

# Causes of death in rural areas of Andhra Pradesh, 1998.

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Valid and reliable statistics on cause of death is an essential input for setting of priorities in the health sector. The importance of a good cause of death reporting system to inform public health policy has been described elsewhere (Mahapatra, 1999). Unfortunately, the cause of death reporting system in India, as it works now, suffers from poor coverage, high incidence of unclassifiable deaths, (c) long delay and irregular publication of statistics and (d) lack of systematic screening (Mahapatra and Rao, 2000). As a result the published cause of death statistics are not very much useful for purposes of policy analysis. In this paper we report results from a study to understand causes of death in rural areas of Andhra Pradesh.

## I. Materials and Methods:

The survey of cause of death in rural (SCD-Rural) areas (RGI, 1991) in the state of AP was taken up for study. Cause of death reports generated by the SCD-Rural system were used. The certificates were reviewed by medically qualified persons. Each of the SCD-Rural village was visited by a special mortality analysis team. This team collected more details about each case, in which information in the SCD-Rural report was not adequate for classification of cause of death. Data on deaths which took place in the reference period, but was not reported by the SCD-Rural system was also collected during field visits.

First a pilot study was undertaken in 1994 using data for two most recent years (1992 and 1993). 4741 deaths were recorded by the Survey of cause of death - rural (SCD-Rural) system during the two years. Copies of death certificates (Form-7) recorded by SCD-Rural field agents or recorders were obtained from the state directorate of health. Only 300 such certificates could be readily obtained. In addition, details of 139 deaths coded as senility were obtained. The pilot study proceeded as follows.

1. The symptoms and circumstances of each unclassified death recorded in the certificate was reviewed by a physician. The summary of his findings was reviewed by a second physician. For any remaining ambiguity about interpretation of available information the opinion of specialists from medical colleges conversant with the age, sex and symptom profile of the case was sought and obtained. 134 deaths could be reclassified as a result of this review.
2. For the remaining 166 deaths, additional information from the field was required. These were subject to reinvestigation by a team consisting of a medical doctor and the local field agent or recorder. Their findings were reviewed by an expert committee consisting of a medicine specialist (internist), paediatrician and public health specialist. In some cases the information obtained from the reinvestigation opened up possibility for reclassification but needed additional information to complete the process. 60 such cases were subjected to a third investigation (consider the original investigation by SCD field agent as the first and the reinvestigation as the second). As a result, it was possible to reclassify all of the 300 deaths.

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The pilot study was a part of the AP Burden of Disease (APBD) and was initiated by the author at the Administrative Staff College of India (ASCI). Dr. G.N.V Ramana is the collaborator for the pilot study. The APBD study is now continued at the Institute of Health Systems (IHS).



3. A separate survey of 139 deaths classified under 'senility' during 1994 was carried out by trained and experienced investigators to obtain more detailed description on events that led to death and symptoms at the time of death. 136 out of the 139 deaths originally coded under senility could thus be reassigned to more specific causes.

The results of the pilot study yielded important information about the SCD-Rural system. There was a lack of clarity about the forwarding and storage of SCD records. This might have been the reason why detailed reports (Form-7) could not be readily retrieved. It was learnt that copies of latter were available with respective primary health centres. The encouraging lesson from this pilot study was that it appeared feasible to improve the proportion of classified deaths under SCD if an appropriate system of review and reinvestigation could be implemented. The quality of interviewing skills available in the field would appear to support a slightly more expanded non- medical list.

Armed with the lessons learnt from the pilot study, we planned for a more comprehensive study to estimate causes of death in rural areas of Andhra Pradesh. We obtained cause of death reports received by the Vital Statistics Division under the SCD-Rural scheme for a nine month period from April to December 1998. The cause of death reports and accompanying symptom records were reviewed by a physician. Each reviewer was given initial training in classification of causes of death including ICD-9, ICD-10 and the Registrar General's non medical list (NML). The reviewer's task for each report was to assess:

1. Whether information contained in the cause of death report and symptom record was adequate to classify the death into one of the causes in the NML.
2. If information was adequate, whether the classification proposed in the cause of death report was appropriate. Appropriateness was judged on the basis of ICD coding rules. If appropriate, the original classification was maintained. Otherwise a revised cause of death was assigned.
3. Whether the information allowed the assigning of a more specific cause of death code than what was envisaged in the NML. For example, most deaths due to cancer could be assigned to specific sites. But the NML had provided only for a single category of cancers.
4. In cases where the information was considered inadequate, specific remarks about the nature of information required had to be appended. For example, age-sex missing information, queries on the underlying cause of death, etc.

All deaths for which information was inadequate for assignment of a cause or tabulation of cause due to non-availability of age-sex information, were marked for field enquiry and onsite review. These deaths were sent to collaborating centres at regional medical colleges for field enquiry where the faculty from community medicine departments were provided with literature on classification of causes of death and requested to visit the concerned village along with the local primary health functionary in charge of the cause of death reports. An epidemiologist from the IHS visited the collaborating centres to clarify doubts. For some areas where a regional collaborator was

