NU-07 Care of the body after death and the public health of burial

HEALING after the FALL, research library, NU-07

Researched 10 October 2026 by Claude Opus agent for THRIVING after the FALL, Book Four. Library document, unverified.

This report covers the body itself: what it can transmit, how to handle, wash and keep it, and how to bury or burn it. Rites and grief are in MI-03, outbreak control and burial-team politics in IN-13 and HY-07, latrines in HY-04, water in HY-02, the dying in NU-06 and animal anthrax in IN-16 (THRIVING library, MI-03, IN-13, HY-07, HY-04, HY-02, NU-06, IN-16). Identification and the burial register belong to OR-05, and animal carcasses to OR-10, neither yet written. Where this report touches them it says so and stops.

Two disagreements are stated up front. IN-13 (Protocol 7) and HY-07 (Protocol 6) tell the burial team to put lime or ash over the body. The field manual, WHO and a controlled experiment say lime does nothing useful and slows decay, so this report recommends none. Both also give 50 metres from any water source, which is generous for a stream and short of every published standard for a drinking well (100 to 250 metres). Section 7 gives the detail.

Findings by section

1. The myth and the record

The tradition. Officials and villagers alike hold that unburied dead cause epidemics. The belief drives the quick mass grave, the forced cremation and the refusal of rites. It looks plausible: the dead smell, draw flies, and lie where an epidemic has been.

The record. PAHO's 2004 manual, written after Hurricane Mitch and the 2001 Gujarat earthquake, opens on the principle that the body of a disaster victim poses no risk of infection, and that bodies must never go into common graves or be cremated in mass against the culture of the bereaved (PAHO 2004). Its chapter by Karl Western gives the phrase to carry: a dead body is the result of an epidemic, not its cause. Oliver Morgan's review that year found no evidence that disaster dead caused epidemics. The risk fell on handlers, from hepatitis B and C, HIV, enteric bacteria and tuberculosis, and unfounded fear drove rapid disposal and chlorinated lime (Morgan 2004, abstract and secondary summary only). Claude de Ville de Goyet of PAHO had already called it a myth (de Ville de Goyet 2000, 2004, both cited via the manuals, not read).

The brief calls the field manual the "Morgan 2016 edition". Morgan led the 2006 first edition. The 2016 second edition was edited by Stephen Cordner, Roland Coninx, Hyo-Jeong Kim, Dana van Alphen and Morris Tidball-Binz for the ICRC, PAHO, WHO and IFRC (ICRC 2016). It gives the reason: disaster victims die of trauma, drowning or fire, not infection, and most organisms in a body do not survive beyond about 48 hours, HIV and Ebola excepted. Survivors spread disease more than the dead do. The risk of bodies fouling water with faeces "has never been measured or documented" (ICRC 2016). WHO adds that rapid mass burial on public health grounds is not justified (WHO FAQ).

What science infers. The myth confuses sequence with cause. When about 12,000 Rwandan refugees died of cholera in Goma, Zaire in July 1994, the bodies were a cofactor at most, through handlers' hands and some water

contamination. After Mitch, diarrhoea rose from 2,849 to 6,798 per 100,000 because sanitation flooded, not because of the dead (PAHO 2004). The mass graves dug in Aceh in 2004 left over 14,000 unidentified at Ulee Lheue alone (THRIVING library, MI-03).

The honest limit. Disaster dead are safe. The dead of certain epidemics are not, and the next four sections are about them. Over-correction is the second error the brief warns of.

2. Which pathogens a corpse transmits, and how

Every route is by touch, fluid, vermin leaving the body or air pushed from the lungs. None travels on the smell.

Pathogen	Route from the body	How long it lasts after death	Who is at risk	Source
Ebola, Marburg, Lassa	Blood, vomit, faeces, skin, by touch	Infectious virus on body surface up to 7 days, in tissues up to 3 days, RNA to 10 weeks (macaques)	Washers, kissers, mourners who touch attendees	Prescott 2015 (secondary), ICRC 2016
Cholera, typhoid, shigella	Faecal leakage onto hands, then food and water	Days, while faeces are wet	Washers, cooks at the funeral meal	Gunnlaugsson 1998, Hoffman and Healing 2018
Plague (pneumonic)	Respiratory droplets during intensive handling	Hours to days	Washers, autopsy	Jullien 2021
Plague (bubonic), typhus	Fleas and lice leave the cooling body for the living. Blood into cuts	Fleas and lice move within hours	Anyone who handles bedding and clothes	Hoffman and Healing 2018, Jullien 2021
Tuberculosis	Air expelled from lungs when the body is moved or the chest pressed. Aerosol in embalming	Organisms survive in organs	Embalmers, dissectors, those who lift the body	Sterling 2000, PAHO 2004, WHO FAQ
Hepatitis B and C, HIV	Blood into cuts or eyes, sharps	HIV recovered up to 16 days at 2°C	Anyone with broken skin on the hands	PAHO 2004, Bankowski 1992 (secondary)
Smallpox	Fresh body, scabs, bedding	Scabs viable for months to years	Washers, those who handle bedding	McCollum 2014, ISID 2018
Meningococcus, group A streptococcus	Droplets, fluids	Short	Close handlers	Hoffman and Healing 2018
Prions (CJD, kuru)	Ingestion or inoculation of tissue	Indefinite	Mortuary practice that opens the body	Hoffman and Healing 2018, Collinge 2008
Anthrax	Spores when the body or carcass is opened	Spores persist for decades	Butchers, skinners, those who open	IN-16, Hoffman and Healing 2018

Peter Hoffman and Tim Healing, in the International Society for Infectious Diseases guide, list the conditions where the body must be bagged and not viewed, embalmed or given hygienic preparation: anthrax, plague, rabies, smallpox, viral haemorrhagic fevers, yellow fever, the prion diseases, invasive group A streptococcus and the blood-borne hepatitides. Skeletons and old burials are not dangerous: none of the great killers survives long in a grave (Hoffman and Healing 2018).

