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Supplementary appendix

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APPENDIX: Initial findings from a novel population-based child mortality surveillance approach (CHAMPS): a descriptive study

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Supplementary Table S1 CHAMPS Cause of Death Categories

Anemias

D64 Other anaemias

D64.9 Anaemia, unspecified

Birth trauma

P15.8 Other specified birth injuries

P15.9 Birth injury, unspecified

Cancer

C22.2 Malignant neoplasm: Hepatoblastoma

C49.9 Malignant neoplasm: Connective and soft tissue, unspecified

C74.9 Malignant neoplasm: Adrenal gland, unspecified

Cesarean delivery

P03.4 Fetus and newborn affected by caesarean delivery

Chorioamnionitis and membrane complications

P02.7 Fetus and newborn affected by chorioamnionitis

Congenital birth defects

G71.2 Congenital myopathies

G80.9 Cerebral palsy, unspecified

Q00.0 Anencephaly

Q02 Microcephaly

Q03 Congenital hydrocephalus

Q03.1 Atresia of foramina of Magendie and Luschka

Q03.9 Congenital hydrocephalus, unspecified

Q04.2 Holoprosencephaly

Q04.6 Congenital cerebral cysts

Q05 Spina bifida

Q05.9 Spina bifida, unspecified

Q11.1 Other anophthalmos

Q21.0 Ventricular septal defect

Q21.1 Atrial septal defect

Q21.3 Tetralogy of Fallot
Q23.4 Hypoplastic left heart syndrome
Q24.8 Other specified congenital malformations of heart
Q24.9 Congenital malformation of heart, unspecified
Q25.1 Coarctation of aorta
Q31.0 Web of larynx
Q31.1 Congenital subglottic stenosis
Q35 Cleft palate
Q35.9 Cleft palate, unspecified
Q37.8 Unspecified cleft palate with bilateral cleft lip
Q39.1 Atresia of oesophagus with tracheo-oesophageal fistula
Q41.1 Congenital absence, atresia and stenosis of jejunum
Q42.0 Congenital absence, atresia and stenosis of rectum with fistula
Q43.3 Congenital malformations of intestinal fixation
Q44.2 Atresia of bile ducts
Q44.7 Other congenital malformations of liver
Q61.3 Polycystic kidney, unspecified
Q62.0 Congenital hydronephrosis
Q64.2 Congenital posterior urethral valves
Q64.9 Congenital malformation of urinary system, unspecified
Q75.3 Macrocephaly
Q77.1 Thanatophoric short stature
Q78.9 Osteochondrodysplasia, unspecified
Q79.0 Congenital diaphragmatic hernia
Q79.2 Exomphalos
Q79.3 Gastroschisis
Q81.9 Epidermolysis bullosa, unspecified
Q87 Other specified congenital malformation syndromes affecting multiple systems
Q87.2 Congenital malformation syndromes predominantly involving limbs
Q87.8 Other specified congenital malformation syndromes, not elsewhere classified
Q89 Other congenital malformations, not elsewhere classified
Q89.7 Multiple congenital malformations, not elsewhere classified
Q89.9 Congenital malformation, unspecified

Q90.9 Down syndrome, unspecified
Q91.3 Edwards syndrome, unspecified
Q91.7 Patau syndrome, unspecified
Q93.2 Chromosome replaced with ring or dicentric
Q98.0 Klinefelter syndrome karyotype 47, XXY
Q99.9 Chromosomal abnormality, unspecified

Congenital infection

P23.2 Congenital pneumonia due to staphylococcus
P23.3 Congenital pneumonia due to streptococcus, group B
P23.4 Congenital pneumonia due to Escherichia coli
P23.6 Congenital pneumonia due to other bacterial agents
P23.8 Congenital pneumonia due to other organisms
P23.9 Congenital pneumonia, unspecified
P35.1 Congenital cytomegalovirus infection
P37.2 Neonatal (disseminated) listeriosis
P37.5 Neonatal candidiasis
P38 Omphalitis of newborn with or without mild haemorrhage
P39.9 Infection specific to the perinatal period, unspecified

Diarrheal Diseases

A03 Shigellosis
A04.4 Other intestinal Escherichia coli infections
A04.5 Campylobacter enteritis
A04.8 Other specified bacterial intestinal infections
A07.1 Giardiasis [lambliasis]
A08.0 Rotaviral enteritis
A08.1 Acute gastroenteropathy due to Norwalk agent
A08.2 Adenoviral enteritis
A08.3 Other viral enteritis
A08.5 Other specified intestinal infections
A09 Other gastroenteritis and colitis of infectious and unspecified origin
A09.0 Other and unspecified gastroenteritis and colitis of infectious origin
A09.9 Gastroenteritis and colitis of unspecified origin
K52.9 Noninfective gastroenteritis and colitis, unspecified