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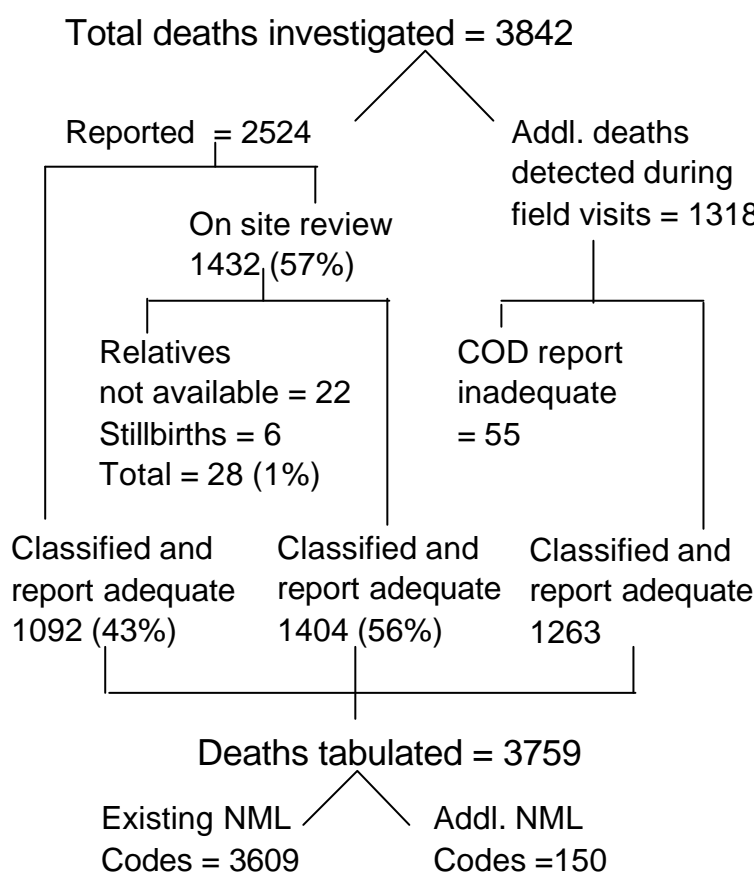
Dr. GNV Ramana had by this time moved to other assignments. Dr. PV Chalapati Rao has been my collaborator from this point onwards.

We had plans to collect data for one full year. Unfortunately the SCD-Rural scheme was discontinued by the Registrar General during the course of this study.

not forthcoming, an epidemiologist from the IHS travelled to the villages and reinterviewed the relatives to fill in gaps in the cause of death report. This process is called an "on site review". During field visits for on-site review additional deaths were detected. These deaths had taken place during the reference period of our study but had not been reported through the SCD-Rural system. Our reviewers in the field collected complete information for these cases to facilitate classification of cause of death. Figure-1 shows a flowchart of deaths investigated from different sources.

Altogether, 3842 deaths were investigated. 2524 of these (66%) came from the SCD-Rural reports and the balance were detected by our field work in the SCD-Rural areas. Thus the extent of under-recording of deaths by the SCD-Rural system was quite high (34%). Out of the 2524 SCD-Rural reports, 1092 (43%) had adequate information for categorisation of cause of death. The balance 1432 (57%) were sent for on site review. Six "infant death" reports were found to have been stillbirths. For another 22 cases, the on-site reviewers could not locate any relatives to enquire about circumstances of the death. Most of these were from major groups such as "cardiovascular causes" (10 cases) and "other clear symptoms" (6 cases). These 28 cases (1% of SCD-Rural reported cases) of stillbirths and relatives not traced were dropped from further analysis. Adequate information could be collected, for the rest 99% cases, through the on-site reviews to classify the cause of death. Another 1318 deaths were detected by on-site reviewers during the course of their field visits to the same SCD-Rural areas. Only 55 of these did not have adequate information for assignment of cause of death (as determined by scrutiny by the IHS team). The remaining 1263 cases had adequate information for classification into appropriate causes of death.

Figure-1: Flow chart of deaths investigated in rural areas of AP, 1998



## II. Results:

Table-1 shows age and sex-specific count of population from the surveyed villages and the total deaths recorded by this study under respective age sex groups. Annual age-specific death rates computed separately for females and males are shown under the respective "Study ASDR" columns. An independent estimate of ASDR obtained from the Sample Registration Scheme, is shown in the columns titled "General ASDR".

Table-1: Comparison of age-specific death rates from the rural cause of death study (study ASDR) with an independent estimate of ASDR (General ASDR)