Bloodborne viruses. Hepatitis B is extremely infectious, HIV less so (Hoffman and Healing 2018). HIV was recovered from 21 of 41 bodies sampled up to 21 hours after death (Bankowski 1992, secondary summary), and PAHO cites 16 days' survival at 2°C (PAHO 2004, citing Demiryurek 2002). The defence is gloves, no sharp instruments, and no washing with cut hands.

Tuberculosis. The first proven corpse-to-embalmer transmission was reported from Baltimore in 2000. The deceased had AIDS and active tuberculosis, DNA fingerprinting matched the strains, and the authors blamed aerosols from fluid injection, frothing at the mouth and nose, and drainage (Sterling 2000, secondary summary). Mortuary workers have high tuberculin conversion (Hoffman and Healing 2018). Lifting a body or pressing its chest pushes air from the lungs, so PAHO advises a cloth over the mouth and a ventilated room (PAHO 2004, citing Healing 1995).

Prions. Kuru spread among the Fore people of the Papua New Guinea highlands through mortuary feasting, in which kin ate the dead as an act of mourning. The practice ended in the 1950s, yet cases appeared into the 2000s, with incubation of over 50 years in some (Collinge 2008). The village lesson is narrow: a body is not opened and its tissue is not consumed. The custom is public and documented and is described only to that extent.

3. Ebola: the funeral chain and the safe and dignified burial

The tradition. Across Guinea, Sierra Leone and Liberia the dead are washed, dressed, touched and often kissed by kin, and a person of standing is mourned by many from other villages. The rite settles a debt to the dead, and withholding it can be read as a curse.

The record. In Kissidougou, Guinea, a male midwife assistant who also performed circumcisions died on 4 December 2014 and was buried that day by about 100 people who washed, touched and kissed the body. Eighty-five confirmed cases followed in six villages, 62 of them (73%) between 15 and 21 December, and 63 died (74%). Only 18 of the 85 (21%) had touched the body. The other 67 (79%) had touched only other mourners. There were 780 contacts in 12 villages, the nearest treatment centres were 52 and 83 miles away, and there were no cases after 10 January 2015 (Victory 2015). That four in five cases came from touching mourners rather than the corpse is the most important single fact here for a burial rule: the gathering is a vector as much as the body.

In Sierra Leone the funeral of a traditional healer near Kenema in May 2014 was later linked to as many as 365 deaths, and WHO wrote that 60% of cases in Guinea were linked to traditional burial practices (WHO 2015). Press reports put the women who washed the healer and fell ill at 13 or 14 [VERIFY]. In Conakry funerals caused 15% of transmissions in March 2014 and 4% from April, after safe burials began (Faye 2015, search summary). Hoffman and Healing write that as many as 65% of those involved in unsafe West African burials were infected (Hoffman and Healing 2018).

Tiffany and colleagues estimated 2.58 secondary cases per unsafe burial (range 0 to 20), with caregivers 2.6 to 5.9 times likelier to be infected than those with contact only after death, and 1,411 to 10,452 cases averted by safe burial, 4.9% to 36.5% of the epidemic (Tiffany 2017, summary only, also cited in THRIVING library, IN-13).

What the protocol changed. WHO's safe and dignified burial protocol of October 2014 has twelve steps (WHO 2014, read via ICRC 2016 Annex 6 and a PBS summary). They reduce to four ideas. A trained team arrives prepared: four carriers and one sprayer in full protective equipment with double nitrile gloves, plus a supervisor and a community communicator who wear none. The family's consent is sought and each step explained first. The body is bagged

and the house sprayed with 0.5% chlorine. The family chooses the grave if it can, watches and prays at a distance with a religious leader, and soiled items are burnt only with its agreement (ICRC 2016 Annex 6).

The CDC's observation of Sierra Leone's teams in late 2014 shows what failed: 70 teams against a need for 120, up to 10 bodies and 11 changes of protective equipment per team per day, bodies collected one to five days after death, 3 of 22 bodies swabbed, families barred from cemeteries, unmarked graves with several bodies each, and graves often shallower than the required 2 metres. The fixes were family attendance, a religious leader praying at a safe distance, single community graves, and marked graves (Nielsen 2015).

What science infers. The protocol worked when families accepted it. Liberia's cremation order (section 8) is the proof by failure. IN-13 concludes, and this report agrees, that a slightly less safe burial the family accepts is safer than a perfect one it evades (THRIVING library, IN-13). Grade B.

4. Cholera and the funeral meal

The record. Guinea-Bissau had 15,878 reported cholera cases and 306 deaths in 1994. In Biombo, outbreaks followed funerals despite a ministry order to disinfect bodies. Villages that did not disinfect had a weekly attack rate after funerals 2.6 times higher (95% CI 1.9 to 3.8). Eating at a funeral with an undisinfected body gave an odds ratio of 14.5 (0.9 to 786), and touching or washing the body 36.2 (2.6 to 1,769), intervals so wide they are signals, not estimates (Gunnlaugsson 1998, abstract only). The authors asked leaders to be told, no meal served and bodies disinfected. IN-13 adds a 2018 Zimbabwean case where the woman who prepared the body served the food beside a contaminated shallow well, and a 2009 Papua New Guinea study where funeral attendance lost significance after adjustment (THRIVING library, IN-13).

What science infers. Faeces leak freely after death (Hoffman and Healing 2018), onto the washer's hands, into the food the washer serves, and from a grave near water into the well. A village that forbids touching the body yet feeds 200 mourners from a shared pot has done the less important half. Grade B for no meal and a disinfected body.

5. Plague, typhus, smallpox and anthrax

Plague. Jullien, de Silva and Garner's 2021 systematic review found no direct proof of transmission from a human corpse, but 16 case series from 1930 to 2019 with 250 cases traced to corpses or carcasses. Three studies named human corpses, with up to 42 cases: a doctor with an axillary bubo after a 1920s autopsy, and nine pneumonic cases after a Madagascan funeral, confounded by two days' lodging with the sick. The other 208 came from animal carcasses through skinning or dissection, and 121 bubonic cases from blood entering cuts. A biologist was infected by a mountain lion about 35 hours dead (Jullien 2021). In 2017 a body prepared without precautions at Moramanga hospital, Madagascar, was followed by 31 sick contacts and 4 deaths (WHO 2017). Famadihana, the turning of the bones, raised fears that year, but old burials carry no plague risk (Hoffman and Healing 2018, Mail and Guardian 2017). Pneumonic plague passes by intensive handling, bubonic by blood into cuts, and fleas leave the cooling body.