R11 Nausea and vomiting

Epilepsy

G41.9 Status epilepticus, unspecified

Heart Diseases

I33.0 Acute and subacute infective endocarditis

I42.0 Dilated cardiomyopathy

I42.9 Cardiomyopathy, unspecified

I50 Heart failure

I51.9 Heart disease, unspecified

HIV

B20 Human immunodeficiency virus [HIV] disease resulting in infectious and parasitic diseases

B20.1 HIV disease resulting in other bacterial infections

B20.3 HIV disease resulting in other viral infections

B20.7 HIV disease resulting in multiple infections

B20.8 HIV disease resulting in other infectious and parasitic diseases

B22 Human immunodeficiency virus [HIV] disease resulting in other specified diseases

B22.2 HIV disease resulting in wasting syndrome

B22.7 HIV disease resulting in multiple diseases classified elsewhere

B23 Human immunodeficiency virus [HIV] disease resulting in other conditions

B23.8 HIV disease resulting in other specified conditions

Injury

S06.5 Traumatic subdural haemorrhage

S07 Crushing injury of head

T20 Burn and corrosion of head and neck

T31.0 Burns involving less than 10% of body surface

T31.1 Burns involving 10-19% of body surface

T31.2 Burns involving 20-29% of body surface

T31.3 Burns involving 30-39% of body surface

T31.5 Burns involving 50-59% of body surface

T71 Asphyxiation

T74.1 Physical abuse

V03.9 Unspecified whether traffic or nontraffic accident

Kidney Disease

N17.9 Acute renal failure, unspecified

Liver disease

B18.2 Chronic viral hepatitis C

E88.8 Other specified metabolic disorders

K72.0 Acute and subacute hepatic failure

K72.1 Chronic hepatic failure

K72.9 Hepatic failure, unspecified

K74.5 Biliary cirrhosis, unspecified

K75.9 Inflammatory liver disease, unspecified

K76.5 Hepatic veno-occlusive disease

K83.1 Obstruction of bile duct

Lower respiratory infections

A37 Whooping cough

B20.6 HIV disease resulting in Pneumocystis jirovecii pneumonia

B22.1 HIV disease resulting in lymphoid interstitial pneumonitis

B25.0 Cytomegaloviral pneumonitis

J10.0 Influenza with pneumonia, seasonal influenza virus identified

J12.0 Adenoviral pneumonia

J12.1 Respiratory syncytial virus pneumonia

J12.2 Parainfluenza virus pneumonia

J12.8 Other viral pneumonia

J13 Pneumonia due to Streptococcus pneumoniae

J14 Pneumonia due to Haemophilus influenzae

J15.0 Pneumonia due to Klebsiella pneumoniae

J15.1 Pneumonia due to Pseudomonas

J15.2 Pneumonia due to staphylococcus

J15.4 Pneumonia due to other streptococci

J15.5 Pneumonia due to Escherichia coli

J15.6 Pneumonia due to other Gram-negative bacteria

J15.8 Other bacterial pneumonia

J15.9 Bacterial pneumonia, unspecified

J16.8 Pneumonia due to other specified infectious organisms

J17.1 Pneumonia in viral diseases classified elsewhere

J17.3 Pneumonia in parasitic diseases
J18 Pneumonia, organism unspecified
J18.0 Bronchopneumonia, unspecified
J18.9 Pneumonia, unspecified
J21.9 Acute bronchiolitis, unspecified
J69.0 Pneumonitis due to food and vomit
J85.1 Abscess of lung with pneumonia
J86.9 Pyothorax without fistula
W78 Inhalation of gastric contents

Malaria

B50 Plasmodium falciparum malaria
B50.0 Plasmodium falciparum malaria with cerebral complications
B50.8 Other severe and complicated Plasmodium falciparum malaria

Malnutrition

E40 Kwashiorkor
E41 Nutritional marasmus
E42 Marasmic kwashiorkor
E43 Unspecified severe protein-energy malnutrition
E44.0 Moderate protein-energy malnutrition
E46 Unspecified protein-energy malnutrition

Malpresentation before labor

P01.7 Fetus and newborn affected by malpresentation before labour

Maternal HIV

B24 Unspecified human immunodeficiency virus [HIV] disease
Z20.6 Contact with and exposure to human immunodeficiency virus [HIV]

Maternal hypertension

O14.2 HELLP syndrome

Maternal infection

P00.2 Fetus and newborn affected by maternal infectious and parasitic diseases

Measles

B05.2 Measles complicated by pneumonia
B05.8 Measles with other complications

Meningitis/Encephalitis

A85.1 Adenoviral encephalitis
A87.8 Other viral meningitis
B37.5 Candidal meningitis
G00.1 Pneumococcal meningitis
G00.2 Streptococcal meningitis
G00.3 Staphylococcal meningitis
G00.8 Other bacterial meningitis
G01 Meningitis in bacterial diseases classified elsewhere
G03.9 Meningitis, unspecified
G04.8 Other encephalitis, myelitis and encephalomyelitis

Motor neuron disease

G12.9 Spinal muscular atrophy, unspecified

Neonatal aspiration syndromes

P24.0 Neonatal aspiration of meconium
P24.9 Neonatal aspiration syndrome, unspecified