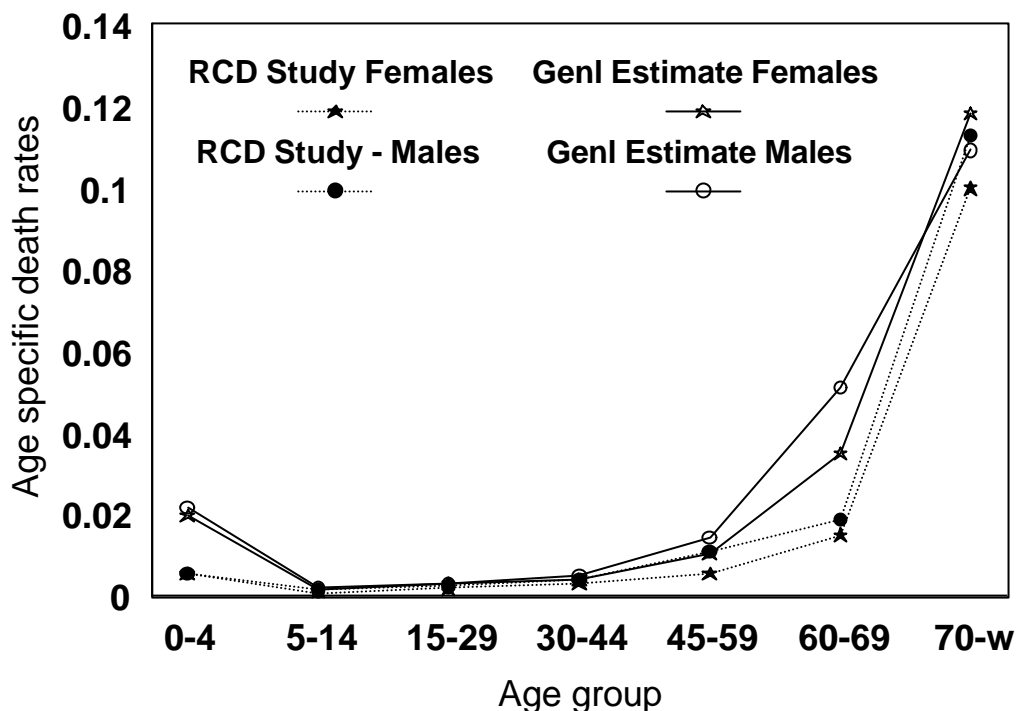
Age group	Females				Males			
	Pop	Deaths	Study ASDR	General ASDR	Pop	Deaths	Study ASDR	General ASDR
0-4	35311	145	0.00547	0.01983	37549	152	0.00539	0.02192
5-14	72022	50	0.00092	0.00138	73304	64	0.00116	0.00157
15-29	97445	152	0.00207	0.00312	98663	165	0.00222	0.00296
30-44	75011	151	0.00268	0.00390	78730	230	0.00389	0.00484
45-59	49884	197	0.00526	0.01037	51920	416	0.01068	0.01461
60-69	23527	263	0.01490	0.03462	23336	323	0.01845	0.05118
70-w	9030	678	0.10011	0.11842	9128	773	0.11291	0.10955
0-w	362230	1636	0.00600	0.01078	372630	2123	0.00759	0.01208

Number of recorded deaths are for a period of nine months. These are inflated proportionately to a 12-month period to calculate the study ASDR, for comparability with general ASDR numbers.

The two estimates of ASDR follow the same age pattern for both females and males (Figure-2). However, only about 60% deaths appear to have been recorded by us. Under-recording was a little more for female deaths (45%) compared to males (38%). Recording of deaths is relatively better for age groups 5 - 44 and also for the very old (age group 70+). Problem of under-recording is most pronounced at age group 0- 4 years (about 70%) and 60-69 years (about 60%).

Data sources and method of correction for under-registration by the Sample Registration Scheme were described in Chapter - 2 on General Demographic Estimates.

Figure-2: Completeness of recorded deaths: age-specific death rates from the APRCD study, 1998 and general estimate of age specific death rates.



Discounting the small number of cases found to have been stillbirths (6)s and those where relatives were not available (22), there were altogether 2495 cause of death reports from the SCD-Rural system for which cause of death could be finally tabulated. We detected another 1263 deaths making it a total of 3759 tabulated. It would be interesting to look at the change in cause-specific mortality proportions (CSMP) estimated from the original SCD-Rural data and the final results after the reviews and field enquiry for an idea about the usability of cause-specific mortality proportions derived from SCD-Rural data. If both under reporting and misclassification by SCD-Rural are non-differential, then the CSMP would not alter. If, however, there are biases in reporting and classification, then the CSMP would change. Percentage change in CSMP is measured with respect to the original estimate. Thus:

$$\% \text{ Change in CSMP} = \frac{\text{CSMP Final} - \text{CSMP Original}}{\text{CSMP Original}} \times 100$$

Change in CSMP would be positive if SCD-Rural under estimates deaths attributable to the concerned cause. A negative change in CSMP would mean that the SCD-Rural over estimated deaths attributable to the concerned cause. Table-2 shows the overall movement of these cases between major NML cause groups and changes in CSMP at the major cause group level.

Table-2: Review of SCD-Rural Cause of Death Reports. Movement of deaths to and from other major cause groups.

NML Cause	Original	Out flow	In flow	Addl. Flow	In. Final	CSMP Original	CSMP Final	% Change in CSMP	
<u>Under estimates by SCD Rural:</u>									
Digestive disorders	145	34	63		111	285	0.058	0.076	30.46
CNS Disorders	247	25	59		119	400	0.099	0.106	7.49
Coughs	435	64	64		252	687	0.174	0.183	4.83
Other clear symptoms	316	44	52		167	491	0.127	0.131	3.13
Fevers	66	30	12		54	102	0.026	0.027	2.58
Accidents and Injuries	366	30	52		174	562	0.147	0.150	1.92
<u>Over estimates by SCD Rural:</u>									
Senility	362		89	21	149	443	0.145	0.118	-18.77
Infant deaths	128		10	14	33	165	0.051	0.044	-14.44
Maternal causes of death	21		8	7	9	29	0.008	0.008	-8.34
Cardiovascular diseases	409		65	55	196	595	0.164	0.158	-3.44

A reduction in the proportion of deaths assigned to senility was expected since a specific objective of this study was to improve classification of deaths assigned to senility and miscellaneous causes. Changes in other cause group specific mortality proportions were not very high at the group level, except for cause groups (a) digestive disorders and (b) infant deaths. The reduction in proportion of "infant deaths", after taking into account the results of on-site review and field enquiries, can be attributed to two factors. Firstly, (a) the proportion of infant deaths additionally detected during field enquiry equalled almost half (2.6%) of the proportion of such deaths detected by the SCD-Rural system in the first instance (5.6%). Secondly, some deaths at higher ages had been erroneously assigned by the SCD-Rural to this cause group.

