type. The corresponding code for Diabetes ICD 9 is 250. The tenth revision introduced a new coding system which distinguishes between insulin dependent (E10), non insulin dependent (E11), malnutrition related diabetes (E12), other specified (E 13) and unspecified (E14) Diabetes. Gestational diabetes is recorded elsewhere. As per ICD norms if a mention of Diabetes is made in part I of death certificate, it should be considered as the underlying cause.

Natural History

The details of natural history of diabetes and its complications are presented in a tabular form in next page.

Natural History	Description	Out come	Source of information
Risk Factors	Genetic, Environmental	Parental history Diet (>fat), Lifestyles (<Phy.activity) Obesity	Migrant studies, Studies in low income urban areas
Incidence	Between 30-69 yrs. there is a straight line relationship of log odds of NIDDM to age with a slope of 0.066 year-1. Low and high prevalence populations varies only in constant terms used in model	Age specific incidence pattern	Review article of Paul McKingue
Prevalence	Among adults prevalence rates increased with age. Prevalence was less among females	Age and sex specific prevalence rates	Community based surveys undertaken in different parts of India
Remission	Nil		
Treatment	Percent receiving treatment	About 50% of the cases detected were known cases	Hospital based studies
Complications	Specific	>Incidence of blindness >Incidence of nephropathy >Diabetic foot	Follow-up studies, Hospital based studies
	Non specific	>Myocardial infarction >Stroke	Follow-up studies, hospital based studies
Mortality	Case fatality	Age and sex specific case fatality rates	Estimating case fatality on the basis of known prevalence and reported deaths due to diabetes
	RR	Influence of increased RR on age and sex specific mortality rates	Follow-up studies undertaken at Fiji

Review of studies undertaken in India:

Diabetes prevalence studies undertaken in India					
Author	Year	Place	Population	Screening	Prevalence (%)
Patel et al	1959	Bombay	18243 volunteers	Post prandial glycosuria	2.4
Ganguly et al	1964	Lucknow	1445 rural hh survey	Post prandial glycosuria	2.3
Ahuja et al	1966	Delhi	1027 volunteers	PP glycosuria and bl. glucose	6.2
Berry et al	1966	Chandigarh	3846 urban hh survey	PP glycosuria	2.9
Satynarayana	1966	Hyderabad	21396 volunteers	PP glycosuria	4.1
Dutta et al	1968	Pondicherry	2694 urban hh survey	PP glycosuria	0.7
Ahuja et al	1972	New Delhi	1639 urban hh survey	Post glucose blood sugar	2.7
Jayarao et al	1972	Hyderabad	2006 rural hh survey	Post prandial glycosuria	2.4
ICMR	1972-75	6 urban centres	19077 hh survey	Post glucose blood sugar	2.1
		5 rural centres	15177 hh survey	Post glucose blood sugar	1.5
Tripathy et al	1979	Koraput	2296 tribal volunteers	Post glucose boood sugar	0.9
Patel	1986	Bhadran, Gujarat	3374 rural h h survey	Post prandial glycosuria	3.8
Verma et al	1986	Delhi	6878 hh survey	Inquiry for known diabetes	3.1
Rao et al	1987	Eluru AP	3579 hh survey	Inquiry for known diabetes	2.4
Murthy et al	1984	Tenali AP	Urban		4.7
Ramachandran et al	1992	Madras	Urban		8.2
			Rural		2.4

Several studies have been undertaken in India to know the prevalence of diabetes. The criteria used to define a case of diabetes varied from verbal enquiry for known diabetes to WHO suggested case definition for diabetes. Hence, it is difficult to compare the prevalence rates reported by these studies.

The largest survey covering 34,194 persons above the age of 14 years was undertaken by the Indian Council of Medical Research (1972-75). The case definition used by the ICMR study is those with blood glucose values more than 130 mg/dl in the capillary blood after oral administration of 50g of glucose. So far this is the largest survey undertaken in the country and considered to be representative. The other studies demonstrated increasing prevalence with age. Males were more frequently affected with a sex ratio of 1:0.6 or even less among females. The estimated average duration of disease is about 8.1 years[17].

[17] PV Rao; Risk factor analysis in diabetes mellitus as related to social progress in Indian Populations 1994

Estimation of prevalence and mortality due to diabetes:

Prevalence :

Survey undertaken by Jayarao et al in rural Hyderabad estimated a prevalence of 2.4% which is higher than the ICMR aggregated rural prevalence. Since Jaya rao's study is undertaken in AP and covered 2006 households we have considered it to be representative of rural AP. We have taken the prevalence reported by Jayarao's study as such for rural AP. Even though this is higher than the ICMR estimates for rural India, a recent study (Ramachandran et al) in rural Tamil Nadu suggests that the prevalence in rural areas are around 2.4%. We have assumed that crude prevalence of diabetes among rural males above 14 yrs will be 2.4%. In case of females GBD estimates used the same prevalence as males. However, studies undertaken in India suggest that the prevalence of diabetes among females is lesser than males. Hence we have applied and adjustment factor of 0.75 on the estimated incidence of males get the corresponding values for the females.