Neonatal encephalopathy

P91 Other disturbances of cerebral status of newborn
P91.0 Neonatal cerebral ischaemia
P91.2 Neonatal cerebral leukomalacia
P91.8 Other specified disturbances of cerebral status of newborn

Neonatal preterm birth complications

P07.0 Extremely low birth weight
P07.1 Other low birth weight
P07.18 Neonatal preterm birth complications
P07.3 Other preterm infants
P22.0 Respiratory distress syndrome of newborn
P22.9 Respiratory distress of newborn, unspecified
P25.1 Pneumothorax originating in the perinatal period
P25.2 Pneumomediastinum originating in the perinatal period
P26 Pulmonary haemorrhage originating in the perinatal period
P26.8 Other pulmonary haemorrhages originating in the perinatal period
P26.9 Unspecified pulmonary haemorrhage originating in the perinatal period
P27.1 Bronchopulmonary dysplasia originating in the perinatal period

P28.0 Primary atelectasis of newborn

P77 Necrotizing enterocolitis of fetus and newborn

Neonatal sepsis

P36.0 Sepsis of newborn due to streptococcus, group B

P36.1 Sepsis of newborn due to other and unspecified streptococci

P36.2 Sepsis of newborn due to Staphylococcus aureus

P36.3 Sepsis of newborn due to other and unspecified staphylococci

P36.4 Sepsis of newborn due to Escherichia coli

P36.5 Sepsis of newborn due to anaerobes

P36.8 Other bacterial sepsis of newborn

P36.9 Bacterial sepsis of newborn, unspecified

Obstructed labor and fetal malpresentation

P03.1 Fetus and newborn affected by other malpresentation, malposition and disproportion during labour and delivery

Other

F89 Unspecified disorder of psychological development

K92.0 Haematemesis

K92.9 Disease of digestive system, unspecified

R19.8 Other specified symptoms and signs involving the digestive system and abdomen

R62.8 Other lack of expected normal physiological development

T80.2 Infections following infusion, transfusion and therapeutic injection

T81 Complications of procedures, not elsewhere classified

T81.4 Infection following a procedure, not elsewhere classified

T85.7 Infection and inflammatory reaction due to other internal prosthetic devices, implants and grafts

T88.3 Malignant hyperthermia due to anaesthesia

T88.9 Complication of surgical and medical care, unspecified

Y63.8 Failure in dosage during other surgical and medical care

Y84.0 Cardiac catheterization

Other disorders of fluid, electrolyte and acid-base balance

E87.0 Hyperosmolality and hypernatraemia

R57.1 Hypovolaemic shock

Other endocrine, metabolic, blood, and immune disorders

D65 Disseminated intravascular coagulation [defibrination syndrome]

