

Chapter 8

Solid waste management

Solid waste management is about dealing with refuse. This chapter looks at communicable disease in relation to solid waste, and presents some practical issues about managing refuse. Solid waste management up to neighbourhood level, including local health structures, is considered, but the management of wastes from industries, mining, or structures like large hospitals or abattoirs are more specialised, and will not be covered here.

Poor solid waste management will result in an unpleasant and often unsafe environment to live or work in. In addition, piles of refuse can be a fire hazard ⁽¹⁵⁾.

In urban areas refuse often ends up in drainage systems, creating drainage problems (see Chapter 7).

Pollution caused by poor management of waste can create serious environmental problems. For example, one litre of diesel can in theory make around 80,000m³ of water undrinkable according to European standards ⁽⁴⁶⁾.

8.1 Solid waste management and infectious disease

Solid waste is often contaminated with human or animal excreta. Those who handle the waste, and those who live or work where the waste accumulates, will therefore often be at risk from excreta-related infections. The specific health risks they will be exposed to will depend on their contact with the excreta (see Table 6.1).

As drainage systems are frequently used for defecation, the solid waste that accumulates in the system is often contaminated, and is a health risk to those who have to handle it ⁽³⁹⁾. (For the health risks related to blocked drainage systems see Chapter 7.)

Organic waste from households, restaurants, and markets attracts rats, which are potential hosts for many infections (e.g. leptospirosis, plague). Organic waste also serves as food and a place to rest and hide for domestic flies, which can transmit faecal-oral infections and infections spread by direct contact, and cockroaches, which can transmit faecal-oral infections.

Other animals which use refuse dumps to rest and hide include mosquitoes; sandflies, vector of leishmaniasis, bartonellosis, and several arboviruses; and reduviid bugs, which can transmit American trypanosomiasis ^(61,80).

Refuse often includes materials which can collect rainwater, such as tin cans, jars, and old car tyres. *Aedes* mosquitoes, which transmit filariasis, urban yellow fever, dengue fever, and several other arboviral infections, can breed in these small water-filled vessels ⁽⁶⁷⁾.

Poorly managed waste often ends up in ponds, reservoirs, or drainage systems. The refuse often blocks drainage channels, resulting in the ponding of water. As these surface waters are often polluted with organic waste, breeding sites for *Culex* mosquitoes and domestic flies are created ^(21,61).

Table 8.1 summarises the health risks relating to poor solid waste management.

8.2 Practical issues about solid waste management

A solid waste management scheme can be a large, complex, and expensive enterprise, with many people, materials, and funds required for good operation. Although it is not possible to go into much detail on solid waste management here, we will look at some important issues.

It is not always necessary to collect waste. In rural areas much of the refuse is re-used (e.g. feed for animals, containers, toys) and solid waste will often be less of a problem. In high-density (peri-) urban areas, however, waste may become a serious problem if poorly managed.

If on-site burial or burning are not possible, waste has to be collected. If affordable, household bins will usually be the most appropriate way of collecting and storing household wastes. Where this is not feasible, communal storage of the waste will be necessary. Collection points must be convenient if they are to be used, and their location must be chosen in collaboration with users. The structures should be designed and built so that insects, rats, and rainwater are kept out, and so that people are discouraged from using them for defecation. The emptying and maintenance of the structures by workers must be made as easy as possible.

