

**Discussion document:**

**Proposal for the Development of a National Surveillance System  
for Injuries Caused by Hazardous Substances**

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## **A. Purpose of Report**

New Zealand currently has no national surveillance system for poisonings or other injuries caused by chemicals. This is widely considered to be a deficit of the national public health system. It is also contrary to current legal requirements under the Toxic Substances Act (1979).

The purpose of this report is to identify and design the most appropriate national surveillance system for injuries caused by hazardous substances in New Zealand. In so doing, several possible approaches were examined and the advantages and disadvantages of each one evaluated. The recommended option is outlined in some detail. The proposed system aims not only to satisfy the legal requirements of current and proposed legislation, but also to provide public health professionals with a useful tool to monitor and evaluate trends in chemical injuries so that regulatory and public health interventions can be introduced in a timely manner.

We have considered it less important to focus on sorting out or recommending various governmental responsibilities and more on the practical implications of implementing a surveillance system that will capture relevant data and be useful for regulatory agencies and researchers. Ultimately, the proposed system must, at a minimum, provide the means to meet requirements under new or existing legislation. However, we have attempted to take it further than this and design a tool that would meet the needs of public health professionals, including researchers.

## **B. Background**

### **Recent History of Poisoning Surveillance in NZ**

Under section 76 of the Toxic Substances Act (1979) there is a requirement for notification to the Medical Officer of Health of poisoning cases that are admitted to hospitals or, in the case of fatalities, come to the attention of Registrars of Births and Deaths. The Medical Officer of Health is obliged to notify the Ministry of Health forthwith of this information. Specifically, the legislation states:

#### *Toxic Substances Act (1979)*

##### 76. Notification of poisoning –

- (1) If any person, upon admission to (a licensed hospital), is found to be suffering from poisoning, the Medical Superintendent or other medical officer for the time being in charge of the hospital shall forthwith give notice of the fact that person has been so found to the Medical Officer of Health.
- (2) Every Registrar of Births and Deaths who, in his official capacity, becomes aware that any deceased person was affected shall forthwith notify the Medical Officer of Health of the death and of the fact that the person was so affected
- (3) Every Medical Officer of Health shall, on receiving any information pursuant to subsection (1) of this section, forthwith advise the Ministry of the information so received.

Throughout the 1980s this legislative requirement was generally complied with, although there is no information on the completeness of compliance. At the Head Office of the Department of Health poisoning notifications were collated by clerical staff and regularly presented in a standardised tabular format in the Department's annual report. The table showed annual numbers of notified cases of poisonings treated in hospitals, by health district and age-group. A more extensive breakdown of annual poisoning numbers, by substance category, was also produced within the Department. The extent to which this was distributed is not clear. However, it is likely that copies were distributed to all public health units at the time.

The notification system that operated during the 1980s and earlier could not be considered to have been a true surveillance system, as it satisfied few of the requirements considered to be characteristic of surveillance systems. In particular:

1. Surveillance systems should incorporate regular and systematic analysis of the data, looking for patterns and trends. There was no such analysis other than on an occasional, ad hoc basis.
2. The analysis of data carried out should be tied to a mechanism for effecting public health action. This can only be considered to have been the case to the extent the system was operated by the Department of Health with powers to take such action under the Toxic Substances Act. However, since no regular formal analysis of data was undertaken, the likelihood of such action was largely a matter of chance.
3. Surveillance systems should frequently and regularly feed back analysed and collated data to the data suppliers. This was not done other than through the Department's annual report, and possibly through a separate more-detailed document once a year.
4. Surveillance systems should be timely in their operation. This was not the case, at least at the national level, since the only deadline that applied was that for having the statistics available for the next annual report.

In the late 1980s the Department concluded that there was little value in it continuing to receive forwarded poisoning notifications from medical officers of health. At that time, a number of factors led officials to conclude that present resources did not allow for the data to be utilised and interpreted. As a result, medical officers of health were asked to stop sending notification reports to the Department of Health. This was not intended to prevent local notification occurring. However, in some cases, the Department's instruction was interpreted as a signal that collection of poisoning notifications was no longer needed, and hospitals ceased notifying poisonings to medical officers of health.

Since 1990 there has been no national system for collection of poisoning notifications and no national statistics have been published. However, the provisions of the Toxic Substances Act

remain in force. It is expected that the Toxic Substances Act will shortly be repealed and superseded by the provisions dealing with chemicals in the Hazardous Substances and New Organisms Act (1996) (HSNO Act). Section 143 of the HSNO Act will replace section 76 of the Toxic Substances Act. The new provision states:

*HSNO Act 1996*

143 Notification of Hazardous Substances Injuries

- (1) In this section, “hospital” means any premises licensed for use as a hospital under the Hospitals Act 1957
- (2) If any person, upon admission to a hospital, is found to be suffering from any injury caused by a hazardous substance, the person for the time being in charge of the hospital shall give notice of the injury to the Medical Officer of Health.
- (3) The Medical Officer of Health shall ensure that information about any injury notified in accordance with subsection (2) of this section (not being information which identifies any individual person) is supplied to the Minister of Health

This section is not yet in force. However, it is intended to supplant section 76 of the Toxic Substances Act. The HSNO Act requirement has several notable differences from the equivalent provision in the Toxic Substances Act:

1. HSNO section 143 refers to any “injury caused by a hazardous substance”, whereas the Toxic Substances Act refers to poisoning. This means that the new legislation will cover other types of injury, such as corrosive burns and injuries caused by explosions.
2. HSNO does not include any requirement for the Registrar of Births and Deaths to notify the medical officer of health of a death. This means that if a hazardous substance causes a death before admission to hospital this may never be notified to the medical officer of health.

3. The Toxic Substances Act requires that notification be “forthwith”, whereas the HSNO provision contains no such requirement for timeliness of notifications. Therefore, notifications under the HSNO Act may be considerably delayed, but still in compliance with the legislation.

In addition to the requirements of the Toxic Substances Act and the HSNO Act, the list of notifiable diseases currently specified in the Health Act (1956) includes “poisoning arising from chemical contamination of the environment”, and “lead absorption equal to or in excess of 15 µg/dl (or 0.72 µmol/l)”. Reporting requirements for notifiable diseases include notification by medical practitioners. Those requirements are, therefore, more comprehensive than the requirements in the Toxic Substances Act and the HSNO Act for reporting only of hospital admissions for poisonings.

From a strict reading of the legislative requirements it would appear that a hospitalised case of poisoning arising from contamination of the environment, or a hospitalised case of lead poisoning would require notification under both the Health Act and the Toxic Substances Act. Whether this actually occurs or not is unclear, although a possible distinction between the two legislative requirements is that the Toxic Substances Act and the HSNO Act may be more focused on surveillance of acute poisonings and the Health Act on chronic poisoning situations.