D66 Hereditary factor VIII deficiency

D69.9 Haemorrhagic condition, unspecified

E16.2 Hypoglycaemia, unspecified

E22.2 Syndrome of inappropriate secretion of antidiuretic hormone

Other gastrointestinal disease

K55.0 Acute vascular disorders of intestine

Other immunodeficiencies

D82.1 Di George syndrome

D84.9 Immunodeficiency, unspecified

Other infections

A39.2 Acute meningococcaemia

B00.7 Disseminated herpesviral disease

B25.8 Other cytomegaloviral diseases

B25.9 Cytomegaloviral disease, unspecified

B33.8 Other specified viral diseases

B34.0 Adenovirus infection, unspecified site

B37.1 Pulmonary candidiasis

B37.8 Candidiasis of other sites

B44.7 Disseminated aspergillosis

B59 Pneumocystosis

G06.0 Intracranial abscess and granuloma

H66.3 Other chronic suppurative otitis media

H66.4 Suppurative otitis media, unspecified

I51.4 Myocarditis, unspecified

K65.0 Acute peritonitis

L03 Cellulitis

M00 Pyogenic arthritis

M86.9 Osteomyelitis, unspecified

Other injury

T07 Unspecified multiple injuries

T17.9 Foreign body in respiratory tract, part unspecified

Other labor and delivery complications

O69.9 Labour and delivery complicated by cord complication, unspecified

Other neonatal disorders

P05.0 Light for gestational age
P05.9 Slow fetal growth, unspecified
P08.0 Exceptionally large baby
P08.1 Other heavy for gestational age infants
P29.0 Neonatal cardiac failure
P29.2 Neonatal hypertension
P29.3 Persistent fetal circulation
P51.0 Massive umbilical haemorrhage of newborn
P52.0 Intraventricular (nontraumatic) haemorrhage, grade 1, of fetus and newborn
P52.1 Intraventricular (nontraumatic) haemorrhage, grade 2, of fetus and newborn
P52.2 Intraventricular (nontraumatic) haemorrhage, grade 3, and grade 4 of fetus and newborn
P52.3 Unspecified intraventricular (nontraumatic) haemorrhage of fetus and newborn
P52.4 Intracerebral (nontraumatic) haemorrhage of fetus and newborn
P52.8 Other intracranial (nontraumatic) haemorrhages of fetus and newborn
P52.9 Intracranial (nontraumatic) haemorrhage of fetus and newborn, unspecified
P55.1 ABO isoimmunization of fetus and newborn
P55.9 Haemolytic disease of fetus and newborn, unspecified
P57.0 Kernicterus due to isoimmunization
P57.9 Kernicterus, unspecified
P59.9 Neonatal jaundice, unspecified
P60 Disseminated intravascular coagulation of fetus and newborn
P61.0 Transient neonatal thrombocytopenia
P70.4 Other neonatal hypoglycaemia
P78.0 Perinatal intestinal perforation
P80.9 Hypothermia of newborn, unspecified
P83.2 Hydrops fetalis not due to haemolytic disease
P90 Convulsions of newborn

Other neurological disorders

G40.9 Epilepsy, unspecified
G91.0 Communicating hydrocephalus
G91.8 Other hydrocephalus
G91.9 Hydrocephalus, unspecified
G93.5 Compression of brain

G96.9 Disorder of central nervous system, unspecified

R56.8 Other and unspecified convulsions

S06.2 Diffuse brain injury

Other respiratory disease

I27.2 Other secondary pulmonary hypertension

J35.3 Hypertrophy of tonsils with hypertrophy of adenoids

J44.8 Other specified chronic obstructive pulmonary disease

J46 Status asthmaticus

J47 Bronchiectasis

J69.8 Pneumonitis due to other solids and liquids

J84.9 Interstitial pulmonary disease, unspecified

J93 Pneumothorax

J93.9 Pneumothorax, unspecified

J98.4 Other disorders of lung

R04.8 Haemorrhage from other sites in respiratory passages

R06.8 Other and unspecified abnormalities of breathing

Z87.0 Personal history of diseases of the respiratory system

Other skin and subcutaneous diseases

L02.0 Cutaneous abscess, furuncle and carbuncle of face

L26 Exfoliative dermatitis

L51.2 Toxic epidermal necrolysis [Lyell]

L98.4 Chronic ulcer of skin, not elsewhere classified

Paralytic ileus and intestinal obstruction

K56.1 Intussusception

K56.2 Volvulus

K56.6 Other and unspecified intestinal obstruction

K56.7 Ileus, unspecified

Perinatal asphyxia/hypoxia

P20 Intrauterine hypoxia

P20.0 Intrauterine hypoxia first noted before onset of labour

P20.1 Intrauterine hypoxia first noted during labour and delivery

P20.9 Intrauterine hypoxia, unspecified

P21.0 Severe birth asphyxia

P21.1 Mild and moderate birth asphyxia

P21.9 Birth asphyxia, unspecified

Placental complications

P02.2 Fetus and newborn affected by other and unspecified morphological and functional abnormalities of placenta

P02.3 Fetus and newborn affected by placental transfusion syndromes

Poisoning

T41.2 Poisoning: Other and unspecified general anaesthetics

T45.1 Poisoning: Antineoplastic and immunosuppressive drugs

T47.4 Poisoning: Other laxatives

T55 Toxic effect of soaps and detergents

T60.0 Toxic effect: Organophosphate and carbamate insecticides

Premature Rupture of membranes

P01.1 Fetus and newborn affected by premature rupture of membranes

Road injuries

V09.3 Pedestrian injured in unspecified traffic accident

Sepsis

A02.1 Salmonella sepsis

A40 Streptococcal sepsis

A40.0 Sepsis due to streptococcus, group A

A40.3 Sepsis due to Streptococcus pneumoniae

A41.0 Sepsis due to Staphylococcus aureus

A41.3 Sepsis due to Haemophilus influenzae

A41.4 Sepsis due to anaerobes

A41.5 Sepsis due to other Gram-negative organisms

A41.8 Other specified sepsis

A41.9 Sepsis, unspecified

A48.3 Toxic shock syndrome

B37.7 Candidal sepsis

G93.4 Encephalopathy, unspecified

Sickle cell disorders

D57.0 Sickle-cell anaemia with crisis

D57.1 Sickle-cell anaemia without crisis

Spontaneous abortion

O03 Spontaneous abortion

Sudden infant death syndrome

R95 Sudden infant death syndrome

Syphilis

A50 Congenital syphilis

A50.9 Congenital syphilis, unspecified

Tuberculosis

A17.0 Tuberculous meningitis

A18.8 Tuberculosis of other specified organs

A19.1 Acute miliary tuberculosis of multiple sites

A19.9 Miliary tuberculosis, unspecified

Umbilical cord complications

P02.4 Fetus and newborn affected by prolapsed cord

P02.5 Fetus and newborn affected by other compression of umbilical cord

Undetermined

P95 Fetal death of unspecified cause

R96 Other sudden death, cause unknown

R99 Other ill-defined and unspecified causes of mortality

Upper respiratory infections

J05.0 Acute obstructive laryngitis [croup]