If we look at the movement of deaths and detection of additional deaths at a detailed cause level, we come across instances of clear bias in cause-specific mortality proportions reported by the SCD-Rural scheme. Table-3 reflects instances of biased reporting by the SCD-Rural system. Deaths due to burns, suicides, rabies, natural calamities, road accidents and abortion are being under reported. On the other hand SCD-Rural has perhaps overestimated deaths attributed to bleeding of pregnancy and puerperium, excessive cold, drowning, snakebite, toxemia of pregnancy and anaemia. (See Appendix 3 for details of movement of deaths and detection of additional deaths by cause for all causes in the non medical list).

Table-3 : Biased reporting by the SCD-Rural for some top causes of death

NML Cause	Original	Out flow	In flow	Addl. In. Flow	Final	CSMP Original	CSMP Final	% Change in CSMP
<u>Under estimates by SCD Rural:</u>								
Burns	32	3	56	63	148	0.013	0.039	206.98
Suicide	64	11	6	76	135	0.026	0.036	40.01
Rabies	123	13	42	89	241	0.049	0.064	30.05
Natural calamity	42	3	14	28	81	0.017	0.022	28.01
Vehicular accident	100	1	19	62	180	0.040	0.048	19.47
Abortion	37	4	11	19	63	0.015	0.017	13.02
<u>Over estimates by SCD Rural:</u>								
Bleeding of preg & puerpm.	52	26	6	20	52	0.021	0.014	-33.63
Excessive cold	75	13	8	15	85	0.030	0.023	-24.78
Drowning	192	55	32	49	218	0.077	0.058	-24.64
Snake bite	362	89	21	149	443	0.145	0.118	-18.77
Toxaemia	46	10	11	11	58	0.018	0.015	-16.31
Anaemia	41	13	6	18	52	0.016	0.014	-15.82

Finally a total of 3759 deaths including the SCD-Rural reports and additional deaths detected by us in the field, are available for tabulation of causes of death. We first tabulated according to the non medical list. The non medical list used by us is an expanded version of the Registrar General's NML. It includes, in addition, some site specific causes of death due to cancer, some accidents and injuries which may be of local public health importance for example, deaths due to electric shock. Appendix 1 and 2 gives our final tabulation of deaths according to the non medical list. In Table- 4 we show the ten leading causes of death in the non medical list, excluding non specific cause groups like senility. Ischaemic heart disease, cerebrovascular accidents, tuberculosis, suicide, bronchitis and excessive heat are among the ten leading causes of death for both females and males.

Table- 4: Top ten non medical list causes of death in rural areas of Andhra Pradesh

All		Females		Males	
Cause	%	Cause	%	Cause	%
Heart attack	11.86	Heart attack	9.11	Heart attack	13.99
Paralysis or cerebral apoplexy	8.78	Paralysis or cerebral apoplexy	8.62	Paralysis or cerebral apoplexy	8.9
Tuberculosis of lungs	6.38	Gastro-enteritis	4.95	Tuberculosis of lungs	7.72
Bronchitis	5.72	Suicide	4.77	Bronchitis	6.5
Suicide	4.79	Bronchitis	4.71	Suicide	4.8
Gastro-enteritis	3.96	Tuberculosis of lungs	4.65	Asthma or allergic disorders of resp. sys.	4.1
Asthma or allergic disorders of resp. sys.	3.59	Asthma or allergic disorders of resp. sys.	2.93	Gastro-enteritis	3.2
Jaundice	2.66	Congestive & other heart diseases	2.69	Jaundice	2.73
Cong. & other heart dis.	2.47	Excessive heat	2.69	Vehicular accident	2.36
Excessive heat	2.23	Jaundice	2.57	Congestive & other heart diseases	2.31
Residual cause with % deaths higher than last cause included above:					
Senility	11.76	Senility	15.59	Senility	8.81

Table-5 shows the top ten causes of death according to the BDL causes. Ischaemic heart disease, cerebrovascular disease, tuberculosis, COPD, diarrhoeal disease, self-inflicted injury (suicide) are among the ten leading causes of death.

Table-5 : Top ten causes of death in rural areas of Andhra Pradesh

Cause	All		Females		Males	
		% Cause		% Cause		%
Ischaemic heart dis.	16.01	Ischaemic heart dis.	14.46	Ischaemic heart dis.	17.21	
Cerebrovascular dis.	11.01	Cerebrovascular dis.	11.66	Cerebrovascular dis.	10.51	
Tuberculosis	6.84	Diarrhoeal diseases	7.02	Tuberculosis	8.25	
Chronic Obstructive Pulmonary Disease	5.97	Tuberculosis	5.01	Chronic Obstructive Pulmonary Dis.	6.76	
Diarrhoeal diseases	5.79	Chronic Obstructive Pulmonary Disease	4.94	Diarrhoeal dis.	4.84	
Self-inflicted injury	4.79	Self-inflicted injury	4.77	Self-inflicted injury	4.81	
Asthma	3.65	Stomach cancer	4.38	Asthma	4.19	
Stomach cancer	3.64	Dementia & degentve. neurological dis.	3.58	Lower Resp. Inf.	3.32	
Lower Resp. Inf.	3.33	Lower Resp. Inf.	3.35	Stomach cancer	3.07	
Residual cause with % deaths higher than last cause included above:						
Other unintentional injuries	4.95	Other unintentional injuries	4.91	Other unintentional injuries	4.98	