Typhus. The body louse leaves a cooling corpse for the warm. The risk is the clothes and bedding, not the flesh (Hoffman and Healing 2018, PAHO 2004 citing WHO 2002).

Smallpox. McCollum and colleagues tabulated old survival experiments for variola in scabs: 417 days at room temperature in the dark, 196 in daylight, 782 under vacuum (Downie and Dumbell), 530 on raw cotton (MacCallum and McDonald), 13 years in envelopes (Wolff and Croon), but 21 days at 35°C and one to two hours in direct sunlight. No live variola has ever been isolated from historical remains, but mortuary workers handling fresh smallpox bodies were infected (McCollum 2014). The fresh body and its bedding are dangerous for months, the old grave is not.

Anthrax. A human anthrax death is bagged and never opened (Hoffman and Healing 2018). For animals found dead, IN-16 gives the rules this report agrees with: do not open, plug the openings, burn where it lies or bury under

at least two feet of cover 100 yards from a well, and no lime, which may shield the spores (THRIVING library, IN-16). WHO's 2008 anthrax manual could not be opened.

6. Keeping the body

The record. In a hot climate faces can become unrecognisable within 12 to 48 hours. Refrigeration at 2 to 4°C slows decay, and a refrigerated shipping container holds up to 50 bodies. Without it, the field manual prefers temporary burial in a marked trench: 1.5 metres deep, 200 metres from drinking water, bodies 0.4 metres apart in one layer, each marked and mapped. It advises against dry ice, which burns handlers, and water ice, which melts fast and whose run-off can carry diarrhoeal disease (ICRC 2016). PAHO had recommended dry ice in 2004. The later manual reversed it.

Philadelphia, autumn 1918. One morgue for 36 bodies, bodies stacked three and four deep, five temporary morgues, embalmers sent in by the Secretary of War, Newton Baker, coffins guarded against theft, volunteers digging graves, 759 deaths on one October day and 12,687 in all (Anderson and Golden 2020). In Baltimore and Washington bodies lay at home beside the sick, iced in corners for days (History.com). MI-03 adds the closure order of 3 October, the private funerals and the potter's field (THRIVING library, MI-03). The record shows horror, not an epidemic caused by the waiting dead: the influenza had already spread among the living who sat with them.

What science infers. The body of an ordinary death may be kept at home 24 to 48 hours in a cool, shaded, ventilated room with no infection risk beyond the faecal and blood precautions in the protocols. Decay and the household's tolerance set the limit, and in heat it shortens to the first day, which is why so many hot-country traditions bury before sunset. Grade C, from expert manuals, not trials.

7. Burial: depth, distance, soil, lime and the mass grave

Six feet. The figure comes from London's plague orders of 1665: "all the Graves shall be at least six foot deep", alongside rules that burials happen before sunrise or after sunset with no neighbours, friends or children attending (City of London 1665). No rationale was stated and the rule lapsed (IanVisits 2020). It was a decree, not a measurement. Grade D.

The practical depth. The field manual gives 1.5 to 3 metres for long-term graves, with the grave bottom at least 1.2 metres above the water table for fewer than five bodies (1.5 metres in sand). For a communal grave the water table must lie at least 2.5 metres down and the bottom 0.7 metres above it. Annex 7 adds that 90 cm to 1.2 metres of soil keeps scavengers out (ICRC 2016). Hoffman and Healing ask for at least 1 metre of earth over a body, and England's Environment Agency for at least 1 metre between grave base and the highest water table (Environment Agency, search summary). Sierra Leone's Ebola procedure set 2 metres (Nielsen 2015), as do IN-13 and HY-07. The village rule: a grave 1.5 to 1.8 metres deep, a metre of earth over the body, the base a metre above the wet-season water table. Where water stands higher, bury on higher ground or in a mound of carried earth. Grade C.

Distance from water. The field manual gives 30 metres from springs and watercourses and 200 metres from wells in chapter 8, but 250 metres in Annex 7, with 10 metres from field drains (ICRC 2016). The inconsistency is the manual's. England's Environment Agency uses 250 metres from any drinking well, borehole or spring, 30 from other springs and watercourses and 10 from field drains. Canada's National Collaborating Centre for Environmental Health found setbacks of 100 metres in Saskatchewan, 120 in British Columbia, 250 in the United Kingdom and one at 30, none with a stated rationale (NCCEH 2017).

The rationale is thin because the harm is thin. Üçisik and Rushbrook, for WHO Europe in 1998, found "no reports" of outbreaks "unequivocally the result of seepage from cemeteries", though doubt persisted for lack of data (Üçisik and Rushbrook 1998, quoted via NCCEH 2017, not read). The studies NCCEH summarised show contamination highest beside graves and falling with distance (Schraps 1972), groundwater inside a South African cemetery far worse than at 50 and 500 metres, and hand-dug wells in Zume, Nigeria contaminated within 25 metres of burials, source

unconfirmed. A body yields about 0.4 to 0.6 litres of leachate per kilogram (Żychowski and Bryndal 2015, snippet only) [VERIFY].

Soil. Sand and gravel let leachate travel fast, clay holds it but floods, and cracked rock and limestone carry it far. Decomposition is fastest at 25 to 35°C and slow below 5°C (NCCEH 2017). The field manual prefers dry sand-clay or slightly alkaline soil on high ground with a 10-metre buffer of deep-rooted plants (ICRC 2016), which matches HY-04's rule that no distance is safe in sand over gravel or in cracked rock (THRIVING library, HY-04).

My inference, and the disagreement with IN-13 and HY-07. A grave is a far smaller source of faecal pathogens than a latrine, which receives fresh faeces daily. HY-04 sets latrines 30 metres from a water point, 50 in sand or gravel. A cemetery should do at least as well: at least 30 metres from any stream or spring, at least 50 metres from a drinking well and never uphill of one, 250 metres as the target for a new cemetery, and cholera, typhoid and Ebola bodies at the end farthest from water [VERIFY, own inference from the latrine analogy]. IN-13 and HY-07's 50 metres is the floor, not the target, for wells. Where to put the cemetery is the owner's decision [OWNER].

