

### Appendix-3-1: SCD (Rural) algorithms and current knowledge based on verbal autopsy.

SCD Code and Cause	Expert opinion and findings from field studies about diagnostic algorithms and validity of verbal autopsy (VA) to assign specific cause of death.	Does SCD questions satisfy expert opinion?
100 Accidents and injuries		
Did the death occur due to an accident or injury or violence? Was the death due to accident? Was the death due to drowning?	Zimicki (1990) found coding of drowning by VA in the Matlab, Bangladesh DSS to be most sensitive and specific.	
200 Maternal not classifiable		
Did the woman die of complication arising from child birth, pregnancy or puerperium? What was the death due to, if not from any of the following causes?	Hayes (1989): Can be diagnosed during labour or delivery with hemorrhage, prolonged labour, convulsions. In case of fever in six weeks after delivery. If fever after abortion. Abortion deaths may be concealed. Can be excluded in late pregnancy, labour or immediate postpartum. Cannot be excluded in early pregnancy.	
300 Fevers: not classifiable		
Did the deceased have high fever? What was the death due to, if not from any of the following causes?	Zimicki (1990) found that there was a tendency for deaths coded to fever and respiratory disease among 1-4 year children to vary inversely with each other.	
311 Malaria		
Did the deceased have high fever? Were there repeated attacks of fever? Was the fever coming on alternate days or every 4th day and was there delirium, sweating and chills?	Gray (1989) cites studies showing that it is difficult to diagnose malaria on the basis of verbal autopsy without laboratory investigations to demonstrate parasites in peripheral smear. The WHO algorithm of intermittent high fever with chills and prostration can be used as a crude diagnostic algorithm. It has not been validated. Hospital studies of clinical diagnosis correlated with blood smears show considerable error (Essex, 1978). However, in endemic areas the falciparum malaria is easily recognised. Andhra Pradesh is an endemic area. Since most deaths due to malaria occur due to P. Falciparum, its recognition as cause of death should cover most malaria deaths. Garene and Fontaine (1989): Malaria is most difficult to evaluate from verbal autopsy. Their criteria were: (a) high fever with sweat or chills, (b) death within three days of beginning fever, and (c) no evidence of adequate prevention of treatment, such as chloroquin or quinine, at least 12 hours prior to death. Hayes (1989): Can be diagnosed in adults if cerebral malaria with headache, shivering attacks, delirium especially in some one recently arrived from non malarial area. If black water fever. Can be excluded if only slight or no fever.	Yes. Does not include additional questions suggested by G&F such as death within 3 days of start of fever and no evidence of antimalarial treatment. A large number of deaths due to malaria occur in early childhood. Specific opinion on this aspect is lacking.
411 Gastro- enteritis		
Did the person die of any digestive disease in the form of diarrhoea, pain in abdomen, vomiting, loss of weight, debility? Did the person have vomiting and diarrhoea? Did the person have a greater incidence of vomiting associated with diarrhoea and dehydration? CL: There is vomiting and diarrhoea of sudden onset. There is dehydration with shallow eyes. The vomiting and diarrhoea are abundant in incidence. Diarrhoea	Zimicki (1990) found the coding of diarrhoea by VA in the Matlab DSS to be most sensitive and specific. Gray (1989) lumps diarrhoea and dysentery together and suggests the following algorithm adapted from Black et al (1982): (a) history of three, four or more liquid stool per day (diarrhoea), (b) passage of blood and mucus (dysentery), dry mouth, dry wrinkled skin, sunken eyes, lack of urine, and in young infants depressed fontanelle and (c) the above conditions should have occurred immediately before time of death. In a study in Bangladesh (Black et al 1982) the above definition was validated by obtaining a history from mother and examining a single stool specimen. Agreement was obtained in	Yes. No questions about frequency of stools in the structured part. But the check list refers to "countless number of motions". Specificity of 80% would balance out the sensitivity of 80% to some