Although there have been a substantial number of notifications of lead absorption (152 in 1999), there have been very few cases notified of poisoning arising from chemical contamination of the environment (none in 1999). This may be because there is no case definition for this category.

In about 1990 responsibility for occupational disease investigation and control was devolved from the Department of Health to the Department of Labour. OSH (The Occupational Safety and Health Division of the Department of Labour) was formed.

OSH is the agency responsible for the enforcement of the Health and Safety in Employment Act, 1992.

Until a few years ago the Schedule of notifiable diseases under the Health Act 1956 contained a number of occupationally related conditions, including diseases caused by chemical exposure. However, these conditions were removed from the Schedule when it was revised in mid-1996. Now, information on occupational diseases is collected under the Notifiable Occupational Disease System (NODS), administered by OSH. Under NODS, using a standardised form, notifications are voluntarily sent by clinicians, doctors, occupational health nurses, and other health professionals to the NODS Registrar at OSH. These notifications allow for national surveillance of workplace injuries of all kinds, including chemical-induced injuries. Categories of injuries involving hazardous substances in the NODS reports include those listed in the following table:

**Table 1. NODS statistics to June 1998.**

<b>Disease type</b>	<b>Notifications since 1992</b>	<b>Confirmed cases since 1992</b>
Occupational asthma	405	116
Asbestos-related disease	814	598
Other occupational respiratory disease	119	586
Occupational diseases due to chemical exposure	542	154
Chronic solvent-induced neurotoxicity	367	54
Occupational cancer	16	

In 1994, the National Toxicology Group at the University of Otago produced a report “Poisoning Notification and Surveillance in New Zealand: The Current Status and Future Direction” (Whittaker, 1994). The report was prompted by the knowledge that the HSNO Act would, at some time in the near future, require the notification of hazardous substances to the Environmental Risk Management Authority (ERMA). The report contains a series of proposals and recommendations that support the development of a notification and surveillance system for poisonings. The report discusses the need to clarify roles and

responsibilities among various agencies, however, a number of the recommendations are no longer relevant to current agency structures and responsibilities.

### **Current Poisoning Surveillance Systems**

A 1999 survey by the Ministry of Health found that, with two exceptions, most Public Health Services do collect poisoning notifications and maintain local poisoning statistics. Specific local arrangements with individual hospitals dictate the kinds of data collected. There are no national guidelines on what should be collected, although there is a degree of similarity across public health services. Tables 1 and 2 show the data fields from four public health services and notification statistics for all PHSs that reported obtaining such data.

It is likely that the vast majority of serious, but non-fatal, acute injuries from chemical exposures will present to the emergency department of a hospital. After the emergency department, the patients may either be released as outpatients after a short stay or, in more serious cases, admitted into a hospital ward. Hospitals each have their own systems for managing records for patients. At Wellington hospital, for example, the basic patient identification information is collected and the nature of the emergency is identified. Injuries from poisonings are segregated into intentional and unintentional categories, and then are classified according to ICD-10 coding.

Reports on hospital-admitted poisonings may be received by the Public Health Service in the form of a faxed or posted paper form with locally-agreed data fields. A critical issue lies in clarifying lines of responsibility for notifying of poisonings at the hospital level. Often hospital staff turnover results in a sudden drop of notifications to the PHS, and reminders are then sent. New staff in emergency rooms may not be aware of reporting requirements under the Toxic Substances or HSNO Acts. Some written guidance material outlining these various responsibilities would be valuable.

Some local public health services have quite sophisticated arrangements, in some cases involving surveillance software. For example, a computerised surveillance system for poisonings currently exists at Auckland Healthcare. This system is set up to collect all

emergency room visits concerning poisonings from 4 major hospitals. Information collected is descriptively analysed and reports are created on a quarterly basis.

Data currently collected by several PHS are shown in Table 2. As shown in the Table, there is a reasonable degree of consistency between the four regions.

**Table 2.** Comparison of acute poisoning data fields currently collected by four public health services

<b>Data field</b>	<b>Auckland Healthcare</b>	<b>Hutt Valley Health</b>	<b>Southern Public Health</b>	<b>Marlborough Public Health</b>
Name of injured	✓	✓	✓	✓
Address	✓	✓	✓	✓
Date of birth	✓	✓	✓	✓
Gender	✓	✓	✓	✓
Ethnicity	✓	✓		✓
Product name	✓	✓	✓	✓
Chemical common name	✓	✓	✓	✓
Exposure setting	✓	✓	✓	
Circumstances	✓	✓	✓	
Date of admission	✓		✓	✓
Length of admission	✓			
Hospital name/ID	✓	✓	✓	
Outcome	✓	✓	✓	✓
Other fields used by PHS's	*date notified vs date presented *estimated quantity *follow up actions *container type	*notifying Dr *occupation *telephone *admitted or discharged *agencies *deceased date *referred from	*Child vs. adult *Child safety measures *Date of poisoning *Notified by *telephone *comments	*Date of poisoning *admitted (yes/no) *home contact person *telephone *comments

Other possibilities: route of exposure, organ systems affected, symptoms or signs

In 1999, Public Health Services were asked by the Ministry of Health to provide information on their own local poisoning statistics by month. The following table summarises the responses of each local PHS to these queries.

**Table 3.** Approximate number of poisoning notifications per month by Health District

<b>PHS</b>	<b>Notifications per month</b>
A+	150
Southern Public Health	20
Healthcare Otago	No data
Healthcare Hawkes Bay	30
Marlborough Public Health	19
Crown Public Health	30
Taranaki Healthcare	9
Midcentral Health	8
Hutt Valley Health	35
Health Bay of Plenty*	1
Choice Health Wairarapa	3
Northland Health	15
Health Waikato	80
Tairāwhiti Healthcare	2
<b>Total</b>	<b>402</b>

\* unclear if Health Bay of Plenty are being notified by hospitals of chemical injuries

The 402 monthly total is equivalent to a total of 4,800 cases per year. These statistics do not segregate hospital ward admissions from emergency room visits, and so could be an overestimate of the number of actual hospital ward admissions. It is, however, almost certainly an underestimate of the number of emergency room visits for poisonings, as the notification rates are likely to be less than 100% for all hospitals. In addition, data from coroners' reports are not included in Table 3. However, mortality data would only be expected to contribute about 7-9 cases per month nationwide.