Lime. The belief is that lime disinfects or speeds decay. PAHO's 2004 chapter 2 said quicklime, formol and zeolite "will almost certainly be necessary" in a mass disaster (PAHO 2004). The 2016 manual reversed this: avoid lime and chemicals, which do not hasten decomposition (ICRC 2016, WHO FAQ). Hoffman and Healing say chloride of lime "has little effect and is dangerous to those applying it". Schotsmans and colleagues buried six pigs in Belgian sandy loam with no lime, hydrated lime or quicklime, and both limes delayed decay over six months, confirmed at 17 and 42 months, though quicklime briefly sped decay in a laboratory study (Schotsmans 2012, abstract only). The brief's "useless, per PAHO" is more exactly "useless, per the 2016 manual and WHO, and once recommended by PAHO". I disagree with IN-13 and HY-07: no lime and no ash in the grave. Grade X.

Individual against mass graves. The field manual allows trenches only in extremes, bodies 0.4 metres apart in one layer, each marked (ICRC 2016), and PAHO forbids common graves (PAHO 2004). The reason is identification and mourning, not hygiene. An unmarked mass grave creates the missing, and prolonged grief reaches 49% after unnatural deaths (Djelantik 2020, via THRIVING library, MI-03). Unidentified bodies are never cremated, and each gets a permanent marker, a unique code, a map and records kept in two places (ICRC 2016). How the records are made belongs to OR-05.

8. Cremation: fuel, India and Liberia

India's practice. Hindu cremation on an open pyre is a living family rite, usually within a day of death. TERI's emissions inventory gives 200 to 600 kg of wood per cremation from the literature, and a 2016 survey of 50 Delhi crematoria found an average of 350 kg, with crematoria producing about 1% of Delhi's particulate pollution (TERI). Mokshda, a Delhi group, reports that its raised, covered pyre on a metal grate needs about 100 kg against 400 to 500 kg in the open (CNN 2011, search summary), and the Indian Institute of Public Administration reports 500 kg against about 60 kg in a green crematorium (IIPA, search summary). These are advocates' figures, not trials [VERIFY].

When wood runs out. After the Gujarat earthquake of January 2001, cremation consumed the wood survivors needed for cooking and heat, and after Mitch mass cremation did the same and its smoke became a respiratory hazard (PAHO 2004). At 350 kg a body a village burns about 3.5 tonnes in an ordinary year of ten deaths and 20 tonnes in a bad epidemic year [VERIFY, own arithmetic], wood it also needs for boiling water and the forge.

Liberia, 2014. In early August 2014 Liberia ordered all Ebola dead in Monrovia cremated, after communities resisted burial grounds near their homes. Families feared their sick would be burnt: by October 391 of 742 treatment beds stood empty, and the sick were hidden and buried secretly at night. More than 2,000 bodies had been cremated by late December, when the order was eased and a 25-acre burial site secured (Fox News/AP 2014, Boston Globe 2014). A rule meant to remove the dead as a source drove the living sick out of care, the clearest case in the record of a hygiene rule causing transmission.

Sri Lanka, 2020 to 2021. Sri Lanka made cremation compulsory for COVID-19 dead in 2020, against WHO guidance and citing an unproven groundwater risk. Muslim families cremated their dead against their faith until the rule was withdrawn in February 2021 (Marsoof 2022, abstract and secondary summary).

Grade. Cremation is valid where the tradition requires it and wood allows. As epidemic control it has no shown advantage over a well-sited grave. Grade D as hygiene, X when forced.

9. Washing and handling: the traditions as tested

Gloves and soap. The field manual's minimum is waterproof gloves, apron and boots, and soap before eating, with no masks (ICRC 2016). Faecal leakage is common, and relatives may prepare a body within 24 hours with gloves, simple protective clothing and hygiene (Hoffman and Healing 2018). Gloves and hand washing stand at grade B.

No embalming. Embalming has no public health benefit for burial within days. It exposes the embalmer to formaldehyde and to the aerosols that gave tuberculosis in Baltimore (Sterling 2000). Hypochlorite must never meet formaldehyde, because together they form a carcinogen (Hoffman and Healing 2018). Grade X for the village.

Tahara. The Jewish rite is performed by the chevra kadisha, a volunteer burial society. The body is washed with warm water, turned gently and never face down, then purified by nine kav of water, about 24 quarts, poured in a continuous stream from up to three vessels (OU Torah, citing HaShoneh Halachos 197:2 to 3). Embalming is forbidden, burial is prompt and all parts are buried together (PAHO 2004). The Shulchan Aruch Harav permits gloves to avoid disease. Grade C as hygiene: the rite already holds the hand covering, respect and speed the manuals ask for.

Ghusl. The Muslim washing is done at least once by a trustworthy washer, of the same sex where possible, starting from the right with the private parts covered (IslamOnline). In Shia practice it is water with sidr (Ziziphus spina-christi, lote tree leaves), then with camphor, then pure (WikiShia). Martyrs are not washed. The ICRC's 2020 guidance for COVID-19 deaths, written with scholars, gives tiers: full ghusl if safe, then water poured or sprayed without touching, then tayammum (dry ablution), then for some scholars a wet hand over the body bag, then none. The shroud and the funeral prayer by at least two people, 1.5 metres apart in the open, continue (ICRC 2020). This is the model for every tradition in an epidemic: keep the act, change the contact.

The West African washing. Kissidougou and Kenema were washings (section 3). In 2014 communities and burial teams negotiated lesser forms, such as a symbolic washing (WHO 2014) [VERIFY]. Where a rite involves restricted knowledge, initiation or gender, it is named and not described (THRIVING library, SY-04).