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SCD Code and Cause	SCD algorithm i.e. structured questions and checklist (CL) means abnormal frequent discharge of fluid faeces from the bowel.	Expert opinion and findings from field studies about diagnostic algorithms and validity of verbal autopsy (VA) to assign specific cause of death.	Does SCD questions satisfy expert opinion?
412 Cholera	<p>Did the person die of any digestive disease in the form of diarrhoea, pain in abdomen, vomiting, loss of weight, debility? Did the person have vomiting and diarrhoea? Was it an acute onset of profuse watery motions resembling rice water followed by vomiting and stoppage of urine, with cramps? Was there acute dehydration without bellyache?</p> <p>CL: Profuse watery motions resembling rice water, followed by vomiting. There is stoppage of urine. Excessive thirst. Collapse and death due to dehydration. The pain in the abdomen is not very distressing.</p>	<p>Expert opinion and findings from field studies about diagnostic algorithms and validity of verbal autopsy (VA) to assign specific cause of death. 80% cases. Mother's subjective report about occurrence of diarrhoea tallied with findings from above algorithm 97% of times. Garene and Fontaine (1989) used following criteria for their study in Senegal: (a) declaration of diarrhoea, (b) evidence of abundant stools until death, (c) no evidence of other diseases mentioned in checklist, (d) signs of dehydration such as thirst, sunken eyes, or sunken fontanelle. However open ended questions on the presence of "diarrhoea" may be unreliable (Gray 1991 citing Black 1984, Kendal et al 1984), Kalter et al (1990). The best algorithm for diagnosis of death due to diarrhoea was the presence of frequent loose or liquid stools irrespective of whether the death was due to diarrhoea alone or in combination with other illness (sensitivity=78% and specificity=79%). The additional specification of diarrhoea stool frequency of 6 or more per day, and signs of dehydration like thirst or sunken eyes improved specificity (92%) but reduced sensitivity (57%). WHO-UNICEF 1992. Sensitivity and specificity for diarrhoea presented a mixed picture. Sensitivity ranged from 0.36 to 0.90 while specificity ranged from 0.61 to 0.97. Several of the verbal autopsies used in these validation studies contained a number of questions about frequency and consistency of stools during the illness preceding death. Sensitivity and specificity varied depending on which criterion was used. Overall, the levels of sensitivity and specificity for deaths associated with diarrhoea were moderate and not high enough to recommend that verbal autopsies be undertaken on a regular basis in every country to monitor mortality from diarrhoea.</p>	<p>Does SCD questions satisfy expert opinion? extent. Hence the resultant estimate should at best be marginally off. Hence can be relied upon</p>
414 Dysentery	<p>Did the person die of any digestive disease in the form of diarrhoea, pain in abdomen, vomiting, loss of weight, debility? Did the person have vomiting and diarrhoea? Was it an acute onset of profuse watery motions resembling rice water followed by vomiting and stoppage of urine, with cramps? Was there acute dehydration without bellyache?</p> <p>CL: Profuse watery motions resembling rice water, followed by vomiting. There is stoppage of urine. Excessive thirst. Collapse and death due to dehydration. The pain in the abdomen is not very distressing.</p>	<p>Garene and Fontaine (1989) include cholera among the adult causes of death identifiable with some degree of confidence in their study in Senegal. Their criteria for cholera was: (a) severe abundant watery diarrhoea (like rice water) or vomiting, without fever; (b) signs of dehydration; (c) death within three days of onset of diarrhoea, and (d) good evidence of contamination or an epidemic.</p> <p>Zimicki (1990) found the coding of dysentery by VA in the Matlab, Bangladesh DSS to be fairly specific but less sensitive. It included some cases of malabsorption. Some dysentery deaths are reported as due to measles or dropsy. Gray (1989) lumps diarrhoea and dysentery together and suggests the following algorithm adapted from Black et al (1982):</p>	<p>Yes. Meets first two of G&amp;F's criteria. Criteria (d) about evidence of contamination appears valid on the face of it and could be added to SCD questions. Criteria (c) about death within 3 days needs to be considered.</p> <p>Yes. Considering low sensitivity dysentery deaths may be underestimated. The</p>