## Other sources of information on poisonings in New Zealand

### *Hospital Discharge Data*

The New Zealand Health Information Service (NZHIS) keeps morbidity statistics on non-occupational injuries, and mortality statistics on all injuries, including occupational injuries and deaths. The International Classification of Diseases (ICD) codes used by the NZHIS for injuries are shown in Table 4.

**Table 4.** ICD Codes and Descriptions used by the NZHIS\*

External cause codes		ICD-9 code	ICD-10 code
	Accidental poisoning by drugs, medicinal substances, and biologicals	E850 - 858	X40 - 45, X48 - 49
	Accidental poisoning by other solid and liquid substances, gases and vapours (excluding foodstuffs, piped gases, other utility gases)	E860 - 864	
		E866	
		E868.0	
	Accident caused by caustic and corrosive substances	E924.1	
	Late effects of accidental poisoning	E929.2	Y88.0 (therapeutic only)
	Drugs, medicinal and biological substances causing adverse effects in therapeutic use	E930 - 949	Y40 - 59
	Suicide/self-inflicted (purposeful)	E950	X60 - 65, X68 - 69
	Undetermined whether purposeful or self inflicted	E980	Y10 - Y16
<b>Toxic effect codes</b>			

External cause codes		ICD-9 code	ICD-10 code
	All codes specifying a toxic effect of a drug or chemical will be accompanied by one of the above external cause codes.		
	Late effect of poisoning due to drug, medicinal or biological substance	909.0	T96
	Late effect of toxic effects of nonmedicinal substances	909.1	T97
	Late effect of adverse effect of drug, medicinal or biological substance	909.5	Various codes specific to nature of adverse effect
	Poisoning by drugs, medicinal substances and biological substances	960 - 979	T36 - T50
	Toxic effects of substances chiefly non-medicinal as to source	980 - 989 except 986 and 988	T51 - T65
<b>Other codes</b>			
	Acute alcoholic intoxication	3030	F10 - F19 with fourth digit 0 except F17
	Drug dependence - intoxication	304 with 5th digit 0-2	
	Drug abuse	305 with 5th digit 0-2	
	<i>Please note that the ICD-9 codes for intoxication are not precise and should be indicative only.</i>		
	<i>Source: New Zealand Health Information Service 2000</i>		

The NZHIS data are categorised, as shown above. However, the statistics tend not to be up-to-date. For example, at the time of this report, the latest figures for mortality and morbidity from public hospitals are for 1996-1997. This is largely due to late arrivals of coroners' reports, which sometimes undergo lengthy legal processes before becoming available.

Another limitation is that poisoning cases are placed into broad categories, which do not identify the specific chemicals involved.

### *National Poisons Centre*

The National Poisons Centre (NPC) in Dunedin fields about 21,000 phone calls per year, covering a range of different chemical exposures. The centre has developed a computerized database of all enquiries regarding actual or potential toxic exposures, utilizing a poisoning incident report format. There is no requirement to phone the NPC in the event of a poisoning; therefore, the NPC mainly serves as a source of expert advice on treatment. This service operates 24 hours per day, 365 days per year. Each telephone call is logged into a database that records information on the patient, the caller, the site of exposure, the substance, incident details, and symptoms, in addition to assessment and treatment advice given. The NPC also answers general queries about potential toxic hazards in occupational and other settings. The annual report of the NPC breaks down poisoning enquiries by category of agent (agricultural chemical, household chemical, etc.), and then again by subcategory (insecticide, fertiliser, etc.).

The NPC maintains an important national link with the World Health Organisation's International Programme on Chemical Safety (IPCS) network of poison control centres around the world. The IPCS has developed a standardised set of reporting forms for chemical injury and other hazardous chemical incidents. These forms are currently still in draft form but will be included in the IPCS INTOX software. The draft IPCS forms are included as Appendix 2.

### *Coroner's reports*

Coronial data are not captured by the local PHS, nor by hospitals, yet deaths from acute exposure to substances are a vital piece of information for a chemical injury surveillance system as these are the most severe responses. There is no specific provision in the HSNO Act requiring the Minister of Health to be notified of poisoning deaths, even though these are the most severe episodes of chemical injury.

All deaths in New Zealand are required to be notified to the Police. The police then decide whether it is necessary to refer the case to the coroner for investigation. For many deaths, no coroner investigation is necessary and it is sufficient for the person's personal GP to certify the cause of death. However, if the circumstances of the death are "sudden, unnatural, or violent", these deaths are likely to be referred to a coroner. All deaths by chemical poisoning would fall into this latter category.

There are approximately 80 coroners in New Zealand, and about 4,500 coroners' reports per year. These reports are sent to the Coronial Services Office in Wellington, and to the Registrar of Births Deaths and Marriages (Department of Internal Affairs). The Registrar of Births Deaths and Marriages sends the summaries of the reports to the New Zealand Health Information Service (NZHIS). The NZHIS uses these data to produce an annual report of causes of mortality in NZ, but these reports are often 2-3 years old. In many instances, delays are the result of lengthy investigations by coroners over causes of death.

The verdicts from coroners are coded in the National Coronial Index, available for viewing by appointment at the Coronial Services Office in Wellington. These codes ("A" through "I"), relate to specific causes of death. Code "F" refers to poisoning or drug overdose when there is no clear evidence of intent to commit suicide. Other verdict codes may indicate causes of death involving an intentional poisoning (e.g. homicide or suicide). The chemical substance identification or exposure circumstances responsible for the death must be obtained manually from the individual coroner reports, also available at the Coronial Services Office. For the years 1994-98, there was an average of 77 "F" code reports per year (range: 66-99).

### **Overseas Situation**

### *Surveillance Systems in other countries*

Most countries rely either on poison centre records or coroners' reports for surveillance of chemical injuries. Larger countries, such as the U.S., rely on regional poison centre data from individual States. National data are usually a conglomeration of such regional databases. Such data are better recorded as "incidents" rather than injuries, as the poisoning data originate from a variety of sources, and are of varying severity. This is similar to the phone call database maintained by the National Poison Centre in Dunedin.

The specific requirements under HSNO that call for notifications of hospitalisations from chemical injuries, are not met by this kind of system.

Although we did not exhaustively search international surveillance activities in this area, we were unable to locate a surveillance system in other countries with analogous goals and mandates of the present proposed system.

### *International Agreements and Conventions*

The United Nations International Programme on Chemical Safety has produced a software package for use by poison centres internationally. A key purpose is to standardise the data captured, to allow for international comparisons of poisoning statistics. A recent IPCS meeting (October 1999) in Singapore discussed data reporting fields that would serve to harmonise terminology and data reporting between poisons centres of various countries. The proposed data fields cover all types of chemical incidents and consequences, including ecological effects from environmental spills. Though the length of these forms and corresponding level of detail are considerable, and may be impracticable for routine chemical injury surveillance purposes, it may be possible to make active only those fields that are of interest.