J06.9 Acute upper respiratory infection, unspecified

Supplemental Table S2 Selected characteristics of CHAMPS-eligible, MITS-consented and non-MITS consented populations, by case type, CHAMPS Network (sites in Manhica, Mozambique; Soweto, South Africa; Kisumu, Kenya; Bamako, Mali; and Baliakandi, Bangladesh), December 2016–December 2018

	MITS case (N=933)	Non-MITS case (N=1179)	Not enrolled (N=273)	Total (N=2385)
CHAMPS Site				
South Africa	464 (50%)	106 (9%)	188 (69%)	758 (32%)
Mozambique	146 (16%)	285 (24%)	4 (1%)	435 (18%)
Kenya	182 (20%)	126 (11%)	14 (5%)	322 (14%)
Mali	95 (10%)	347 (29%)	1 (0%)	443 (19%)
Bangladesh	46 (5%)	315 (27%)	66 (24%)	427 (18%)
Age group				
Stillbirth	180 (19%)	411 (35%)	65 (24%)	656 (28%)
Death in the first 24 hours	162 (17%)	150 (13%)	42 (15%)	354 (15%)
Early Neonate (1 to 6 days)	185 (20%)	148 (13%)	76 (28%)	409 (17%)
Late Neonate (7 to 27 days)	102 (11%)	87 (7%)	28 (10%)	217 (9%)
Infant (28 days to less than 12 months)	174 (19%)	204 (17%)	39 (14%)	417 (17%)
Child (12 months to less than 60 Months)	130 (14%)	179 (15%)	23 (8%)	332 (14%)
Missing	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Religion of primary caretaker				
N-Miss	0	11	0	11
Muslim	135 (14%)	623 (53%)	65 (24%)	823 (35%)
Christian	557 (60%)	394 (34%)	133 (49%)	1084 (46%)
African traditional religion	45 (5%)	52 (4%)	0 (0%)	97 (4%)
Other or no religion	196 (21%)	99 (8%)	75 (27%)	370 (16%)
Sex of deceased				
Female	407 (44%)	507 (43%)	109 (40%)	1023 (43%)
Indeterminate	2 (0%)	0 (0%)	0 (0%)	2 (0%)
Male	524 (56%)	660 (56%)	164 (60%)	1348 (57%)
Unknown	0 (0%)	12 (1%)	0 (0%)	12 (1%)
Hours from death to notification				
<=24 hr	813 (87%)	565 (48%)	227 (83%)	1605 (67%)
>24 hr	120 (13%)	614 (52%)	46 (17%)	780 (33%)
Missing	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Hours from death to MITS procedure				
<=24 hours	616 (66%)	0 (0%)	0 (0%)	616 (26%)
>24 hours	316 (34%)	0 (0%)	0 (0%)	316 (13%)
Missing or Not Applicable	1 (0%)	1179 (100%)	273 (100%)	1453 (61%)
Location and timing of death				
Facility, <=24 hours after admission	268 (29%)	106 (9%)	0 (0%)	374 (16%)
Facility, >24 hours after admission	572 (61%)	646 (55%)	251 (92%)	1469 (62%)
Community	93 (10%)	427 (36%)	22 (8%)	542 (23%)

Supplemental Table S3. Number of listed causes of death, by selected case characteristics, CHAMPS Network (sites in Manhiça, Mozambique; Soweto, South Africa; Kisumu, Kenya; Bamako, Mali; and Baliakandi, Bangladesh), December 2016–December 2018

	0 (N=21)	1 (N=327)	2 (N=219)	3 (N=174)	4 (N=111)	5 (N=57)	6 (N=14)	7 (N=10)	Total (N=933)
Age group									
1–59 months	6 (2%)	68 (22%)	82 (27%)	69 (23%)	44 (14%)	23 (8%)	7 (2%)	5 (2%)	304 (100%)
Neonate	7 (2%)	112 (25%)	116 (26%)	102 (23%)	66 (15%)	34 (8%)	7 (2%)	5 (1%)	449 (100%)
Stillbirth	8 (4%)	147 (82%)	21 (12%)	3 (2%)	1 (1%)	0 (0%)	0 (0%)	0 (0%)	180 (100%)
CHAMPS Site									
Bangladesh	1 (2%)	19 (41%)	12 (26%)	10 (22%)	4 (9%)	0 (0%)	0 (0%)	0 (0%)	46 (100%)
Kenya	7 (4%)	96 (53%)	41 (23%)	23 (13%)	13 (7%)	2 (1%)	0 (0%)	0 (0%)	182 (100%)
Mali	6 (6%)	46 (48%)	18 (19%)	15 (16%)	6 (6%)	2 (2%)	0 (0%)	2 (2%)	95 (100%)
Mozambique	5 (3%)	89 (61%)	32 (22%)	12 (8%)	8 (5%)	0 (0%)	0 (0%)	0 (0%)	146 (100%)
South Africa	2 (0%)	77 (17%)	116 (25%)	114 (25%)	80 (17%)	53 (11%)	14 (3%)	8 (2%)	464 (100%)
Location and timing of death									
Community	5 (5%)	43 (46%)	26 (28%)	15 (16%)	3 (3%)	0 (0%)	0 (0%)	1 (1%)	93 (100%)
Facility, ≤24 hours after admission	8 (3%)	104 (39%)	85 (32%)	41 (15%)	23 (9%)	6 (2%)	1 (0%)	0 (0%)	268 (100%)
Facility, >24 hours after admission	8 (1%)	180 (31%)	108 (19%)	118 (21%)	85 (15%)	51 (9%)	13 (2%)	9 (2%)	572 (100%)