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SCD algorithm i.e. structured questions and checklist (CL) diarrhoea? Did the person have diarrhoeal faeces containing blood or mucus with bellyache? CL: Frequent motions with lower bellyache not of rice water variety containing mucus or blood. There is constant desire to defecate without actual defecating.	(a) history of three, four or more liquid stool per day (diarrhoea), (b) passage of blood and mucus (dysentery), (c) dry mouth, dry wrinkled skin, sunken eyes, lack of urine, and in young infants depressed fontanelle and (d) the above conditions should have occurred immediately before time of death.	questions regarding diarrhoea and dysentery branch off from each other regarding presence or absence of blood and mucus. Under-reporting in one may be picked up by the other. Lumping both as diarrhoeal diseases may avoid this problem. However, some correction for Zimnicki's (1990) finding that some dysentery deaths are coded as measles or dropsy would be needed.
511 Tuberculosis of lungs (Pulmonary TB) Did the deceased die due to cough? Whether the cough was of long duration i.e. for more than a few months? Was the person rapidly getting weak and losing weight? Was there a history of night sweats? Was there spitting of blood, pain in the chest and loss of appetite? CL: The deceased had a history of chronic cough. The person would have lost weight rapidly. There may be history of blood in coughed material, or pure blood itself might have been coughed out. There would be continued emaciation with loss of weight, fever and sweats.	Gray (1989) notes that it is difficult to recognise tuberculosis in childhood. WHO algorithm for TB in children: (a) chronic cough for three months or more unresponsive to antibiotic treatment, (b) weight loss, (c) slight fever, (d) blood in sputum, (e) abdominal swelling, (f) painless swellings (lymph nodes) in neck, under the arms, or in the groin, (g) swelling of the joints of slow onset. The algorithm is yet to be validated. Hayes (1989): Can be diagnosed if cough, blood in sputum, weight loss, fever, night sweats, anorexia were present. Possibility of confusion with lung cancer is present. Can be excluded if no related symptoms. Cannot be excluded from lung cancer.	Yes. WHO algorithm includes lymph nodes, abdominal swelling etc. characteristic of primary complex in children. Note that SCD code here is for pulmonary TB.
512 Bronchitis Did the deceased die due to cough? Whether the cough was of long duration i.e. for more than a few months? Did the elderly person have continuous cough with frothy mucous expectoration? CL: Cough of long duration, elderly person. Shortness of breath. Bouts of cough resulting in frothy mucous expectoration. Some times with fever. Patient usually	Hayes (1989): Emphysema is lumped with bronchitis. Can be diagnosed if there was cough and wheezing with or without fever, history of recurrent episodes, say 3 per year. Differential diagnosis with asthma. Can be excluded if no relevant symptoms at time of death.	Yes.

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SCD algorithm i.e. structured questions and checklist (CL) has no sleep and suffers slow deterioration of his conditions.		
<b>513 Asthma and allergic disorders of respiratory system</b>		
Did the deceased die due to cough? Whether the cough was of long duration i.e. for more than a few months? Did the person have cough during certain seasons? Did he spends sleepless nights due to cough? Was there wheezing sound with breathing? Was he always sitting in bed for relief of cough?	Hayes (1989): Can be diagnosed especially in young person, typical wheeze, cyanosis, unable to drink more than sips, history of past recurrent episodes. Can be excluded if not breathless at time of death although wheeze would be less apparent at the terminal stage.	Yes.
CL: Symptoms similar to bronchitis but the suffering is usually seasonal. There is difficulty in breathing with "catcall" (wheezing) like sounds. The cough is paroxysmal in nature and with breathlessness. In case of asthma the diseases of chronic nature. The household gives a history of several years.		
<b>521 Pneumonia</b>		
Did the deceased die due to cough? Was the cough of short duration? Was there high fever with cough of sudden onset?	Gray (1989): cute lower respiratory tract infections (ALTRI) such as pneumonia and bronchiolitis of bacterial and viral origin may be important in Indian subcontinent. The following algorithm from Rile et al (1981) and Essex (1978) is recommended by Gray: (a) cough and fever, (b) difficulty in breathing or rapid respiration due to shortness of breath or chest pain, (c) duration less than two weeks. Although not adequately validated vaccine trial data suggest its usefulness. Garene and Fontaine (1989): (a) evidence of fever until death and (b) symptoms like rapid breathing, breathing like a pup, difficult breathing, palpating nostrils, insuction, acute cough. Symptoms should have lasted at least 24 hours before death to avoid confusion with signs of agony. Kalter et al (1990): For acute lower respiratory infection (ALRI) in childrens presence of cough and dyspnoea had sensitivity of 84% and a specificity of 76% in excluding non respiratory causes and a specificity of only 44% in excluding deaths due to upper respiratory tract infection (URTI). Including presence of fever in the algorithm reduced sensitivity slightly to 82% and increased specificity to 58% for the-URTI comparison. Adding signs of respiratory distress improved specificity to 83% for URTI comparison and 84% for exclusion of non respiratory causes. However sensitivity reduced to 68%. Hayes (1989): Can be diagnosed in adults if dyspnoeic at rest, high fever, +/- cough or chest pain. Can be excluded if none of these symptoms present.	Yes. Going by Kalter et al's finding, the SCD algorithm of cough and fever should have 82% sensitivity and specificity of 58% for exclusion of URTI and 76% for exclusion of non- respiratory causes.
CL: There is cough of short duration, with high fever. This is of sudden onset. There is pain in chest. There may be rapid breathing. If child there may be convulsions and vomiting. There is respiratory failure causing death.		
<b>530 Whooping cough</b>		
Did the deceased die due to cough? Was there	The WHO EPI algorithm for identification of deaths due to whooping cough: (a) history of severe cough persisting for two or more weeks, (b) recurrent bouts of coughing with	Yes. G&F's point (b) about epidemics could be added.