The wake. The Irish wake, the Catholic vigil and novena PAHO describes in Colombia (PAHO 2004), and home vigils everywhere carry no infection risk after an ordinary death. Viewing helps most of the bereaved: 96% of 460 parents who saw their dead child did not regret it (Omerov 2014, via THRIVING library, MI-03). The risks are the food after a cholera death and the touching after a fever death. Whether viewing should ever be refused in an epidemic is, as MI-03 says, the owner's question [OWNER]. Viewing at two metres through an open door, or the face shown briefly from an open bag without touch, meets the evidence.

10. How many will die: the village's arithmetic

The village figures are my own arithmetic from the cited rates [VERIFY].

Setting	Rate	Village of 300	District of 3,000
Modern low-mortality population	6 to 8 per 1,000 a year (TERI, Indian states 2016)	2 to 3 deaths a year	20 to 25
Sub-Saharan baseline, implied by UNHCR	About 9 per 1,000 a year (0.25 per 10,000 a day)	About 3	About 27

Setting	Rate	Village of 300	District of 3,000
Pre-industrial village, no hospital	Assumed 25 to 35 per 1,000 [VERIFY]	8 to 10	75 to 100
Emergency threshold (UNHCR, Sphere)	1 per 10,000 a day	11 a year, about one a month	110
Influenza 1918, Philadelphia excess	748 per 100,000	2 extra	22 extra
Kissidougou Ebola cluster, 2014	63 deaths in six villages	10 to 20 in one village [VERIFY]	63
Plague, Eyam 1665 to 1666	257 deaths in 689, about 37% (THRIVING library, HY-07)	About 110	Not applicable, village event

A village of 300 should plan for about ten deaths in an ordinary year, a grave about once a month, and in an epidemic year for three to six times that, with days of more than one body. A district of 3,000 should plan for two a week. UNHCR sets its emergency threshold at four times the sub-Saharan average (UNHCR), so a pre-industrial village sits near it in an ordinary year [VERIFY, own inference].

Evidence grades

Practice	Tradition says	Record shows	Science infers	Grade
Ordinary and disaster dead as no epidemic risk	The dead breed plague	No epidemic traced to them (PAHO 2004, ICRC 2016)	Trauma kills, pathogens die with host	B
Gloves, apron, soap for handlers	Varies	Handler infections via blood, faeces (Hoffman and Healing 2018)	Blocks the main routes	B
Masks for ordinary handlers	Smell carries disease	Not advised (ICRC 2016)	Air is not the route	D
Cloth over mouth, ventilated room	None	One case series (Sterling 2000)	Plausible against TB	C
Safe and dignified burial for VHF	Washing honours the dead	2.58 cases per unsafe burial (Tiffany 2017)	Breaks the chain	B
No meal after a cholera death	Feeding mourners is duty	RR 2.6, meal OR 14.5 (Gunnlaugsson 1998)	Faecal route via food	B
0.5% chlorine on cholera or VHF body	None	Part of Biombo and SDB packages	Not tested alone	C
Burning bedding after plague, typhus, smallpox	Widespread	Scabs viable for months (McCollum 2014)	Sound	C
Six feet deep	1665 decree	No basis recorded	Beyond 1 m cover adds little	D

Practice	Tradition says	Record shows	Science infers	Grade
1 m earth over body, 1 m above water table	None	Manual standard (ICRC 2016)	Sound	C
250 m from drinking wells	None	No seepage epidemic found (Üçisik and Rushbrook 1998)	Precaution without rationale	D
Lime or ash in the grave	Disinfects, speeds decay	Slows decay (Schotsmans 2012), burns users	No benefit	X
Mass grave for health	Speed prevents plague	Creates the missing (MI-03)	No benefit	X
Marked temporary trench	None	Field practice (ICRC 2016)	Allows identification	C
Keeping body 24 to 48 h, cool room	Wake, vigil	No infection from waiting dead	Decay sets the limit	C
Water ice	Widespread	Run-off risk (ICRC 2016)	Weak	D
Embalming	Funeral custom	TB to embalmer (Sterling 2000)	No village benefit	X
Cremation as hygiene	Fire purifies	Fuel loss, India 2001	Equals a sited grave	D
Forced cremation	State order	Liberia's empty beds, Sri Lanka	Harmful	X
Tahara, ghusl with gloves and tiers	Purifies the dead	Accepted by ISID, ICRC	Contains the hygiene	C
Hepatitis B vaccine (pre-Fall)	None	Effective (Hoffman and Healing 2018)	Use where available	A

Means ledger

Rung	Ordinary death	Epidemic death	What it changes
Hands and knowledge	Close eyes and jaw, wash with whole skin, wash own hands. Bury within 48 h at 1.5 m	No touching, no meal, small gathering kept apart. Bury same day in bedding	Knowing which death is dangerous does most of the work
Hearth	Soap, water, cloth shroud, a cool shaded room	Oiled cloth or leather over hands, cloth over mouth, boiled clothes, soap	Soap and boiling remove most handler risk
Garden and still	Wax-cloth or oiled-cloth gloves, ethanol hand rub, a fenced, mapped burial ground	Shroud kept ready, a hurdle or stretcher, burial team named in advance	Repeatable practice and a sited cemetery

Rung	Ordinary death	Epidemic death	What it changes
Village dispensary (300)	Rubber or nitrile gloves from salvage, aprons, boots, a burial book [OWNER, register per OR-05]	Chlorine at 0.5% and 0.05%, body bags or waxed sheets, a trained team of five, swabs if any lab	Safe and dignified burial possible in village form
District infirmary (3,000)	Cool store or root cellar for bodies, a gravedigging crew with shoring	Epidemic cemetery, full SDB kit, a pyre for traditions that cremate	Can absorb a bad week
Pre-Fall hospital	Refrigerated mortuary at 2 to 4°C, death certificate, funeral industry	Full SDB, laboratory confirmation by swab, hepatitis B vaccination of staff	Identification and confirmation, little change in transmission

Knowledge at the first rung changes outcomes most. Higher rungs add safety and dignity, but whether a death is ordinary or dangerous is decided by hands and knowledge.

Harm test

The Ebola funeral. One unsafe burial gave 85 cases and 63 deaths in Kissidougou. The error is washing, touching or kissing a fever death, then touching other mourners. Signs: fever, vomiting, diarrhoea or bleeding in mourners 2 to 21 days later. Then: isolate the sick, list every attender, and use the safe burial for every death in the area until 42 days pass without a case (THRIVING library, IN-13).