## **C. Considerations for a proposed national surveillance system for chemical injuries**

### **Uses and attributes of surveillance systems**

The primary purpose of this report is to propose a national surveillance system for poisonings and other chemical injuries. Before specifying such a system, it is necessary to define the purpose of the chemical injury surveillance system and desirable features and functions that the ideal system would have. It may turn out to be neither practicable nor cost-effective for the actual system to fully match the ideal system. Nonetheless, it is important for the ideal system to be defined, so that it can at least be a goal to be worked towards.

There are various definitions for surveillance, including “continuous analysis, interpretation, and feedback of systematically collected data, generally using methods distinguished by their practicality, uniformity, and rapidity, rather than by accuracy or completeness” (Last, 1995). Surveillance is particularly characterised by its association with mechanisms for taking swift and appropriate responsive action if the results of the surveillance system show such action is warranted.

Of primary importance is that a surveillance system be useful. It has been stated that a surveillance system may be useful if it satisfactorily addresses at least one of the following questions (Klaucke et al., 1988):

Does the system:

1. Detect trends signalling changes in the occurrence of disease?
2. Detect epidemics?
3. Provide estimates of the magnitude of morbidity and mortality related to the health problem under surveillance?
4. Stimulate epidemiologic research likely to lead to control or prevention?
5. Identify risk factors associated with disease occurrence?
6. Permit assessment of the effects of control measures?

7. Lead to improved clinical practice by the health-care providers who are the constituents of the surveillance system?

In our view, a chemical injury surveillance system in New Zealand should have the potential at least to contribute to all of these goals. By combining data at a national level it should be able to detect emerging trends in chemical injuries, particularly if these lead to fatalities. In that sense it should be able to detect “epidemics”. The data should be useful for assessing the extent of morbidity and mortality associated with chemical injury, and its availability may stimulate epidemiologic research, possibly leading to the identification of risk factors for chemical injury and possible control measures. Finally, there is the potential for the data to identify situations where treatment of cases might be improved.

In addition to the uses set out above, any such system should be useful at both a local and a national level. Data which are regularly reported to the national level should be analysed and the analysed results regularly fed back to those who report the data. A system which does not report back analysed results and only has value at the national (regulatory and policy-making) level is likely to become slowly run-down. It will provide little incentive for national reporting to those who locally report and collect the data. This would appear to have been a problem with the system that existed in New Zealand until about 1990.

The system should also be directly useful at the local level. Case-reports of poisoning or other chemical injuries should, in at least some cases, alert public health staff to the need for interventions to prevent possible recurrences or to address some other public health problem signalled by the incident.

Seven attributes of a successful surveillance system have been defined (Klaucke et al., 1988):

1. Simplicity (The system should be as simple as possible while meeting its objectives)
2. Flexibility (The system should be able to readily adapt to changing information needs and variation in reporting sources)

3. Acceptability (The system should not impose unacceptable conditions or requirements on those who are required to report the data)
4. Sensitivity (The system should be likely to detect a high proportion of cases in order to detect trends and patterns)
5. Positive predictive value (A high proportion of cases reported by the system should be true cases of the condition under surveillance – in this case, injuries caused by chemical substances)
6. Representativeness (In order to be able to generalise to the population at large the cases that are detected by the system should be representative of all cases. Representativeness is more important than collection of data on all cases.)
7. Timeliness (The value of the surveillance system is largely a function of the speed at which the data move through the system from initial reporting at a local level, national reporting, data analysis, and feedback of results to data suppliers and appropriate regulatory or public health authorities).

Again, these attributes are ideals and their relative importance will vary depending on the surveillance system under consideration.

Most experience in New Zealand is with the surveillance of communicable diseases, through the national notifiable disease surveillance system. However, there are likely to be several important differences in terms of attributes between the existing communicable (notifiable) diseases surveillance system and the likely chemical injuries surveillance system:

Positive predictive value: With communicable diseases there is a generally well-defined list of diseases with case-definitions. Notification requires not only clinical illness, but also laboratory confirmation of the presence of the organism. Therefore, there is generally a very high positive predictive value. With chemical injuries, particularly poisoning, the situation is likely to be less clear cut. For example, children will often be taken to hospital by their parents on suspicion that they have consumed the contents of containers that they have been

found to be playing with. In some cases the children will not have consumed anything. Treatment may be administered on suspicion, without any laboratory confirmation of actual ingestion. In other cases, consumption of some non-food items (eg, detergent) would probably result in no physical health damage at all, even in the complete absence of treatment. These are not true poisonings (one commentator has described them as “inappropriate ingestions”), but will frequently be reported as such. The upshot of this is that, compared with communicable disease notifications, there is likely to be a wide range of variation in the nature and severity of the cases associated with chemical injury notifications, with a relatively lower positive predictive value. Numbers of reported cases should not be taken at face value as an indication of severity of the problem.

Timeliness: At a national level probably the major value of a chemical injury surveillance system is to identify existing or emerging chemical substances or products which are causing disproportionate harm. However, in most cases, detection of these substances is likely to be relatively slow, since it will rely on the accumulation of a sufficient number of cases for it to become apparent to the operators of the surveillance system. This is in contrast to the situation with communicable diseases for which outbreaks can be comparatively explosive, if, for example, there is a substantial non-immune population or a contaminated food item moves into commerce or is consumed at a social function. The implication of this difference is that the frequency of feed back of analysed data to suppliers and appropriate authorities may reasonably be less than the frequency of feedback of analysed data for communicable disease notifications.

It is possible that a food item contaminated with a chemical substance could move into commerce and cause an explosive increase in cases of illness or death. Such occurrences are rare, but have occurred overseas (e.g., the Spanish toxic oil syndrome of the early 1980s). In the unlikely event that there was such an occurrence in New Zealand it probably would not first be detected via a chemical injury notification system. It is more likely to be reported as an acute disease outbreak, or through the notifiable disease system using a category, such as “poisoning arising from chemical contamination of the environment” or “acute gastroenteritis”.

Representativeness: Under both the Toxic Substances Act and the HSNO Act there is a requirement only for chemical injury cases involving admission to a hospital to be notified to the medical officer of health. In addition, there is a requirement in the Toxic Substances Act, not present in the HSNO Act, for Registrars of Births and Deaths to notify deaths from poisoning. This differs from the situation with notifiable diseases where every medical practitioner is required to notify.