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SCD algorithm i.e. structured questions and checklist (CL) paroxysmal attacks of coughing over a period of time and severe bouts of cough with whoop at the end? CL: Cough with whoop at the end of the spell of severe bout of cough. Vomiting of food leading to emaciation during short illness. Fever not essential. Generally in the case of children.	characteristic whoop, © cough followed by vomiting. Gray (1989) reports that in a Kenyan study (Voorhoeve et al, 1978) using criteria similar to WHO algorithm whooping cough could be confirmed by more objective clinical investigation in 40% of cases. When mothers of children with confirmed whooping cough were reinterviewed after an interval of 6-12 months 96% gave a concordant history of whooping cough, suggesting reliability of recall for positive cases. Gray also cites vaccine trials which show decline in whooping cough deaths estimated by algorithms similar to the WHO's shown above (Cook, 1978, Muller et al 1984). Garene and Fontaine (1989): Whooping cough is easily recognised by people. In addition to declaration by the family following criteria was used: (a) death during the period of cough (100 days after the start), (b) evidence of an epidemic in the village or contamination from outside, (c) long lasting cough together with symptoms such as whoop, vomiting, red eyes.	The criteria of death within 100 days need to be considered.
<b>610 Stroke</b> Was the deceased in coma for long time before death? Was there a sudden onset of paralysis of one half of body or a limb, along with fever or without fever? CL: An elderly person moving about freely suddenly gets sick and suffers loss of consciousness and becomes comatose. Paralysis of half of body or all limbs or face is noticed later. The person may regain sense and remain paralytic or may die without regaining to consciousness level.	Hayes (1989): Can be diagnosed if sudden paralysis or loss of speech leading to unconsciousness. Cannot usually be excluded. Can be excluded only if no other suggestive history.	Yes.
<b>620 Meningitis</b> Was the deceased in coma for a long time before death? Was there fever with convulsions, stiffness of the neck with headache, and pain in eyes, the fever remaining high and continuous, patient getting irritated by sound or light? CL: There is fever of short duration. There is rigidity of neck, convulsions and headache. The patient is irritated and does not like light, sound etc. The patient becomes unconscious and dies.	Garene and Fontaine (1989): Meningitis appeared to be more difficult to assess than other causes. Criteria: (a) fever until death, (b) symptoms of meningitis like head bent backwards, arms and legs bent, swollen fontanelle, and (c) convulsions, headaches, photophobia might have been present. Evidence of an epidemic of meningitis.	Yes. G&F's criteria about epidemic could be added.
<b>630 Convulsions</b> Was the deceased in coma for a long time before death? If a child, did it die of convulsions, with no other symptoms?	Garene and Fontaine (1989): Epilepsy is well identified by people. Their criteria: (a) declaration by the family, (b) report of an epileptic crisis, © evidence of treatment for epilepsy since most people usually receive treatment prior to death.	Yes.