Considering the reported higher prevalence in urban areas we have assumed that both incidence and prevalence in urban AP are higher than the rural areas. The ICMR survey suggested that prevalence of diabetes is 1.4 times higher in urban areas. By applying a factor of 1.4 to the reported prevalence of this study we have estimated the prevalence of diabetes in urban AP. This gave a prevalence of 3.4% which is slightly higher than the ICMR estimates of urban areas but closer to small scale studies undertaken in urban AP and Madras. We have assumed that urban males above 14 years will have a crude NIDDM prevalence of 3.4%. Considering reported lower prevalence among females an adjustment factor of 0.75 was applied for the estimated incidence among males to arrive at the corresponding rates for females.

Mortality:

We have taken the APBD estimated deaths in urban areas for males and females as such. The CSMR rates are closely comparable with the GBD India estimates. In case of rural areas we have noticed that in case of males in 60+ age group the SCD estimates gave a cause specific mortality rate of 4 per thousand which we felt is an over estimate. Hence, we have assumed that the CSMR in rural males above 60 Ys in rural areas would closer to that of urban areas. Since the incidence and prevalence in rural areas are lesser than urban areas this assumption gives higher

case fatality in rural areas which is quite plausible. For other age groups we have used the SCD estimated death numbers as such which are close to CSMR of urban areas.

Estimation of Incidence and Consistency Check:

The above estimates on prevalence, cause specific mortality and remission were used to estimate the incidence rates and duration of diabetes through DISMOD. Through an iterative process the incidence and case fatality rates were adjusted to achieve the estimated prevalence and reported deaths. The results of the outputs from DISMOD are presented in the table.

Estimates of age and sex specific incidence and prevalence of Diabetes from DISMOD

Age group	Annual Incidence rate/1000				Annual prevalence rate/1000			
	Rural Male	Rural Female	Urban Male	Urban Female	Rural Male	Rural Female	Urban Male	Urban Female
15-44	0.38	0.26	0.71	0.54	5.47	3.77	10.44	7.88
45-59	7.49	5.25	13.22	10.22	64.61	45.52	118.43	92.16
60+	11.37	8.38	16.9	14.19	211.59	154.29	375.14	300.25
Crude rates	1.84	1.39	2.53	2.14	24.11	18.48	34.06	29.95

Estimates of cause specific mortality due to diabetes from DISMOD

Age group	Annual Cause specific mortality rate /1000				Annual cause specific deaths			
	Rural Male	Rural Female	Urban Male	Urban Female	Rural Male	Rural Female	Urban Male	Urban Female
15-44	0.02	0.01	0.02	0.01	187	124	76	54
45-59	0.31	0.19	0.31	0.2	952	588	308	193
60+	1.84	1.41	1.8	1.4	2863	2374	683	661

Estimation of disability:

The complications of diabetes could be specific affecting eyes, kidneys and feet. These complications include retinopathy and other changes in eye like cataract, diabetic nephropathy and neuropathic ulcer in the legs and feet leading to prolonged immobilisation and sometimes amputation. These complications do not occur in non diabetics. In addition, the non specific complications of diabetes include the conditions such as increased risk from stroke and ischemic heart disease. In hospital based studies undertaken in India , 72% of the hospitalised diabetics died due to vascular complications. Renal disease is an important cause of death[18]. The incidence of major complications due to diabetes increases exponentially with increasing duration of diabetes.

[18] P V Rao Risk factor analysis in Diabetes Mellitus as related to social progress in Indian Populations New Delhi 1994

1. Blindness:

Follow-up study in Wisconsin USA showed that 4% of diabetic patients develop blindness[19]. Another study in UK had estimated the incidence of blindness in diabetics to be around 5/1000 person years[20].

2. Renal Failure:

In a cohort study undertaken in Germany the cumulative risk of developing renal failure requiring transplant was 2% after 15 years of diabetes, 5% after 20 years of diabetes and 10% after approximately 25 years of diabetes[21].

3. Diabetic foot:

Development of neuropathic ulcers is one of the commonest complications of diabetes. These lesions require prolonged immobilisation and nursing care. In a study undertaken in elderly diabetic patients in UK the prevalence of foot ulcers was 3%. US national data for 1987 show that lower extremity amputations for non traumatic conditions is about 8 per 1000 diabetic individuals

4. Diabetes as a risk factor for other diseases:

Estimates of routine US data for diabetes and follow up study undertaken in Chile[22] suggest that diabetes is an important risk factor for many diseases.

Diabetes as a risk factor	
Disease / complication	Relative Risk
Coronary heart disease	2-5
Stroke	2-3
Tuberculosis	6
Blindness	20
End Stage Renal disease	25
Amputation	40

The estimates of disability weights are based on all these factors. For the sake of comparability the same disability weights used for the GBD estimates have been used for APBD study also.

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19 Moss SE et al; The incidence of vision loss in a diabetic population; Ophthalmology 1988 95: 1340-1348

20 Cohen DL et al; A Population based study of the incidence of complications associated with Type 2 diabetes in the elderly Diabetic Med 1991; 8 928-933

21 Diabetes drafting group. Prevalence of small vessel and large vessel disease in diabetic patients from 14 centres. The WHO multinational study of vascular disease in diabetics. Diabetolgia 1985; 28; 615-640

22 Olmos P et al. Tuberculosis and diabetes mellitus : a longitudinal retrospective study in a teaching hospital. Rev Med Chil 1989; 117:979-983