The implication of this difference is that a surveillance system for chemical injuries would presently only be empowered to collect data on more serious, non-fatal cases. Anyone who attends only their GP or is solely a hospital outpatient would not be required to be notified. In addition, anyone who died before reaching hospital would not be notified under the HSNO Act requirements. This means that the system as intended under the HSNO legislation would be unlikely to collect a representative selection of cases – it would miss the less serious (ie, not hospitalised) cases, as well as the cases with the most serious outcome (ie, death). This is also an issue of low sensitivity. The system would collect data on only a small fraction of cases of injuries attributed by the medical profession to chemicals. We consider below whether it would be important to collect data on these other cases of chemical injury and, if so, how it might be done.

### **The scope of a national chemical injury surveillance system**

Although the Toxic Substances Act is currently in force and requires only notifications of poisonings, we have assumed for the purposes of this report that the provisions of the HSNO Act will come into force shortly. Therefore, we have couched our proposal for a surveillance system in terms of collection of data on the broader category of injuries caused by hazardous substances. “Hazardous substance” is defined in the HSNO Act (section 2) as including substances with one or more of the following properties: explosiveness, flammability, oxidising capacity, corrosiveness, toxicity (including chronic toxicity), or ecotoxicity; or the ability to react with air or water to form a substance with one of those properties.

In our discussions with stakeholders during the development of this proposal, it became apparent that a key issue involved the scope of the injuries caused by chemicals that would

most appropriately be covered by a national surveillance system. The key issues can be summarised as follows:

- Should both acute and chronic chemical injuries be covered?
- Should injuries from both medicines and non-medicines be included?
- Should adverse reactions to drugs or prescribed medicines be included?
- Should the system be extended to include cases treated only by GPs and cases treated only in outpatient facilities?
- Should fatalities occurring before hospitalisation be included?
- Should both unintentional and intentional injuries (ie, suicide attempts and homicides) be included?
- Should cases of occupational injury from chemicals be included?
- Should chemical incidents (eg, spillages, agrichemical spray drift incidents) be included?

We have carefully considered all these issues in the light of likely uses of the system, the existence of other surveillance systems, and the desirable attributes of surveillance systems outlined above. In brief, our views on these issues are:

#### *Acute and/or Chronic injuries*

Section 143 of the HSNO Act requires notification by a hospital of “any injury caused by a hazardous substance” resulting in admission. The Act is silent on the meaning of “injury”, but “hazardous substance” is defined as including substances with the ability to cause chronic (as well as acute) toxicity. Therefore, a literal interpretation of the statute would suggest that it is intended that notifications include chronic injuries caused by hazardous substances. Potentially, this could include cancers, such as those caused by tobacco, mesothelioma

caused by asbestos, and a number of other conditions possibly associated with exposures that may date back decades. It might also, for example, include alcohol-related injuries, such as cirrhosis of the liver associated with long-term alcohol consumption, foetal alcohol syndrome, or even injuries or fatalities caused by motor vehicle crashes in which the driver was under the influence of alcohol or other drugs.

This raises a fundamental question: was it intended and would it be useful to include such injuries in the surveillance system? This is an issue that requires a clear policy decision, and it is essential that it be clarified. In our view, as a general principle, it is inadvisable to include chronic injuries in the initial surveillance system. Chronic injuries are usually not specific in nature and they are often recognised only after long periods of time have elapsed after exposures, making timely interventions impossible for the affected individuals.

Furthermore, such patients are often treated not in hospitals, but by GPs and other health care providers, who are not required to notify poisoning/chemical injury cases. While these reasons argue against including chronic chemical exposures and injuries in surveillance, the ideal surveillance system would still allow the flexibility for notifying chronic injuries when there is an established toxicological or epidemiological link between exposure and effect. Injuries secondary to the chemical exposure (e.g. a driving crash after consuming alcohol) would complicate and confuse notification statistics. We believe the surveillance system should focus on the primary hazardous qualities (e.g., toxicity or corrosiveness) of the substances.

We also believe the surveillance system should focus on injuries caused by short term exposures, but be flexible enough to accommodate injuries from a range of exposure circumstances.

We therefore consider that it would be appropriate initially to restrict the chemical injuries encompassed by the proposed surveillance system to those arising from acute exposures (using a flexible definition of “acute”), including acute chemical injuries that might not be classified as poisonings, such as severe chemical burns. This can be justified in terms of the requirement for timeliness and the need to maintain a high positive predictive value. It would also allow the exposure component of the data, including substance identification, to be more accurately and comprehensively reported. While injuries arising from chronic exposures

could be considered at a later stage, it is our opinion that an initial focus on the most serious acute injuries and the simplest data flow would be advantageous.

#### *Adverse reactions to prescribed medicines or drugs*

We consider that data on adverse reactions to therapeutic drugs should be specifically excluded from consideration. There is already a satisfactory system in place operated by the University of Otago, and we see no reason for dual data collection. It is also likely to be the case that most adverse reactions involve GPs only and not hospital admissions.

In regard to adverse reactions to drugs of abuse, including overdoses, we believe that these would appropriately be collected by the system we propose.

#### *Injuries not involving hospital admission.*

As described earlier, the HSNO Act, section 143, stipulates only that injuries resulting in admission to a hospital must be notified to the Medical Officer of Health. "Admission" is not defined in the Act. However, it would appear to exclude patients treated only in emergency rooms, and certainly excludes patients treated only by their GP.

Clearly, the definition of what constitutes an "admission" will be critical to the consistent and appropriate implementation of the chemical injury surveillance system. Some hospitals may interpret admission as meaning only admission to a ward and an overnight stay, whereas others may interpret it as including admission to short stay units where injured people can be treated and later released the same day. The public health protective intent of HSNO implies that all significant injuries be notified. Therefore it seems appropriate to include short stay unit cases in the definition of "admission". We believe it would be appropriate to clarify this, either by amendment of the Act or by the issue of an administrative guideline.

A wider issue is whether it would be desirable or even cost-effective for the requirement for collection of chemical injury surveillance data to be broadened to include cases treated only in emergency rooms and even cases treated only by GPs. We understand that some public health services have arrangements with local hospitals to collect data also from ER visits. Many chemical injuries are treated in the emergency rooms or after hours, but do not require

admission to a hospital ward. It is not known what proportion of all poisonings would be short term ER visits, but it is likely to be the majority. Some medical officers of health we have consulted have advocated amendment of the HSNO Act to stipulate that injuries resulting in ER visits also be notified. One justification for this position is that ER visits may be the first places where “near misses” of actual serious poisonings occur, and therefore be important in signalling the need for preventive measures to be taken.