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<p><b>SCD algorithm i.e. structured questions and checklist (CL)</b>            CL: The child had convulsions repeatedly due to any of several underlying causes. It may have convulsions with high fever, diarrhoea and infections of brain, etc. Convulsions mean violent involuntary muscular contraction. They are followed by unconsciousness, leading to death.</p>		
<p><b>700 Congestive and other heart failure</b>            Was it heart failure or not due to heart attack? Was there breathlessness or palpitation?            CL: Chronic breathlessness and cough with swelling feet and abdomen and palpitation of heart. Breathlessness increases by walking, relief obtained by sitting. Death is due to acute and severe breathlessness in case of congestive heart disease. Other heart disorders (not due to heart attack); if diagnosed during last illness may also be included here.</p>	<p>Hayes (1989): Can be diagnosed. Exertional dyspnoea, edema, orthopnea. Can be excluded if no edema or dyspnoea.</p>	Yes.
<p><b>730 Ischaemic heart disease (heart attack)</b>            Were the death sudden? Was there acute pain in the chest or the arm followed with breathlessness?            CL: Patient might have complained of severe and acute pain in chest or arm followed by sweating and severe breathlessness. Becomes cold and clammy and dies suddenly due to breathlessness or unconsciousness. It is a sudden death.</p>	<p>Hayes (1989): Diagnosis by verbal autopsy doubtful. Can be diagnosed only if there was history of typical pain, although it can be difficult even with living patient. Cannot be excluded. Any unexplained sudden death could be provoked by ischaemic heart disease. Can be excluded if there is history of chronic disease leading to death without pain.</p>	Yes.
<p><b>812 Jaundice</b>            Was other clear symptoms present? Were there any external evidence of disease like yellow eyes and skin? Was the colour of the eyes and skin yellow? Did he have vomiting and aversion to food? Did he finally die of a swelling all over the body?            CL: The eyes are yellow in colour, and the skin is yellow. There is fever, malaise, headache, nausea, vomiting and loss of appetite. Urine is of high yellow colour.</p>	<p>Hayes (1989): Hepatitis can be diagnosed if anorexia and nausea with or without vomiting, fever, followed by jaundice. It can be excluded if no related symptoms. Could be confused with gall stone infection, but pain will be severe in that case.</p>	Yes. Need to change the label from jaundice to hepatitis.
<p><b>821 Chicken pox</b></p>		

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<b>822 Measles</b> Were other clear symptoms present? Was there any skin eruptions and skin changes? Was it a child? Did the deceased have fever for 4 days and later the body became red, and developed cough and cold? (Usually a child) CL: Did the deceased have fever for 4 days and later the body become red and develop cough and cold.	The WHO EPI algorithm is as follows: (a) history of a blotchy rash lasting three or more days, followed by peeling of the skin, (b) history of fever, (c) history of cough, runny nose and red eyes, and (d) the above conditions should have occurred within three months of death. Gray (1989) informs that lay diagnosis using above algorithm has been used successfully in numerous vaccine efficacy studies. In addition the disease is commonly recognised by the community. It has been shown that the rash, subsequent peeling of skin, cough, and conjunctival inflammation provided maximum discrimination between cases with confirmed measles and control children with other illness. The sensitivity and specificity of the above algorithm exceed 90% (Leeuwenberg et al., 1984). Garene and Fontaine (1989): Deaths were due to measles death was easy to determine since people recognize the disease accurately. Their criteria were: (a) declaration of measles by parents, (b) death within six weeks of the beginning of fever and rash, (c) evidence of an epidemic in the village, (d) symptoms in the following sequence i.e. fever, running nose, red eyes, rash starting on face, rash in mouth, rash all over body, peeling skin, and (e) no evidence of excluding symptoms such as water in the pimples. Zimicki (1990) found that the measles category contained some deaths occurring after other diseases in which rashes occur, while some measles related deaths were classified as dysentery, respiratory disease, fever or dropsy. Kalter et al (1990) found that the algorithm consisting of (a) death after 120 days of age, and (b) both rash and fever last for three or more days yielded 94% sensitivity and 89% specificity. Information about fading of rash increased specificity to 94% without affecting sensitivity. These authors noted that most children dying of measles do not survive till peeling of skin (desquamation). WHO-UNICEF 1992: Verbal autopsy would seem to be a good method for identifying measles as a cause of death, although the epidemic nature of measles must be kept in mind. During any short time period, whether or not there are deaths from measles depends largely on whether there has been an outbreak of measles during the period under study.	Yes. Scope for improvement. For example points like age at death more than 120 days (4 months), revising existing question of fever for 4 days to fever and rash at least for 3 days, evidence of epidemic in the village, red eyes.
<b>831 Tetanus</b> Were there other clear symptoms present? Was there any external evidence of disease like convulsions or spasms? Deaths of new born excluded here. Was there a history of injury? Was there locking of the jaw? Were there severe spasms of the limb? CL: Does not include neonatal tetanus.	Hayes (1989): Can be diagnosed by verbal autopsy.	Yes.
<b>861 Cancer</b> Were there other clear symptoms present? Was there any external evidence of disease like tumour? Was	Hayes (1989): Breast cancer can be identified only if there is no cultural inhibition about intimate area. It could also be confused with chronic infection. Thus it would be difficult to	Can't say. Likely to underestimate cancer