Supplementary Table S4: ICD-PM maternal condition group Main maternal conditions included in group*

M1: Complications of placenta, cord and membranes

1. placenta praevia
2. other forms of placental separation and haemorrhage
3. placental dysfunction, infarction, insufficiency
4. fetal-placental transfusion syndromes
5. prolapsed cord, other compression of umbilical cord
6. chorioamnionitis
7. other complications of membranes

M2: Maternal complications of pregnancy

1. incompetent cervix
2. preterm rupture of membranes
3. oligohydramnios/polyhydramnios
4. ectopic pregnancy
5. multiple pregnancy
6. maternal death
7. malpresentation before labour
8. other complications of pregnancy

M3: Other complications of labour and delivery

1. breech delivery and extraction
2. other malpresentation, malposition and disproportion during labour and delivery
3. forceps delivery/vacuum extraction
4. caesarean delivery
5. precipitate delivery
6. preterm labour and delivery
7. other complications of labour and delivery, including termination of pregnancy

M4: Maternal medical and surgical conditions

1. pre-eclampsia, eclampsia
2. gestational hypertension
3. other hypertensive disorders
4. renal and urinary tract diseases
5. infectious and parasitic disease
6. circulatory and respiratory disease
7. nutritional disorders
8. injury
9. surgical procedure
10. other medical procedures
11. maternal diabetes, including gestational diabetes
12. maternal anaesthesia and analgesia
13. maternal medication
14. tobacco/alcohol/drugs of addiction
15. nutritional chemical substances
16. environmental chemical substances
17. unspecified maternal condition

M5: No maternal condition

1. no maternal condition identified (healthy mother)

Supplementary Figure S1: Illustrative cases

Case 1: Stillbirth

A 35-week estimated gestational age (EGA) stillborn female with a birth weight of 2.4 kg from a twin pregnancy. The mother was a 20-year-old woman who had been diagnosed with HIV prior to pregnancy and had attended 4 antenatal care visits but did not have a recorded syphilis test. Post-mortem HIV, malaria and TB testing on the deceased were negative. TAC of blood and CSF was strongly positive for *Treponema pallidum*. Immunohistochemistry demonstrated the spirochetes in liver, CNS and placenta. Study staff on site reported back the results to the mother of the stillbirth and was able to confirm the positive syphilis test and treat her and the remaining family according to national guidelines.

Case 2: Neonate

A female neonate with a low birth weight of 1.1 kg was admitted to the newborn nursery immediately after vaginal delivery for prematurity and respiratory distress syndrome. On admission, physical examination was normal with no congenital abnormalities detected. Treatment included oxygen via nasal catheter, dextrose, Vitamin K, crystalline penicillin and gentamicin. The day prior to death the neonate developed jaundice and fever. On postnatal day eight, the fever continued with diffuse coarse crepitations bilaterally, and the patient expired. Blood and CSF collected postmortem were positive by culture and TAC for *Klebsiella pneumoniae*. Lung, liver and CNS tissue were also positive for *K. pneumoniae* by immunohistochemistry. The DeCoDe panel assigned *Klebsiella* sepsis as the immediate cause of death and low birth weight as the underlying cause (prematurity was routinely coded as low birth weight). A verbal autopsy was not available on this neonate.

Case 3: 1–59 months old

A 17-month-old presented to a local hospital with a 4-day history of vomiting and subjective fever. On admission the child was noted to be anemic and in respiratory distress and shock. Despite aggressive fluid and oxygen treatment, the child desaturated and could not be resuscitated. *Streptococcus pneumoniae* was positive by culture and TAC in blood and CSF and in CNS tissue by immunohistochemistry. Lung TAC was also positive for *S pneumoniae*, *Klebsiella pneumoniae* and *Haemophilus influenzae* (non-B); immunohistochemistry was only positive for *S. pneumoniae*. Sickled erythrocytes were noted histologically in the liver, previous diagnosis of sickle cell disease was not known. The immediate cause of death determined for this case was pneumococcal sepsis with sickle cell disease as the underlying cause.

Figure S2.