Table 8.1. Disease groups where poor solid waste management plays a role in transmission (adapted from 60)

Risk factors of poor solid waste management:		Disease groups									
		Faecal-oral infections	Schistosomiasis	Water-based with two intermediate hosts	Soil-transmitted helminths	Beef and pork tapeworm	Leptospirosis	Guinea-worm infection	Spread by direct contact	Vector-borne infections	
i	Rats								(a)		
	Domestic flies/cockroaches										
	Refuse accumulates	(b)							(b)	(c)	
ii	Containers in refuse									(d)	
	Refuse blocks drainage					(e)			(b)	(f)	
	Organic waste in water	(b)							(b)	(f)	
iii	Excreta in refuse										

(a): Flea-borne infections (plague, murine typhus fever)
 (b): The risk is caused by domestic flies
 (c): Vectors use refuse as a hiding/resting place: mosquitoes, sandflies, reduviid bug
 (d): *Aedes* mosquitoes
 (e): For humans: cysticercosis; for cattle and pork: beef and pork tapeworm
 (f): *Culex* mosquitoes

The collection points have to be managed correctly, otherwise they will become a health threat. Regular collection is essential. In hot climates flies and rats can be attracted to solid waste within two days, so the refuse probably needs to be collected daily or every other day (17,21).

Waste is often dumped in public areas or on wastelands. The uncontrolled discharge of waste must be discouraged, and the displaced wastes have to be collected. Part of solid waste management is making sure that refuse does not end up in drainage systems or surface water. The actual volume of wastes produced will depend on the situation. In low-income urban communities in developing countries one should count on a volume of 1 to 2.5 litres per person per day, with a weight of up to 1kg per person per day (15,17).

In developing countries burying the refuse will usually be the most practical way of disposal. To prevent animals from accessing the refuse, it should be covered daily with 0.15m of soil. The last layer of soil covering the waste should be at least 0.5m thick ^(253,350). Incineration is usually not feasible because of the frequently high content of moist (organic) waste, which would use too much fuel to burn.

Disposal of medical wastes

In addition to 'normal' wastes, health centres, feeding centres, and specialised medical centres (e.g. cholera treatment centres) will produce medical waste.

There are different types of medical waste: sharp objects (e.g. needles, syringes, blades), material which has been in contact with blood, puss, or other body fluids (e.g. bandages or cotton wool), and organic waste (e.g. placentas).

There are many infections which could be transmitted through these wastes, and it is therefore important that they are disposed of so that the pathogens are isolated from people or animals.

Sharp objects should be collected in sturdy, closed containers with a small opening just large enough to pass the objects through. When these containers are full they should be discarded in a waste disposal pit. A disposal pit for medical wastes should be deep, with a superstructure with a small opening that can be locked securely. The superstructure must keep people, animals, insects, and surface water out. The pit is quite similar to a pit latrine.

Contaminated bandages and other materials should be wrapped in plastic bags reserved for and identified as medical waste. The bags should be burnt in an incinerator. It should be assumed that incinerated waste is still infective, and the ashes must be disposed of in the waste disposal pit ⁽²¹⁾.

It will be difficult to incinerate organic wastes, so these wastes should be wrapped in plastic bags and thrown into the waste disposal pit.

To make sure the medical waste is properly dealt with, and to ensure that scavengers (e.g. children, animals) do not have access to it, the waste should not leave the compound of the health structures. The incinerator and waste disposal pit should be near each other, and should be fenced off to keep people and animals away.

Although the medical waste disposal pit is similar to a pit latrine, latrines should not be used for medical wastes as there is a risk of contaminating the slab or superstructure.

Whether normal waste from the health structure can be disposed of without special precautions will depend on how well the medical and uncontaminated waste are separated. If there is any doubt, all normal waste should be treated as medical waste and incinerated.

People dealing with waste in a health centre must be aware of the health risks, and be provided with protective clothing and adequate tools.

Disposal of the dead

The health risk of a dead body is usually negligible, and the risk of an outbreak due to the presence of dead bodies after a disaster is extremely small ⁽⁶⁶⁾. Although rapid disposal of the dead is normally not necessary for health reasons, it may be demanded by the people, and this demand will have to be considered.

The exceptions are people who die during outbreaks of cholera, louse-borne typhus, or plague ⁽²¹⁾. The dead bodies of people who die during these epidemics should be handled carefully. The bodies (and clothes) should be disinfected or treated rapidly; and the bodies should be manipulated as little as possible before burial or cremation.