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SCD algorithm i.e. structured questions and checklist (CL) there a small swelling in the mouth, breast, lips and skin, uterus or other areas, rapidly breaking and bleeding with pain, growing bigger and bigger at a great speed? CL: There may be a swelling of small size in breast, tongue, mouth, face, penis, skin. It has a rapid growth and soon begins to bleed. In case of breast and penis the growth multiplies like mushroom. In the case of malignancy of the cervix or uterus, there will be little bleeding, not related to menses, or in a woman who is in menopause there is extreme emaciation and loss of weight. In case of lung cancer, there is inexplicable cough. In case of cancer of the throat, there is change or loss of voice and difficulty in swallowing. In the case of cancer of the anus or rectum, the motion is to being passed due to pain, there is bleeding during the passing of motion etc.	discriminate breast cancer in Andhra Pradesh. It could be excluded as there was no treatment for it and there was no weight loss. For cervical cancer, history may not be forthcoming to male interviewer. Post-menopausal age may be used as suggestive. Lung cancer can be confused with tuberculosis, although the latter would have longer history and low grade fever compared to lung cancer. It could be excluded in case of no cough, no weight loss and no haemoptysis. Liver cancer may not be distinguished from terminal cirrhosis. It may be excluded if no vomiting, no jaundice, swollen abdomen or diarrhoea are detected. Stomach cancer may be confused with chronic peptic ulcer or pyloric stenosis. It can be excluded if there was no weight loss, no vomiting and history of loss of appetite. Colon cancer can be confused with other causes of intestinal obstruction or anaemia which of course would be more acute.	deaths, since these questions would bring out the most obvious cancer deaths only. It may be desirable to ask about cancer stomach in the digestive disorder module than here. Similarly questions about lung cancer would appropriately belong in the cough module. The omnibus label of cancer is too vague. Site-specific labels would be more desirable.
900 Infant deaths: not classifiable Did the new born child die soon after birth or within one year. What was the death due to if not from any of the following causes?	Gray(1989) In summary, if a death is reported during the first month of life it should be possible to discriminate between neonatal tetanus, birth trauma/asphyxia and low birth weight, or external congenital abnormalities. Garewe and Fontaine (1989) designed their questionnaire for neonatal deaths to assess five main causes: neonatal tetanus, pneumonia of the newborn, birth trauma, congenital defects and a composite group consisting of prematurity and low birth weight. Community studies from India (Kielman et al 1983, Shah et al 1984) suggest that roughly one third of perinatal deaths can be attributed to prematurity, another one third to birth injury and about 6% to congenital defects, 5% due to infections and rest attributed to unknown causes.	No. Difficult to distinguish prematurity from low birth weight (LBW). So lumping with low birth weight is called for. Since LBW label does not exist, it can be added here without disturbing the structure of SCD list.
910 Prematurity Did the child die soon after birth or within one year? Was the baby premature, underweight and small in size or was it one of plural births? CL: This always refers to the new born baby. The baby is very small in size and markedly underweight. The child has feeding and sucking difficulty. The skin is very soft, and nails are not fully developed. The cry of the baby is feeble and weak.	Difficult in distinguishing pre maturity in the absence of birth weight or definite record of gestational age. Garewe and Fontaine (1989) lump prematurity and low birth weight together and assess it from mothers report either of low number of weeks of pregnancy or that the child was markedly small, or of cases of twins or triplets. Death usually occurred within three days of birth. Gray (1989) opines that the WHO algorithm for low birth weight, birth trauma or asphyxia is potentially valid. This algorithm is as follows: (a) Stillborn infant or infant dying within first week of life, (b) failure to suckle or cry normally after birth and any time prior to death, (c) very small infant, (d) history of prolonged or complicated labour, (e) signs of trauma, particularly bruising or indentation of the skull.	No. Difficult to distinguish prematurity from low birth weight (LBW). So lumping with low birth weight is called for. Since LBW label does not exist, it can be added here without disturbing the structure of SCD list.