Stillbirth due to syphilis. Panel shows abundant spirochetes within the liver tissue highlighted by T. pallidum immunohistochemistry (immunohistochemical assay with Treponema pallidum polyclonal antibody)

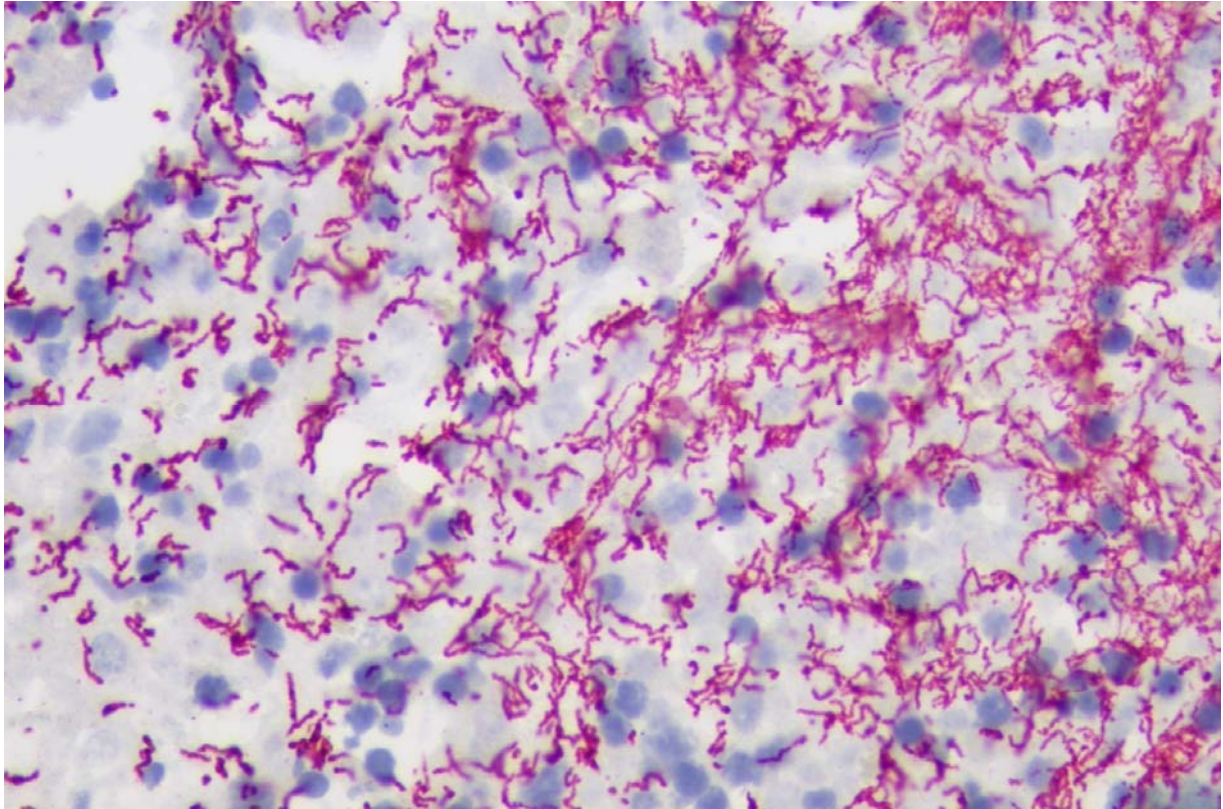


Figure S3- Neutrophilic meningitis caused by *Klebsiella pneumoniae*: Panel shows high magnification of abundant bacterial antigens in the meninges by immunohistochemistry (immunohistochemical assay with *Klebsiella pneumoniae* polyclonal antibody).