The cholera meal. Signs: watery diarrhoea in mourners within one to five days. Then: rehydration (THRIVING library, HY-03, IN-13), boiled or chlorinated water at every gathering (THRIVING library, HY-02), and no funeral meals in the area.

Handler infection. Blood-borne viruses through cuts, tuberculosis by aerosol, plague by cuts or droplets, typhus and plague by vermin. Who must never handle an epidemic death: anyone with broken skin on hands or forearms, anyone ill, children, and in a fever epidemic the pregnant [VERIFY, own inference, no source read sets a rule for pregnancy]. Anyone with gloves or whole skin may wash the ordinary dead.

Gravediggers' injuries. About 54 US workers a year died in trenching and excavation in 1992 to 2001 (CDC 2004, search summary), and US law requires shoring or sloping in any trench 1.5 metres (5 feet) or deeper outside stable rock (OSHA). A Farmingdale, New York gravedigger was buried to the waist in 2015 when an unshored grave collapsed (Business Insurance 2015). A study of 18 gravediggers rated every task at high or very high biomechanical risk, with shoulder, knee and back pain most common (Jiménez 2025, abstract only). The error is a lone digger in a deep, vertical-sided grave in sand or wet soil. Signs: cracks at the lip, soil trickling from the walls, water in the base. Then: step or slope the sides above 1.2 metres, keep spoil half a metre from the edge, never dig alone [VERIFY, the distances are mine from general excavation practice].

Groundwater. A grave in sand above a well, or a cholera body by a stream. Signs: an odd taste in the well, diarrhoea among its users. Then: stop using the well, chlorinate (THRIVING library, HY-02), move the next burials.

Lime and chlorine. Quicklime burns skin and eyes and heats on contact with water. Chlorine at 0.5% is for bodies, surfaces and gloved hands, 0.05% for skin (THRIVING library, IN-13). Spraying mourners drives them away for no gain.

Mass graves and denied rites. The harm falls on the living: prolonged grief, the missing never found, and lost trust.

MI-03 documents Aceh, Philadelphia and COVID-19 (THRIVING library, MI-03). Liberia added the further harm of the sick driven into hiding.

Fuel and smoke. Mass cremation strips fuel the survivors need and adds smoke (PAHO 2004).

Red flags

Signs that a death is not ordinary and the epidemic protocols apply even without proof:

1. **Bleeding** from mouth, nose, eyes, gums or rectum, or bloody vomit or stool. Treat as a viral haemorrhagic fever.
2. **A cluster:** a second fever death in a household or village within three weeks, or the death of someone who nursed a fever death.
3. **Profuse watery diarrhoea or vomiting** and death within a day or two. Treat as cholera.
4. **Painful swollen glands** in groin, armpit or neck, or bloody cough after fever. Treat as plague and look for dead rats.
5. **Lice** on someone who died of fever with a rash. Treat as typhus.
6. **Deep, firm, uniform pustules** on face and limbs. Treat as smallpox.
7. **A long wasting cough.** Treat as tuberculosis for the handlers.
8. **Jaundice** or a known blood-borne infection. Treat the blood as dangerous.
9. **A black painless ulcer,** or an animal dead with dark blood at its openings. Treat as anthrax and do not open.
10. **Any handler** ill within three weeks of a burial.

When no protective means exist: no bare skin touches the body, it is wrapped in its own bedding and buried that day, the family speaks and sings at a distance, and the name goes in the book. The honest comfort is the rite kept in another form, as the ICRC ghusl tiers show: what cannot be done with hands can be done with poured water, then with words.

The case against

The myth-busters may prove too much. Morgan, de Ville de Goyet and the field manual wrote about disaster dead, and their message travelled into epidemics where it fails. Hoffman and Healing's 65% infected at unsafe Ebola burials and the 85 cases from one Kissidougou funeral show that for a few diseases the body is among the most dangerous objects in the village. This report answers by putting the red flags before the comfort.

The groundwater evidence is thin both ways. Üçisik and Rushbrook found no proven outbreak from seepage but too little data to rule one out, and NCCEH found the setbacks unsupported. Contamination near graves in South Africa and Nigeria is real even if disease is not proven. This report's distances rest on the latrine analogy, not on measurement.

The case for lime. PAHO recommended quicklime in 2004, Arkansas requires lime on animal carcasses (THRIVING library, IN-16), and quicklime briefly sped decay in the Schotsmans laboratory work. None shows a benefit against pathogens, but a village that has always limed its graves will hear the argument.

The case against concentrating on burial. Faye's Conakry data put funerals at 15% of transmission at most in the month measured, and Tiffany found caregivers two to six times likelier to be infected than those who touched only the dead. The household bedside was the larger source. Burial teams also met resistance and violence, as at Womey in September 2014 (THRIVING library, IN-13). Effort spent on burials at the expense of the sickroom is misplaced.

The case against home washing. A village without a laboratory cannot tell which death is dangerous, and Baltimore's embalmer and Moramanga's contacts handled bodies thought ordinary. The answer is gloves and whole skin for every washing, not a ban.

The case against the fuel argument. A village with managed coppice may not face the scarcity of Gujarat, and improved pyres claim to cut wood four- or five-fold. The tradition, not the forester, decides how its dead are disposed of.

The romance on both sides. The hospital view holds that only professionals bury safely, which Sierra Leone's overloaded teams disprove. The traditional view holds that the rite cannot change, which the chevra kadisha's gloves and the ghusl tiers disprove: the traditions changed it themselves. Marsoof's critique of Sri Lanka's policy is the warning against a state that changes it for them.