## Summary and conclusion:

To estimate the cause of death structure in rural areas, we implemented the Andhra Pradesh Rural Cause of Death (APRCD) study, 1998. All SCD-Rural death reports received by the state's Vital Statistics Division for a nine-month period, 1998 April to December, were systematically reviewed by a physician. SCD-Rural system uses verbal autopsy to determine cause of death in sample areas. Reports considered to have adequate information for assignment of cause of death from the non- medical list were coded by the physician. In some cases, this code was identical to code originally given by the SCD-Rural system and for some others there was a change in coding. Reports without adequate information for assignment of cause of death were dispatched for field enquiry and on-site review by a physician. A final cause of death code was assigned based on the on-site review. Additional deaths were detected by the visiting physicians from the same sample villages and pertaining to the study period. These deaths were investigated using verbal autopsy and a cause of death was assigned after systematic screening by another physician reviewer. Altogether 3842 deaths from the rural areas of Andhra Pradesh were investigated.

Table-5 shows the ten leading causes of death in Andhra Pradesh. Figure-2 indicates the cause-specific mortality proportions for the same ten causes but within different age groups. Lower respiratory infection (LRI), diarrhoeal diseases and low birth weight predominantly affect infants and children. Poor nutrition, unsafe water, poor sanitation and personal hygiene as well as access to appropriate treatment are responsible for the three main causes of death among children. In young

adults, suicides and tuberculosis are the top causes of death. High incidence of suicides is a pointer to educational, social and cultural factors. Tuberculosis continues to be an important public health problem despite decade-long programmes to control the incidence of this disease. Ischaemic heart disease shows up as an important cause of death among older adults and further increases as age advances. Other important causes of death for older adults are cerebrovascular disease, chronic obstructive pulmonary diseases, asthma and Stomach cancer. Ischaemic heart diseases and cerebrovascular diseases call for changes in lifestyle. Chronic obstructive pulmonary diseases point to the need for control of indoor and outdoor air pollution and smoking. Stomach cancer could be, to some extent, dealt with by early diagnosis and treatment. In a nutshell, the mortality profile of Andhra Pradesh clearly reflects the persisting problems arising from poor nutrition, water supply and hygiene as also socio- cultural problems and the emergence of non communicable and degenerative diseases.

## References:

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### **Appendix-1: Non medical list causes of death - rural females.**

NMLC Cause	Age groups							All
	0-4	5-14	15-29	30-44	45-59	60-69	70+	
100 Accidents & injuries: not classifiable	0	0	3	1	2	2	3	11
1000 Senility	0	0	0	1	2	26	226	255
101 Electric Shock	0	0	0	0	4	0	0	4
111 Snake bite	2	0	5	3	3	0	0	13
112 Stings of venomous insects like scorpion	0	1	1	2	1	0	0	5
113 Rabies	0	1	0	0	0	0	1	2
121 Drowning	0	1	4	2	0	3	0	10
122 Fall	2	1	0	0	1	2	16	22
123 Vehicular accident	1	2	6	3	2	1	0	15
124 Burns	1	4	7	5	0	1	1	19
130 Suicide	1	3	35	23	5	7	4	78
140 Homicide	0	0	7	1	2	0	0	10
151 Excessive heat	3	2	3	1	3	13	19	44
152 Excessive cold	0	0	0	0	0	0	0	0
153 Natural calamity	0	0	0	0	0	0	0	0
200 Maternal: not classifiable	0	0	3	2	0	0	0	5
210 Abortion	0	0	5	2	0	0	0	7
221 Toxaemia	0	0	3	1	0	0	0	4
222 Anaemia	0	0	1	0	0	1	0	2