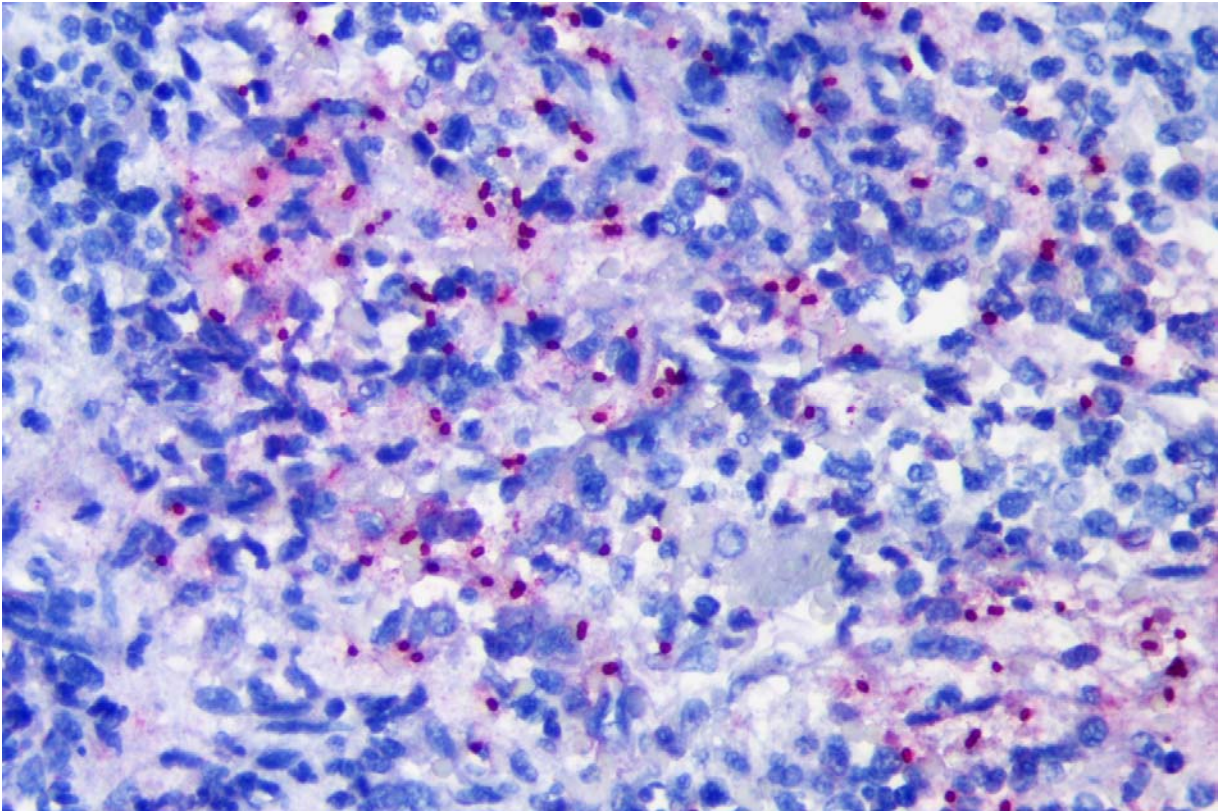


Figure S4 (annotated)- Pneumococcal sepsis with sickle cell disease: Panel shows microscopic examination of the liver shows sickle cell aggregates in sinusoidal spaces; hematoxylin-eosin stain.

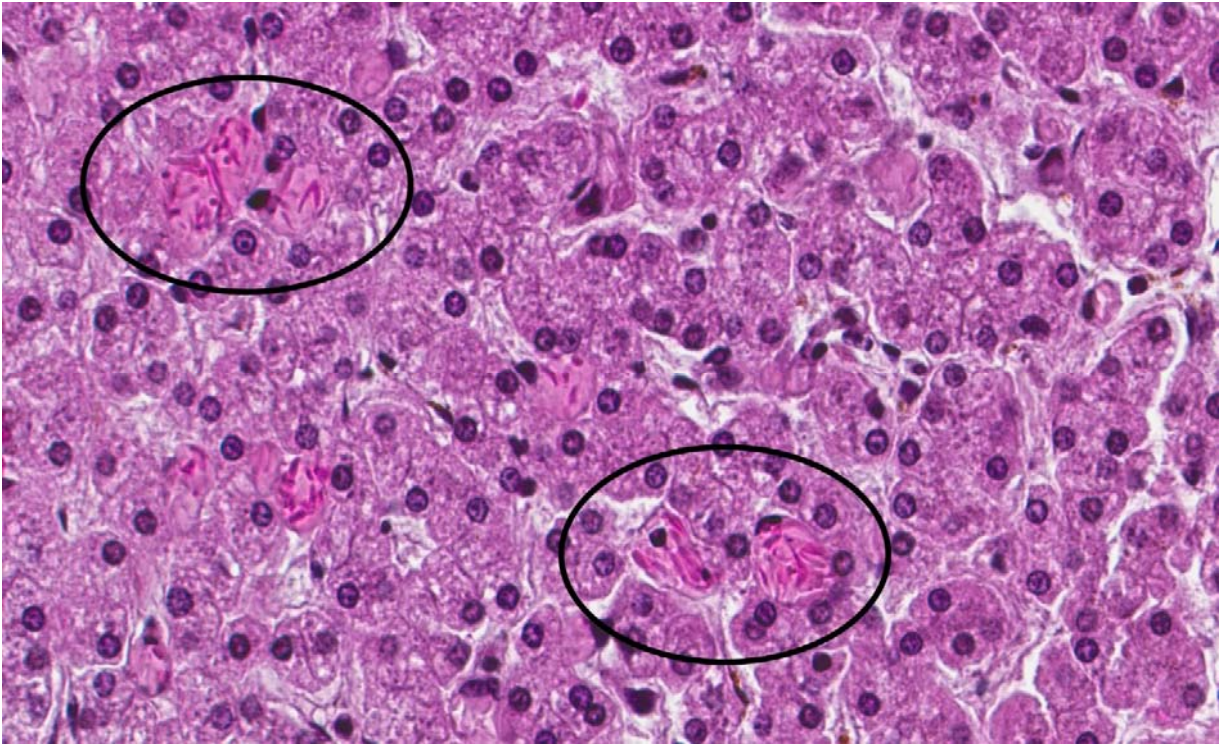


Figure S4. Case 3 (not annotated)