10-line summary

1. Disaster dead and ordinary dead cause no epidemics. The survivors and their water are the risk (PAHO 2004, Morgan 2004, ICRC 2016).
2. The body is dangerous after Ebola, Marburg, Lassa, cholera, plague, typhus, smallpox and anthrax, and to its handlers after tuberculosis and the blood-borne viruses.
3. In Kissidougou 79% of the funeral's cases came from touching mourners, not the body. The gathering is a vector.
4. Each unsafe Ebola burial gave about 2.6 further cases, and safe burial averted up to a third of the epidemic.
5. After a cholera death: disinfect the body, serve no meal, keep the grave away from water.
6. Gloves, an apron, whole skin and soap protect every handler of an ordinary body. Masks and lime do not help.
7. One metre of earth over the body, the base one metre above the wet-season water table, 30 metres from streams, at least 50 from wells and never uphill of one.
8. Lime slows decay and burns the user. Embalming endangers the embalmer. Neither belongs in the village.
9. A pyre takes about 350 kg of wood, and forced cremation drove Liberia's sick into hiding.
10. Mass graves have no health justification and create the missing. Every body gets its own marked, recorded grave.

Open questions

1. Does cemetery leachate cause disease in wells at distances a village can manage? Neither shown nor excluded. The setbacks here are analogy.
2. How long does cholera survive in a buried body in wet tropical soil? Not found.
3. Across many funerals, how much Ebola transmission came from the body and how much from the mourners? Kissidougou is one funeral.
4. Can washing water poured on the ground carry cholera to a well? Not found.
5. What does an open pyre really burn at village scale, by wood type? The figures are surveys and advocacy.
6. When, if ever, should viewing be refused? MI-03 leaves this to the owner and so does this report [OWNER].
7. Should every death be reported to the healer before the washing, so the red flags can be checked? [OWNER]
8. Identification and the register belong to OR-05.

Sources to read in full

1. ICRC 2016, Management of Dead Bodies after Disasters, 2nd edition. Read in full here.
2. PAHO 2004, Management of Dead Bodies in Disaster Situations. Western's chapter, the cultural chapter, and the quicklime advice since reversed.
3. Hoffman and Healing 2018 (ISID). The best list of which bodies are dangerous.
4. Morgan 2004. Only the abstract was read. The full text was refused.
5. Üçisik and Rushbrook 1998, WHO Europe. The groundwater evidence. Refused here.
6. WHO 2014, safe and dignified burial protocol. Read only in summary.
7. Gunnlaugsson 1998. Only the abstract was read.
8. Victory 2015 (Kissidougou) and Jullien 2021 (plague).

9. WHO 2008, Anthrax in Humans and Animals, and Barry 2004, The Great Influenza. Neither could be read.

At the bedside after the Fall

The household. Know the ten red flags. For an ordinary death, close the eyes and jaw and straighten the limbs in the first hours, wash the body with soap and covered hands, wash your own hands after, and keep the body in the coolest room for up to 48 hours, less in heat. For a red-flag death, no bare skin touches the body, it is wrapped in its bedding, and the healer is told before anyone gathers. It needs soap, a basin, a shroud cloth, gloves or oiled cloth, and a known person to send word to. The first failure to expect is the family washing a fever death because grief is stronger than the rule.

The village of 300. A named burial team of five, trained before it is needed and paid in kind. A fenced, mapped cemetery on high ground, at least 50 metres from any drinking well and never upslope of one. A burial book [OWNER, form per OR-05]. A kit of two pairs of rubber gloves per member, aprons, boots, a stretcher, shrouds, chlorine, spades and a pick. Rules that every death is reported to the healer before the washing and that no meal follows a diarrhoea death [OWNER]. Expect about ten deaths a year. The first failure to expect is a cemetery sited for convenience, found out the first wet season the graves fill with water.

The district of 3,000. Pooled village teams, a designated epidemic cemetery, a cool store for bodies, a gravedigging crew that shores its graves, a full burial kit for a team of five, a wood store for traditions that cremate, and a trusted communicator in each village, since IN-13's trial found trust built years before saves lives during an epidemic (THRIVING library, IN-13). Expect about two deaths a week. The first failure to expect is the epidemic rule applied to every death, families ceasing to report, and the first fever death reaching a funeral.

Protocols

Protocol 1. The ordinary death at home

1. **Check the red flags.** If any is present, use the matching epidemic protocol.
2. **In the first two to four hours,** close the eyes, tie the jaw shut with a cloth under the chin and over the head, straighten the limbs, lay the body on its back. Stiffening begins within hours [VERIFY].
3. **Cover any cuts** on your hands. Wear gloves, or oiled or waxed cloth.
4. **Wash** with warm water and soap, head to foot, private parts covered, by the family's rite. Expect leakage of faeces and urine. Pad under the hips.
5. **Dress or shroud** the body. Burn or boil soiled cloth.
6. **Wash your hands** with soap for 20 seconds, and before eating.
7. **Keep** the body in the coolest shaded, ventilated room, raised off the floor, for the wake. At most 48 hours, 24 in hot weather.
8. **No loose ice.** If ice is used, keep it in a closed vessel and empty the melt water into a latrine.
9. **Bury** by Protocol 7, or cremate by the family's tradition, and **record** the death [OWNER, per OR-05].

Protocol 2. Washing the body in any tradition

1. **Washers:** two healthy adults with no cuts or sores on hands or forearms.
2. **Hands:** gloves or the rite's permitted covering. The chevra kadisha and Islamic scholars both permit gloves.
3. **Water:** clean and warm. For tahara, nine kav, about 23 litres, poured continuously, so three large vessels are filled first.
4. **After any red-flag death,** use the rite's lesser form: pouring without touching, tayammum, or a symbolic washing.
5. **Wash water** into a latrine or a pit at least 30 metres from any well, never into a stream.
6. **Afterwards:** peel gloves off inside out, wash hands with soap, boil the cloths.