In our view it would be premature to extend the notification requirements to include emergency room visits or GP visits, for two main reasons: Firstly, we are in the process of implementing what is essentially a new national surveillance system. Although local notifications do already occur, we have good reason to believe that they are incomplete. There is considerable work to be done simply to ensure that there is complete notification of admissions, let alone broadening the system to require notifications from emergency rooms. Such broadening, if it were made a general legal requirement, would potentially consume considerable resources and not necessarily bring commensurate returns. It would be better to get the system operating in a more limited fashion (ie, admissions only) before making any decision to extend it to other possible sources of notifications. It would be possible to construct a surveillance system to allow for the local option of including notifications of cases dealt with only in emergency rooms. These data could then be analysed and responded to locally, even if the data were not reported to the national surveillance system.,

It is reasonable to assume that admissions involve the most serious cases (not including fatalities, which are discussed below). A more extensive inclusion criterion would capture many cases that were not necessarily chemical injury cases, for reasons described above. Even though admissions may constitute the “tip of the iceberg”, any substance that was causing true injuries treated in substantial numbers in emergency rooms and by GPs would almost certainly generate appreciable numbers of admissions. Despite this, there could be advantages in public health services being made aware of the less serious cases, so that they could intervene, if appropriate.

In consideration of this, we recommend that the initial surveillance system be designed to meet the letter of the HSNO Act, as currently written, and to include only data from hospital ward admissions or admissions into short stay units. We suggest that consideration be given

to amending the HSNO Act to include a clear definition of admission. The surveillance system we propose would have the flexibility to permit local inclusion of ER visits. Also, if appropriate, it should be able eventually to be extended to include national data collection of ER visits, and possibly data from GPs or other health care providers, should it be decided there were significant public health and regulatory gains to be made by addition of these data. This would be contingent on appropriate amendments to the HSNO Act.

### *Deaths*

Unlike the Toxic Substances Act 1979 there is no specific provision in the HSNO Act requiring notification of poisoning deaths by Registrars of Births and Deaths. This situation is anomalous, as deaths are obviously the most severe chemical injuries, and they will often occur before admission to a hospital. For a comprehensive and useful chemical injury surveillance system it would be essential to obtain data on fatal cases. In the light of this consideration, we have proposed below a surveillance system which, using administrative procedures, would also capture data on deaths caused by hazardous substances.

### *Therapeutic substances*

Section 143 of the HSNO Act makes no distinction between hazardous substances that are therapeutic substances and those that are not. We believe it appropriate that the proposed system collect data on both medicines and non-medicines, as there is no other system separately collecting data on therapeutics. However, as discussed above, we do not believe that the proposed system should collect data on therapeutics that cause adverse reactions when they are used as intended. The system should be confined to injury from therapeutics when they have been inappropriately used (e.g., overdoses).

### *Occupational injuries*

Section 143 of the HSNO Act contains no exclusion for chemical injuries sustained while at work and must, therefore, be considered to include them. The question arises whether this is simply duplicating the data collection of the NODS system maintained by OSH. We consider that while there would be some dual reporting the overlap would probably not be great.

The NODS system obtains reports from a wide variety of clinical sources, including GPs and occupational physicians. It will include injuries ranging from mild to severe, and both acute and chronic injuries. In this sense, even though the system is voluntary, NODS data go beyond the requirements under HSNO to notify of hospitalisations. Therefore, it appears that the NODS system would need to remain separate from any proposed general surveillance system for chemical injuries. However, once the national chemical injury surveillance system is operating it would probably be worthwhile for there to be administrative arrangements between departments so that OSH may take advantage of the occupational injury data that are collected under HSNO. For this purpose it would be essential that the data collection form used for chemical injury surveillance contained a field for recording whether the injury was the result of an occupational exposure.

#### *Intentional vs. unintentional injuries*

Some jurisdictions make the distinction between intentional (e.g., from a suicide or homicide attempt) and unintentional injuries (where the exposure or its effect were unintentional), while others may not. However, the distinction between intentional and unintentional is not always clear. Section 143 of the HSNO Act makes no distinction between the two categories and data on both types of injury should be collected by the system.

The types of public health interventions appropriate in response to intentional injuries will differ from responses to unintentional injuries. Therefore, we consider it important for the proposed surveillance system to attempt to distinguish the two types of injuries as this will help in focusing on preventative or control measures. Although some inferences can be made about intentionality on the basis of the age of the case and the nature of the substance involved, these are not always exact and an appropriate field should be included in the data collection instrument.

#### *Incidents involving hazardous substances*

Section 144 of the HSNO Act states:

#### 144. Reporting of Incidents

- (1) Every person in charge of a substance involved in an incident resulting in serious harm to any person or serious environmental damage shall, unless an enforcement officer attended the incident or subsection (2) of this section applies, report that incident to an enforcement officer.
- (2) No person shall be obliged to report an incident to an enforcement officer under the Act where the incident is required to be reported under any other Act.

The question has been raised as to whether notifications under this section should be part of the same surveillance system that would capture data on injuries caused by chemicals under section 143 of the HSNO Act. For a number of reasons we do not believe this would be appropriate. Firstly, the reporting authorities under sections 143 and 144 are quite different. Section 143 notifications arise in hospitals and are made to medical officers of health; section 144 reports may arise from any person in charge of a substance and are made to an enforcement officer (who may in some circumstances be a medical officer of health). Secondly, although the incidents covered by section 144 may indeed result in chemical injuries, in general the data sets that will be captured will be substantially different, and the flows of data will also be different. Attempting to merge the two systems would inevitably lead to a confused and chaotic situation.

Having said that, we suggest that any surveillance system that may in the future be designed to collect information on incidents involving substances (including associated injuries) be structured so that it may be linked to the proposed surveillance system for chemical injuries.

### **Summary of the scope of the proposed system**

As discussed above, the system we propose will collect chemical injury surveillance data on:

- Hospital admissions, including admissions to short-stay units
- Injuries caused by inappropriate use of therapeutic and non-therapeutic substances
- Acute, but not chronic, injuries
- Both occupational and non-occupational injuries
- Both intentional and unintentional injuries
- Deaths occurring before or after admission to hospital

The system will not collect data on:

- Injuries treated solely in emergency rooms or by GPs or other practitioners
- Adverse reactions to therapeutic substances used as intended
- Chronic illnesses/injuries
- Incidents involving chemicals

**Do you agree with the proposed scope of poisonings/chemical injuries that would be covered by the surveillance system? If not, what changes would you make?**

### **Surveillance system objectives**

Taking into account the above considerations we have set out below what we see as appropriate objectives for the national chemical injury surveillance system. As discussed, there are complementary national and local uses for surveillance data and, therefore, we propose both national and local objectives. Surveillance at a national level is important because the number of events occurring at any individual local level may be too few to permit identification of emerging hazards. Combining the data from across the country may produce sufficient numbers of similar events that otherwise difficult-to-detect patterns and trends may become apparent. Also, collation of data at the national level feeds into policy formulation and assists in the development of regulations.