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922 Congenital malformation	<p>Did the child die soon after birth or within one year? Was the death of baby due to injury at birth? Was the injury at birth due to congenital malformations? CL: The child has an abnormal head, too big or too small. Some times, the intestines are outside. Some times the urinary system has some malformation, some times the anus is not perforated to pass motion. In major abnormalities life is not compatible. Some times minor malformations like hare lip may occur which through surgical care can be rectified, but are neglected and the child may die of starvation and malnutrition at a later stage though not immediately.</p>	Yes.
923 Birth injury	<p>Did the child die soon after birth or within one year? Was the death of baby due to injury at birth? Was the injury at birth due to use of instruments, difficult labour etc. CL: Generally there is a history of prolonged labour with or without use of instruments. The child after birth is usually blue in colour, cries in low voice, had convulsions or facial paralysis or injuries on the face, upper extremities, collar bone etc.</p>	Yes.
931 Respiratory infections of the newborn	<p>Did the new born child die soon after birth or within one year? Was the death due to infection after birth? Did the baby have fever after birth with difficulty in breathing? CL: The infections of the respiratory tract, are most common. A few days after birth there is fever. The infant may have rapid breathing, convulsions, vomiting and feeding difficulties and may die without any external sign of infection.</p>	Yes.
932 Cord infection	<p>Did the child die soon after birth or within one year? Was the death due to infection after birth? Was there sepsis of the umbilical cord? CL: With similar description as for respiratory infection of the new</p>	No. This diagnosis of cord infection needs to be replaced by neonatal

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SCD Code and Cause	Expert opinion and findings from field studies about diagnostic algorithms and validity of verbal autopsy (VA) to assign specific cause of death.	Does SCD questions satisfy expert opinion? tetanus and the questions modified suitably.
SCD algorithm i.e. structured questions and checklist (CL) born, the child may have an abscess of the umbilical cord, or sepsis of the cord, or even of the umbilicus itself at a later stage. Deaths due to tetanic convulsions of newborn to be included here.	<p>references and given arguments that the WHO algorithm is highly specific. Fever and umbilical sepsis is reported in 20-50% of neonatal tetanus cases (Galazka and Stroh, 1986 cited in Gray, 1991). Thus the label ,cord infection, may not capture all neonatal tetanus deaths. Kaller et al (1990) found that for neonatal tetanus the algorithm consisting of (a) death at &lt;math&gt;\leq 30&lt;/math&gt; days associated with (b) convulsions or spasms during two weeks prior to death had cent percent sensitivity. The addition of information that the child suckled normally after birth until onset of illness did not reduce sensitivity. Questions on whether the child stopped suckling after onset of illness or had generalised stiffness dropped sensitivity to 94%. WHO-UNICEF 1992: Verbal autopsy would seem to be a useful instrument for identifying neonatal tetanus. However deaths from neonatal tetanus are known to be underreported owing to underreporting of neonatal deaths in general.</p>	
933 Diarrhea of new born	<p>Zimnicki (1990) found the coding of diarrhoea by VA in the Matlab DSS to be most sensitive and specific. Gray (1989) lumps diarrhoea and dysentery together and suggests the following algorithm adapted from Black et al (1982): (a) history of three, four or more liquid stool per day (diarrhoea), (b) passage of blood and mucus (dysentery), (c) dry mouth, dry wrinkled skin, sunken eyes, lack of urine, and in young infants depressed fontanelle and (d) the above conditions should have occurred immediately before time of death. In a study in Bangladesh (Black et al 1982) the above definition was validated by obtaining a history from mother and examining a single stool specimen. Agreement was obtained in 80% cases. Mothers subjective report about occurrence of diarrhoea tallied with findings from above algorithm 97% of times. Garne and Fontaine (1989) used following criteria for their study in Senegal: (a) declaration of diarrhoea, (b) evidence of abundant stools until death, (c) no evidence of other disease mentioned in check list, (d) signs of dehydration such as thirst, sunken eyes, or sunken fontanelle. However open ended questions on the presence of "diarrhoea" may be unreliable (Gray 1991 citing Black 1984, Kendal et al 1984). Kaller et al (1990): The best algorithm for diagnosis of death due to diarrhoea was the presence of frequent loose or liquid stools irrespective of whether death was due to diarrhoea alone or in combination with other illness (sensitivity=78% and specificity=79%). The additional specification of diarrhoea stool frequency of 6 or more per day, and signs of dehydration like thirst or sunken eyes improved specificity (92%) but reduced sensitivity (57%). WHO-UNICEF 1992: Sensitivity and specificity for diarrhoea presented a mixed picture. Sensitivity ranged from 0.36 to 0.90 while specificity ranged from 0.61 to 0.97. Several of the verbal autopsies used in these validation studies contained a number of questions about frequency and consistency of stools during the illness preceding death. Sensitivity and specificity varied depending on which criterion was used. Overall, the levels of sensitivity and specificity for deaths associated with diarrhoea were</p>	<p>Yes. No questions about frequency of stools in the structured part. But the check list refers to "countless number of motions". Specificity of 80% would balance out the sensitivity of 80% to some extent. Hence the resultant estimate should at best be marginally off. Hence can be relied upon</p>
Did the child die soon after birth or within one year? Was the death due to infection after birth? Did the child die of diarrhea? CL: Otherwise healthy infant suddenly passes countless number of motions and vomiting, the skin becomes dry, the tongue is dry and parched. The fontanelle are depressed. The eyes are sunken. The urine is yellow and scanty. There is high temperature, and the child soon goes into coma and passed motion in the unconscious state and dies.		