NMLC Cause d	Age groups							All
	0-4	5-14	15-29	30-44	45-59	60-69	70+	
231 Bleeding of pregnancy and puerperium	0	0	3	0	0	0	0	3
232 Malposition of child leading to death of mother	0	0	2	0	0	0	0	2
233 Puerperal sepsis	1	0	3	0	0	0	1	5
300 Fevers: not classifiable	0	1	0	0	4	3	2	10
311 Malaria	0	1	1	2	2	1	11	18
321 Influenza	1	0	0	0	0	0	0	1
331 Typhoid	1	1	1	3	1	4	7	18
400 Digestive disorders: not classifiable	0	0	0	2	2	0	1	5
411 Gastro-enteritis	10	6	6	5	9	17	28	81
412 Cholera	1	1	0	0	0	2	0	4
413 Food poisoning	0	1	1	1	0	0	0	3
414 Dysentery	0	4	0	0	1	3	11	19
421 Peptic ulcer or ulcer of stomach	0	0	1	0	1	4	2	8
431 Acute abdomen	2	0	3	2	1	2	8	18
500 Coughs: not classifiable	0	0	0	1	1	0	4	6
511 Tuberculosis of lungs	0	1	9	22	18	14	12	76
512 Bronchitis	0	0	1	3	7	16	50	77
513 Asthma or allergic disorders of the respiratory system	0	0	1	3	4	7	33	48
521 Pneumonia	4	1	1	0	1	5	8	20
530 Whooping cough	3	0	0	0	0	0	0	3
600 CNS disorders: not classifiable	1	0	1	2	0	1	0	5
610 Paralysis or cerebral apoplexy	2	2	3	5	12	32	85	141
620 Meningitis	3	1	0	0	1	0	3	8
630 Convulsions	5	4	4	2	1	1	1	18
700 Congestive & other heart diseases	3	2	1	4	12	7	15	44
710 Anaemia	0	1	3	7	0	9	12	32
730 Heart attack (ischaemic heart disease)	1	0	4	19	36	31	58	149
800 Other medically certified deaths	0	0	1	0	0	1	0	2
802 HIV positive, AIDS	0	0	0	1	1	0	1	3
803 Acute alcoholic intoxication	0	0	0	0	0	0	0	0
804 Cellulitis with septicaemia	1	0	0	1	2	2	2	8
809 Adverse Drug Reaction	0	0	0	1	0	1	1	3
811 Cirrhosis & chronic liver diseases	0	0	1	0	3	2	2	8
812 Jaundice	8	6	8	8	4	2	6	42
821 Chickenpox	0	0	0	0	0	0	0	0
822 Measles	0	0	0	0	0	0	0	0
823 Leprosy	0	0	0	0	1	1	1	3
831 Tetanus	1	1	0	0	1	0	0	3
841 Poliomyelitis	0	0	0	0	0	0	0	0
851 Mental disease	0	0	1	1	3	0	4	9
861 Cancer	0	0	5	2	10	12	8	37
863 Cancer - Oropharynx	0	0	0	1	7	6	0	14

NMLC Cause d	Age groups							All
	0-4	5-14	15-29	30-44	45-59	60-69	70+	
864 Cancer - Stomach	0	0	0	1	2	1	2	6
865 Cancer - Cervix	0	0	0	1	7	2	2	12
866 Cancer - Uterus	0	0	0	2	5	4	5	16
867 Cancer - Breast	0	0	0	0	3	2	1	6
868 Cancer - Brain	1	0	1	0	0	0	0	2
869 Other site specific cancers	0	1	0	0	1	1	4	7
871 Diabetes	0	0	0	2	4	9	10	25
881 Hyperplasia of prostate	0	0	0	0	0	0	0	0
882 Uraemia	0	0	3	0	4	2	7	16
890 Obstructed hernia	0	0	0	0	0	0	0	0
900 Infant deaths: not classifiable	19	0	0	0	0	0	0	19
910 Prematurity	30	0	0	0	0	0	0	30
922 Congenital malformation	1	0	0	0	0	0	0	1
923 Birth injury	4	0	0	0	0	0	0	4
931 Respiratory infections of the new born	29	0	0	0	0	0	0	29
932 Cord infection (tetanus)	0	0	0	0	0	0	0	0
933 Diarrhoea of newborn	3	0	0	0	0	0	0	3
All causes	145	50	152	151	197	263	678	1,636

## Appendix-2: Non medical list causes of death - rural males.

NMLC Cause d	Age groups							All
	0-4	5-14	15-29	30-44	45-59	60-69	70+	
100 Accidents & injuries: not classifiable	2	1	6	2	6	0	3	20
1000 Senility	0	0	1	1	0	15	170	187
101 Electric Shock	0	0	8	3	0	2	0	13
111 Snake bite	0	3	6	4	6	3	2	24
112 Stings of venomous insects like scorpion	0	0	1	0	0	0	0	1
113 Rabies	0	1	3	0	0	0	1	5
121 Drowning	5	4	0	3	2	2	2	18
122 Fall	0	0	5	3	4	3	10	25
123 Vehicular accident	1	0	18	10	9	10	2	50
124 Burns	2	1	1	3	2	1	0	10
130 Suicide	1	1	34	34	18	4	10	102
140 Homicide	1	1	5	3	3	0	1	14
151 Excessive heat	0	2	0	2	10	6	20	40
152 Excessive cold	0	0	0	0	0	0	0	0
153 Natural calamity	0	0	0	1	0	1	2	4
200 Maternal: not classifiable	0	0	0	0	0	0	0	0
210 Abortion	0	0	0	0	0	0	0	0
221 Toxaemia	0	0	0	0	0	0	0	0
222 Anaemia	0	0	0	0	0	0	0	0
231 Bleeding of pregnancy and puerperium	0	0	0	0	0	0	0	0
232 Malposition of child leading to death of mother	0	0	0	0	0	0	0	0
233 Puerpural sepsis	0	0	0	1	0	0	0	1
300 Fevers: not classifiable	1	3	2	1	3	0	9	19
311 Malaria	0	0	0	4	2	4	2	12
321 Influenza	1	0	0	0	1	1	0	3
331 Typhoid	0	1	2	3	2	5	7	20
400 Digestive disorders: not classifiable	0	0	0	0	2	0	0	2
411 Gastro-enteritis	9	5	3	6	10	8	27	68
412 Cholera	0	0	0	0	0	0	0	0
413 Food poisoning	0	2	3	0	1	0	2	8
414 Dysentery	4	0	0	2	1	3	7	17
421 Peptic ulcer or ulcer of stomach	0	1	1	2	6	4	5	19
431 Acute abdomen	0	1	6	6	8	4	6	31
500 Coughs: not classifiable	1	1	2	3	4	2	4	17
511 Tuberculosis of lungs	1	3	7	33	46	37	37	164
512 Bronchitis	1	0	1	3	17	32	84	138
513 Asthma or allergic disorders of the respiratory system	1	1	2	1	17	26	39	87
521 Pneumonia	14	3	1	1	5	2	17	43
530 Whooping cough	2	0	0	0	0	0	2	4
600 CNS disorders: not classifiable	1	3	0	0	0	0	0	4