At the local level surveillance data may be used to follow-up on chemical injuries, so that appropriate preventive measures may be introduced.

Proposed national objectives of the chemical injury surveillance system are:

1. Identification of new (emerging) product-specific hazards in the community
2. Identification of national trends and regional differences in poisoning notification rates, leading to appropriate investigations
3. Identification of high risk population groups

4. Provision of data to justify policy and regulatory decisions, including scheduling of chemicals and amendments to the legislation
5. Provision of data for developing health education resources
6. Provision of data for making resource allocation decisions
7. Compliance with legal requirements
8. Provision of data for epidemiological research

Proposed local objectives for the chemical injury surveillance system are:

1. Provision of adequate data for follow-up and investigation of chemical injuries occurring locally
2. Monitoring of local trends
3. Provision of data for justifying poisoning prevention initiatives
4. Provision of data for making resource allocation decisions
5. Compliance with legal requirements

These objectives should be viewed in the context of the proposed scope of the system, as set out in the previous section.

**Question: Do you agree with the proposed objectives? Are there others that should be added?**

## **D. A Proposal for National Surveillance of Chemical Injuries in New Zealand**

In identifying options for the establishment of a national poisoning surveillance system for New Zealand, we start from the position that, irrespective of any proposal we make, local arrangements for supply of data from hospitals to medical officers of health will continue, as this will be a requirement of the HSNO Act. Despite this, our investigations suggest there is ample room for a national system to strengthen and standardise procedures occurring at the local level. The other main area of benefit from a national surveillance system would come from combining data from across the country. This would allow the identification of trends and patterns not apparent at a local level.

Any national hazardous chemical injury surveillance system for New Zealand should be able to fulfil the objectives set out above and also measure up well in terms of the attributes for surveillance systems set out on page 12. In the course of this work we have identified four possibilities for consideration of inclusion in the national surveillance system. These are:

1. Regular analysis of data from the New Zealand Health Information Service. This would involve periodic collection and statistical analysis of hospital discharge and mortality data. Geographic patterns and time trends would be sought and the data could be fed back to medical officers of health.
2. Greater use of data collected from enquiries to the National Poisons Centre in Dunedin. The annual number of enquiries to the NPC (about 21,000) considerably exceeds the annual number of poisoning notifications received from hospitals by medical officers of health (about 5,000).
3. Operation of a surveillance system similar to that currently in use for collection of notifiable disease data. Under contract to the Ministry of Health, ESR operates the national notifiable disease surveillance system. This involves regular collection from public health units of data on notified diseases, using EpiSurv, a purpose-built data collection software tool, with analytic capabilities. The transmitted data are collated by ESR, analysed for trends and patterns, and the results of the analysis fed back monthly,

via the New Zealand Public Health Report, to suppliers of the data. Procedures for collection, collation, and analysis of the data are now very well developed and an analogous or parallel system could readily be developed for notifications of hazardous chemicals injuries.

4. Regular collection and analysis of data collected from the National Coronial Office in Wellington. The National Coronial Index would readily allow identification of all coroners' reports of non-intentional poisoning cases. In addition, if it was considered to be useful, reports of intentional poisonings (suicides) could also be identified. Using a standardised form it would be possible to extract consistent information from coroners' reports about each of the cases. This might be done, say, every 3 months during a regular visit to the Coronial Office. This administrative procedure would supply the information on fatalities that would not be collected under the HSNO Act, and would require no change to the law. Our advice is that, other than photocopying charges, there would be no charge for making the reports available, provided someone was sent to scan the reports and record the appropriate data. Since receipt of coroners' reports at the national office may sometimes be quite delayed, there would need to be a mechanism to update previous years' statistics with late data.

In our view, all of these components have a role to play in a national chemical injury surveillance system. We believe that, given the success of the national notifiable disease surveillance system and the experience gained in its operation, it would be most appropriate to apply a similar approach to the collection, collation, analysis, and feed-back of data on injuries from chemicals. At the same time, to supply information on fatalities, data should be systematically and regularly extracted from appropriate coroners' reports. This would be done at a national level, and a summary of the data incorporated in the national surveillance report which would periodically feed back analysed data to suppliers..

We have considered the possible alternatives for national surveillance. Firstly, use of NZHIS hospital discharge and mortality data would not, in itself, be adequate for national surveillance for several reasons, particularly:

- a) There would be delays in obtaining up-to-date data, particularly for mortality.