Protocol 3. The death from a feared fever (Ebola, Marburg, Lassa, or unknown fever with bleeding)

1. **Nobody touches, washes or kisses the body.** The communicator tells the family why before the team arrives.
2. **Team:** four carriers, one sprayer, one supervisor, one communicator. Survivors of the disease first (THRIVING library, HY-07, IN-13).
3. **The five who touch** wear two pairs of gloves, long sleeves, apron, boots, cloth over mouth and nose, and eye cover, put on before entering. No one touches their face.
4. **Agree with the family** the grave, who watches, what is said and what is kept. No force (THRIVING library, HY-07).
5. **The body:** spray with 0.5% chlorine, wrap in its bedding without shaking, then a bag or two waxed sheets, then coffin or stretcher.
6. **The house:** spray bed and floor with 0.5% chlorine. Burn the mattress and soiled items only with the family's agreement.
7. **Bury the same day,** the family walking two metres behind, in a single marked grave 2 metres deep at the end of the cemetery farthest from water.
8. **The rite at the grave:** the family speaks, prays and sings at two metres, a religious leader may lead, and the name is spoken and written.
9. **Undress** outer gloves first, then apron and boots, inner gloves last, all into a fire. Hands in 0.05% chlorine, then soap.
10. **Watch** the team, family and attenders for fever for 21 days.
11. **Tolerance:** if the family refuses the full protocol, do the safest version it will accept, with it, rather than walk away.

Chlorine: 0.5% is about 1 part 5% bleach to 9 parts water, 0.05% about 1 to 99. Bleach weakens with age (THRIVING library, IN-13).

Protocol 4. The death from cholera or typhoid

1. **Washers** wear gloves and apron. Expect heavy faecal leakage.
2. **Disinfect** the body by washing or spraying with 0.5% chlorine, then wash by the rite with the lesser form.
3. **Plug nothing and open nothing.** Wrap in a waterproof layer if one exists.
4. **No funeral meal.** Mourners bring boiled water. Washers prepare no food for three days [VERIFY, own].
5. **Bury** within 24 hours, at least 30 metres from any stream and 50 from any well, downhill. Never in sand above a well.
6. **Boil or burn** bedding and clothes. Disinfect the latrine the dead person used.
7. **Watch** washers and mourners for diarrhoea for five days.

Protocol 5. The death from plague, typhus or smallpox

1. **Vermin first.** For plague and typhus, assume fleas and lice have moved to the bedding and nearby people. Handlers tie clothes at wrist and ankle, then change and boil them.
2. **For pneumonic plague** (cough with blood), handlers cover mouth and nose and eyes, and do not wash the body.
3. **For smallpox,** do not wash. Bag or wrap. Burn all bedding and clothing. Scabs stay viable for months.
4. **Bury** the same day, or cremate if the tradition allows. Never open the body.
5. **Handlers** with cuts do not take part. Blood into cuts transmits bubonic plague.
6. **Search** for dead rats around the house after a plague death and burn them with tongs, not hands.

Protocol 6. The death from tuberculosis, jaundice or a known blood-borne infection

1. **Before lifting,** lay a cloth over the mouth and nose of the body and open the windows.

2. **Lift without pressing** on the chest.
3. **Gloves and whole skin,** no sharp instruments, no shaving, no cutting.
4. **Any blood** on skin: wash with soap at once. Any blood into eyes: rinse with clean water for 15 minutes.
5. **Washing** may proceed by the rite with these precautions.

Protocol 7. Siting and digging a grave

1. **Site:** high ground, dry sand-clay or loam. Not in sand over gravel, not in cracked rock or limestone, not in a floodplain.
2. **Distances:** at least 30 metres from any stream or spring, at least 50 metres from any drinking well and never uphill of it. Aim for 250 metres from wells for a new cemetery. At least 10 metres from field drains.
3. **Water table:** at the end of the wet season, check the water level in nearby wells or a stepped test pit. If water stands within 2.5 metres of the surface, choose higher ground [VERIFY, own from the 1 m clearance and ICRC 2016's 2.5 m].
4. **Size:** about 2 metres long, 0.8 metres wide, 1.5 to 1.8 metres deep, giving 1 metre of earth over the body. 2 metres for a feared-fever death.
5. **Diggers:** never one alone. Below 1.2 metres in loose soil, step or slope the sides. Spoil half a metre from the edge. Climb out if the walls crack or trickle.
6. **Labour:** about 2.4 cubic metres of earth, roughly 4 to 8 person-hours in loam [VERIFY, own].
7. **No lime, no ash.** Fill by hand, mound the surface, and mark with a durable marker.
8. **Map** each grave by row and number in the book [OWNER, per OR-05].
9. **Gloves** for any digger who handles the body.

Protocol 8. Many dead at once

1. **Do not dig a mass grave for health reasons.** There are none.
2. **Record:** number and describe each body, its belongings bagged with it [OWNER, per OR-05].
3. **Keep cool:** a shaded, ventilated store. If more than can be buried in 48 hours, use temporary trench burial: 1.5 metres deep, bodies 0.4 metres apart, one layer, each marked and mapped, 200 metres from drinking water.
4. **No cremation of unidentified bodies.**
5. **Handlers:** gloves, aprons, boots, soap, rotated every few hours. No masks.
6. **Families** may view and take their dead as soon as identified.
7. **Mark** every body's place so it can be moved to its own grave later.

Protocol 9. Cremation where the tradition requires it

1. **Wood:** 350 kg (200 to 600) of seasoned wood per body, about 100 kg on a raised, covered grate, by its makers' claim.
2. **Site:** downwind of houses.
3. **Never imposed,** and never for hygiene alone.
4. **Ashes** are handled by the family's rite. They carry no infection.

Numbers to carry

1. **Ten deaths a year** in a village of 300 without a hospital, three to six times that in an epidemic year [VERIFY].
2. **The dangerous few:** Ebola and its kin, cholera, plague, typhus, smallpox, anthrax, and for handlers tuberculosis and the blood-borne viruses. All other dead are safe to touch with whole skin and gloves.
3. **2.6:** further Ebola cases from each unsafe burial (Tiffany 2017).
4. **79%:** of Kissidougou's funeral cases came from touching the mourners, not the body (Victory 2015).
5. **One metre** of earth over the body, and one metre between the grave base and the wet-season water table.

6. **30, 50, 250:** metres from a stream, the least from a well, and the target from a well.
7. **0.5% and 0.05%:** chlorine for the body, and for skin.
8. **24 to 48 hours:** how long to keep an ordinary body without cooling.
9. **350 kg:** wood for one open pyre.
10. **1.2 metres:** deeper than this in loose soil, step or slope a grave's sides. US law requires it from 1.5 metres.

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