NMLC d	NMLCause	Age groups							All
		0-4	5-14	15-29	30-44	45-59	60-69	70+	
610	Paralysis or cerebral apoplexy	0	1	3	9	37	40	99	189
620	Meningitis	3	6	1	1	1	0	0	12
630	Convulsions	7	6	6	2	4	1	1	27
700	Congestive & other heart diseases	4	1	5	4	13	10	12	49
710	Anaemia	0	0	1	4	4	2	9	20
730	Heart attack (ischaemic heart disease)	1	3	6	38	96	53	100	297
800	Other medically certified deaths	0	1	0	0	1	1	1	4
802	HIV positive, AIDS	0	0	2	3	1	0	0	6
803	Acute alcoholic intoxication	0	0	0	1	5	1	0	7
804	Cellulitis with septicaemia	1	0	0	1	2	0	1	5
809	Adverse Drug Reaction	0	0	1	0	0	2	0	3
811	Cirrhosis & chronic liver diseases	0	0	2	3	7	4	2	18
812	Jaundice	3	5	11	12	15	6	6	58
821	Chickenpox	0	0	0	0	0	0	0	0
822	Measles	0	0	0	0	0	0	0	0
823	Leprosy	0	0	0	0	2	2	1	5
831	Tetanus	0	0	0	0	0	0	0	0
841	Poliomyelitis	0	0	0	0	0	0	0	0
851	Mental disease	1	1	2	0	1	0	0	5
861	Cancer	0	0	2	2	7	4	13	28
863	Cancer - Oropharynx	1	0	0	0	6	8	11	26
864	Cancer - Stomach	0	0	1	2	4	2	5	14
865	Cancer - Cervix	0	0	0	0	0	0	0	0
866	Cancer - Uterus	0	0	0	0	0	0	0	0
867	Cancer - Breast	0	0	0	0	0	0	0	0
868	Cancer - Brain	0	0	0	2	1	0	0	3
869	Other site specific cancers	0	1	2	3	4	2	3	15
871	Diabetes	0	1	1	2	14	3	25	46
881	Hyperplasia of prostate	0	0	0	0	3	3	2	8
882	Uraemia	0	0	1	6	3	3	9	22
890	Obstructed hernia	0	0	0	0	0	1	2	3
900	Infant deaths: not classifiable	16	0	0	0	0	0	0	16
910	Prematurity	32	0	0	0	0	0	0	32
922	Congenital malformation	6	0	0	0	0	0	0	6
923	Birth injury	3	0	0	0	0	0	0	3
931	Respiratory infections of the new born	21	0	0	0	0	0	0	21
932	Cord infection (tetanus)	0	0	0	0	0	0	0	0
933	Diarrhoea of new born	5	0	0	0	0	0	0	5
	All causes	152	64	165	230	416	323	773	2,123

Appendix-3: AP rural cause of death study, 1998: Movement of deaths between detailed causes and detection of additional deaths.

NML Cause	Original	Stays - First Rvw	Stays - Onsite Rvw	Outflo w in grp	Outflo w acc grp	Inflow same grp	Inflow other grps	Additional In Flow	Final	CSMP Original	CSMP Final	% Change in CSMP
Accidents & injuries: not classifiable	35	26	1	3	5	1	5	17	50	0.014	0.013	-5.18
Snake bite	27	23	1	3	0	0	1	12	37	0.011	0.010	-9.04
Stings of venomous insects like scorpion etc.	3	2	1	0	0	0	0	3	6	0.001	0.002	32.75
Rabies	1	1	0	0	0	0	3	3	7	0.000	0.002	364.62
Drowning	16	11	3	2	0	0	3	11	28	0.006	0.007	16.15
Fall	18	17	0	1	0	1	11	18	47	0.007	0.013	73.31
Road accident	40	36	3	0	1	3	4	19	65	0.016	0.017	7.86
Burns	21	14	5	2	0	1	1	8	29	0.008	0.008	-8.34
Suicide	100	96	3	0	1	4	15	62	180	0.040	0.048	19.47
Homicide	18	16	2	0	0	0	1	5	24	0.007	0.006	-11.5
Excessive heat	75	26	36	0	13	0	8	15	85	0.030	0.023	-24.78
Excessive cold	0	0	0	0	0	0	0	0	0	0.000	0.000	0
Natural calamity	12	0	1	1	10	2	0	1	4	0.005	0.001	-77.88
Maternal: not classifiable	7	1	2	1	3	0	2	0	5	0.003	0.001	-52.59
Abortion	5	4	0	0	1	0	0	3	7	0.002	0.002	-7.08