### Appendix-3-1: SCD (Rural) algorithms and current knowledge based on verbal autopsy.

SCD Code and Cause	Expert opinion and findings from field studies about diagnostic algorithms and validity of verbal autopsy (VA) to assign specific cause of death.	Does SC: questions satisfy expert opinion?
SCD algorithm i.e. structured questions and checklist (CL)	moderate and not high enough to recommend that verbal autopsies be undertaken on a regular basis in every country to monitor mortality from diarrhoea.	
000 Senility	Was the person extremely old and apparently not sick? Patient should be above 60 years and none of the specific causes noted above can be traced in him.	

#### Detailed reference of Sources cited in the above table:

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2. Leeuwenberg J., Gemert W., Muller A.S., Voorhoeve A.M. and Kok P.W.; 1984; The epidemiology of measles in Maternal and child health in rural Kenya: an epidemiological study, Croom Helm, London, 127-42.
3. Kalter (1990); Kalter Henry D., Gray Ronald H., Black Robert E. and Gultian Socorro A.; 1990; Validation of post mortem interviews to ascertain selected causes of death in children; International journal of epidemiology 19(2): 380-386.
4. WHO-UNICEF (1992); WHO and UNICEF, 1994; Measurement of overall and cause-specific mortality in infants and children: Memorandum from a WHO / UNICEF meeting; Bulletin of the World Health Organization 72(5):707-713
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7. Adult VA tools workshop; London School of Hygiene & Tropical Medicine (LSHTM); 1993; Verbal autopsy tools for adult deaths. Workshop report, 11-15 January 1993; Mimeo.
8. Hayes et al 1989; Hayes Richard, Mertens Theiry, Lockett Geraldine and Rodrigues Laura; Causes of adult deaths in developing countries. A review of data and methods. World Bank working paper WPS 246, July 1989.

#### Acronyms used in the above table:

SCD: Survey of cause of death rural in India.

CL: SCD checklist in SCD (Rural) manual of instructions part II-Non medical list.

Appendix-3-1: SCD (Rural) algorithms and current knowledge based on verbal autopsy.

VA: Verbal Autopsy.

DSS: Demographic Surveillance system.

G&F: Garene & Fontaine, 1989

Gray (1989) cites study by Puffer and Serano (1973) who conducted a study on child mortality in Latin America. They could identify clinical malnutrition from retrospective data even though death certificates gave other underlying causes. Their algorithm for identification of deaths due to malnutrition is as follows: (a) history of weight loss (moderate or severe), (b) did the child's arm, legs, body or face become thinner?, (c) did the child's legs, body or face become swollen (oedema)?, (d) could the ribs be seen more prominently through the skin?, (e) did the child's hair fall out, pull out easily, or change colour?, (f) did the child have difficulty moving around the house or in locating food or toys after dark, compared to other children of the same age?