NML Cause	Original	Stays - First Rvw	Stays - Onsite Rvw	Outflo w in grp	Outflo w acc grp	Inflow same grp	Inflow other grps	Additional In Flow	Final	CSMP Original	CSMP Final	% Change in CSMP
Toxaemia	1	1	0	0	0	0	3	0	4	0.000	0.001	165.5
Anaemia	4	0	1	0	3	0	0	1	2	0.002	0.001	-66.81
Bleeding of pregnancy & puerperium	3	1	1	0	1	0	0	1	3	0.001	0.001	-33.63
Malposition of child causing maternal death	0	0	0	0	0	1	0	1	2	0.000	0.001	0
Puerpural sepsis	1	1	0	0	0	0	2	3	6	0.000	0.002	298.24
Fevers: not classifiable	26	2	4	3	17	1	2	20	29	0.010	0.008	-25.97
Malaria	5	4	1	0	0	0	6	19	30	0.002	0.008	298.24
Influenza	11	2	0	1	8	1	0	1	4	0.004	0.001	-75.86
Typhoid	24	8	9	2	5	4	4	14	39	0.010	0.010	7.86
Digestive disorders: not classifiable	10	1	1	3	5	0	1	4	7	0.004	0.002	-53.54
Gastroenteritis	32	20	9	0	3	5	51	63	148	0.013	0.039	206.98
Cholera	0	0	0	0	0	1	0	3	4	0.000	0.001	0
Food poisoning	11	1	5	1	4	0	1	4	11	0.004	0.003	-33.63
Dysentery	20	13	5	2	0	1	4	13	36	0.008	0.010	19.47
Peptic ulcer	20	10	5	1	4	5	3	4	27	0.008	0.007	-10.4

NML Cause	Original	Stays - First Rvw	Stays - Onsite Rvw	Outflo w in grp	Outflo w acc grp	Inflow same grp	Inflow other grps	Additional In Flow	Final	CSMP Original	CSMP Final	% Change in CSMP
Acute abdomen	52	10	16	8	18	3	3	20	52	0.021	0.014	-33.63
Coughs: not classifiable	17	1	5	8	3	2	1	14	23	0.007	0.006	-10.2
Tuberculosis of lungs	123	24	86	3	10	19	23	89	241	0.049	0.064	30.05
Bronchitis	192	58	79	14	41	6	26	49	218	0.077	0.058	-24.64
Asthma	64	10	43	5	6	3	3	76	135	0.026	0.036	40.01
Pneumonia	37	16	17	0	4	2	9	19	63	0.015	0.017	13.02
Whooping cough	2	0	0	2	0	0	2	5	7	0.001	0.002	132.31
CNS disorders: not classifiable	7	3	0	1	3	0	2	0	5	0.003	0.001	-52.59
Paralysis	210	144	49	2	15	3	41	93	330	0.084	0.088	4.3
Meningitis	7	3	4	0	0	2	7	4	20	0.003	0.005	89.64
Convulsions	23	4	10	2	7	0	9	22	45	0.009	0.012	29.86
Congenital & other heart diseases	68	20	21	6	21	6	11	36	94	0.027	0.025	-8.25
Anaemia	41	18	10	4	9	1	5	18	52	0.016	0.014	-15.82
Heart attack (IHD)	300	102	160	3	35	6	39	142	449	0.120	0.119	-0.66
Other medically certified deaths	19	4	4	1	10	0	7	11	26	0.008	0.007	-9.17
Cirrhosis & chronic liver diseases	14	8	4	0	2	0	1	13	26	0.006	0.007	23.27
Jaundice	67	28	27	5	7	2	10	33	100	0.027	0.027	-0.93

NML Cause	Original	Stays - First Rvw	Stays - Onsite Rvw	Outflo w in grp	Outflo w acc grp	Inflow same grp	Inflow other grps	Additional In Flow	Final	CSMP Original	CSMP Final	% Change in CSMP
Chickenpox	0	0	0	0	0	0	0	0	0	0.000	0.000	0
Measles	0	0	0	0	0	0	0	0	0	0.000	0.000	0
Leprosy	3	2	1	0	0	0	1	4	8	0.001	0.002	77
Tetanus	5	1	1	2	1	0	0	1	3	0.002	0.001	-60.18
Poliomyelitis	1	0	0	0	1	0	0	0	0	0.000	0.000	-100
Mental disease	16	4	4	0	8	0	2	4	14	0.006	0.004	-41.92
Cancer	112	33	67	3	9	5	15	65	185	0.045	0.049	9.64
Diabetes	42	18	21	0	3	3	11	28	81	0.017	0.022	28.01
Hyperplasia of prostate	6	3	0	0	3	0	2	2	7	0.002	0.002	-22.56
Uraemia	28	16	12	0	0	1	3	6	38	0.011	0.010	-9.92
Obstructed hernia	3	3	0	0	0	0	0	0	3	0.001	0.001	-33.63
Infant deaths: not classifiable	34	3	12	15	4	7	4	2	28	0.014	0.007	-45.34
Prematurity	46	5	31	7	3	8	3	11	58	0.018	0.015	-16.31
Congenital malformation	4	2	0	1	1	3	2	5	12	0.002	0.003	99.12
Birth injury	6	6	0	0	0	0	0	1	7	0.002	0.002	-22.56
Respiratory infection of new born	33	17	7	7	2	12	4	11	51	0.013	0.014	2.58
Cord infection (tetanus)	1	0	0	1	0	0	0	0	0	0.000	0.000	-100

NML Cause	Original	Stays - First Rvw	Stays - Onsite Rvw	Outflo w in grp	Outflo w acc grp	Inflow same grp	Inflow other grps	Additional In Flow	Final	CSMP Original	CSMP Final	% Change in CSMP
Diarrhoea of newborn	4	2	2	0	0	1	1	3	9	0.002	0.002	49.34
Senility	362	187	86	0	89	0	21	149	443	0.145	0.118	-18.77