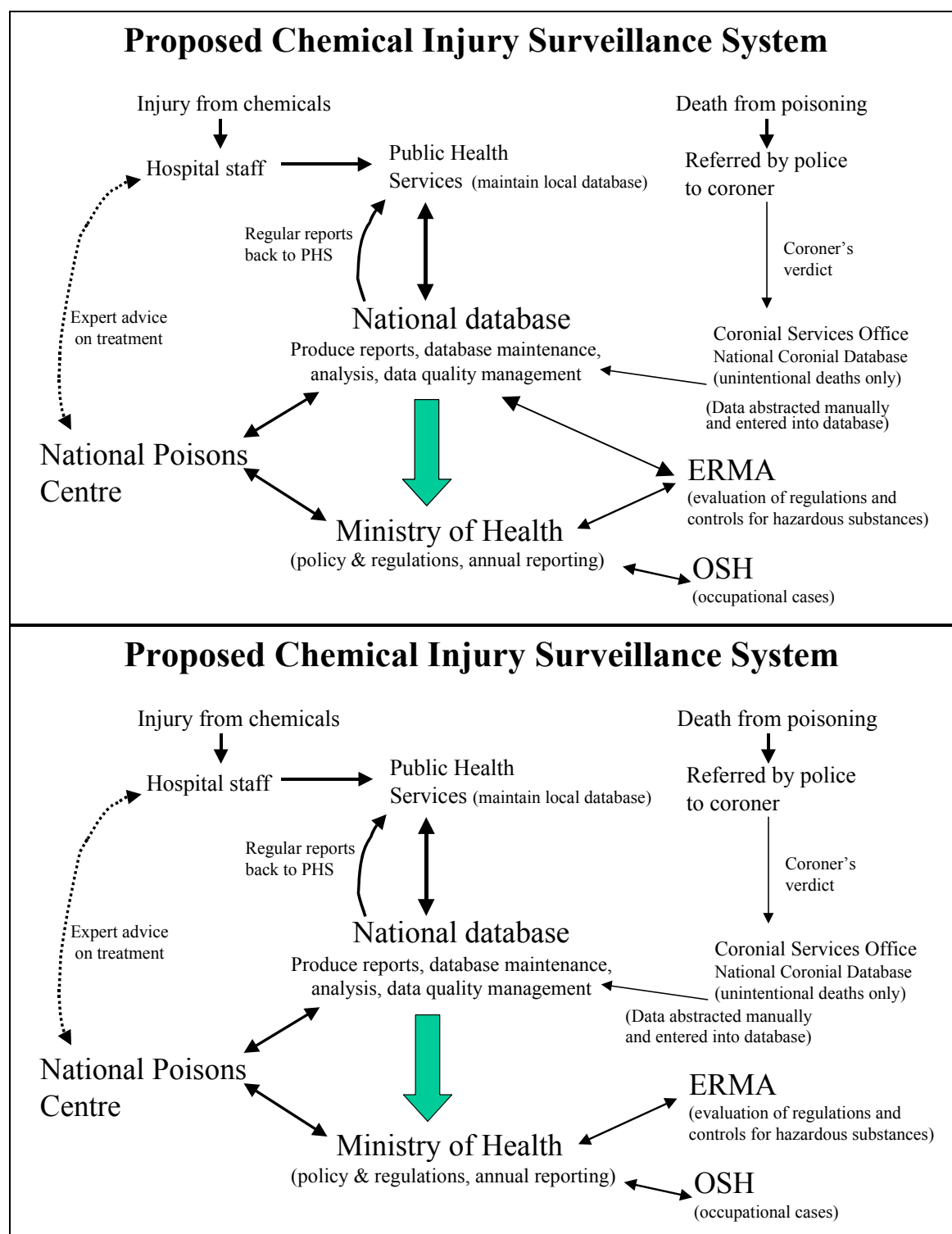
- b) The information provided by the system, when collated at a national level would be insufficiently specific to identify particular implicated chemicals or chemical products.
- c) The information would not be likely to contain personal identifiers to facilitate interventions for particular incidents.

Despite these limitations, periodic analysis of NZHIS data would be useful, since it would provide a check on the completeness of the data collection in the national surveillance system.

Data collected by the NPC are of value in that they cover more than just hospitalised cases of poisoning and can be used to provide a more comprehensive picture of potential poisonings occurring around the country. However, NPC data represent enquiries not necessarily from hospitals, usually in the early stages of a poisoning, and do not cover outcomes. As such, they do not provide a picture of the severity of chemical injuries. Information on outcome is, however, available from notifications of hospital admissions. We believe that it would be essential for the hazardous chemical surveillance system to maintain close links with the NPC, with a regular sharing of data. Information on enquiries to the NPC could be used to tailor the data collection categories in the surveillance system and could guide the statistical analysis.

Figure 1 shows how data would flow in the proposed surveillance system.

**Figure 1.**



**In general, do you agree with the scheme proposed in Figure 1? Are there any modifications that you would make?**

There are several other important questions that must be addressed in specifying the form of the national surveillance system. These include:

1. How can local notification of hospital admissions be improved and strengthened?
2. Which data should be captured by the system?
3. Should the national database contain personal identifiers?
4. What type of analysis of the national data set would be carried out?
5. How would analysed data be fed back to suppliers, and how frequently?
6. Would data be collected and transmitted using an existing software system or via another purpose-built system?
7. Which agency would operate the national surveillance system?
8. Should the national surveillance system be operated as a sentinel system?
9. Who should be responsible for ensuring notifications by hospitals?

We are not in a position to give definitive answers to any of these questions, as they will require further and more-detailed discussion and will be refined during fuller specification and development of the surveillance system. However, as far as they go, our views are as follows:

1. How can local notification of hospital admissions be improved and strengthened?

We were unable to have discussions with more than a few public health services during this course of this project. However, it was clear that there are no nationally consistent or standardised procedures for referral of poisoning notifications from hospitals to public health services. Nor is there a standard data set that is collected across public health

service areas. Local surveillance is very much dependent on local arrangements, with some areas having more effective procedures than others. We believe that it is essential that, as part and parcel of the development of a national surveillance system, guidelines for collection and transfer of data locally be developed, for the use of both hospital and public health service staff. These guidelines would include specification of procedures, roles and responsibilities, and the minimum data set to be collected. Model forms for data transfer should also be developed as part of the guidelines. Because of the wide range of hospital data-capture systems in use around the country we do not think it would yet be appropriate to provide software for transfer of data from hospital to public health service. We suggest that the default option be the use of a paper form for each case (possibly faxed to the public health service), with the provision that local arrangements could be made for electronic transfer of data, provided the same data set could be captured. This would be dependent on local circumstances.

**Do you agree with this approach? Are there other ways in which notifications by hospitals can be improved and strengthened?**

1. Which data should be captured by the system?

Currently there is some variation, but also much commonality, in the poisoning notification data sets that are captured locally. Some modification will be necessary when the HSNO Act comes into force to allow for the possibility of injuries from chemicals other than just poisonings.

For the effective operation of a national surveillance system it would be essential for there to be a prescribed minimum data set (MDS) that was obtained uniformly by all public health units. This would contain the data set that was transferred to the national surveillance centre. This would leave open the possibility of local arrangements to capture more than the minimum data set. However, the additional fields would not be transferred nationally.

A key principle in development of the minimum data set would be that the data be useful. Final specification of the minimum data set will require wider consultation. However, in Appendix 1 we set out what we believe would be an appropriate minimum data set for hospitals to supply to public health units. This data set takes into account what we know of the data currently obtained from hospitals by various public health units, and also the outcome of a recent workshop convened by the World Health Organisation and held in Singapore.<sup>1</sup>

**Do you agree with the proposed minimum data set in Appendix 1? If not, what changes would you make?**

1. Should the national database contain personal identifiers?

As a general ethical principle, surveillance systems should only contain personal identifiers if they are essential for the effective operation of the system. And, even then, appropriate confidentiality safeguards should be in place.

Public health services frequently follow up cases of poisoning for preventive and regulatory purposes. Therefore, they need to receive from hospitals the names and addresses of cases. However, personal identifier information is not useful at a national level. Therefore, we believe, names and street addresses should be stripped from the MDS before it is transmitted to the national surveillance system operator.

Despite these considerations, there is a need to be able to check for duplicate reports and to eliminate these from the national data set. For this purpose, we suggest the use of encrypted NHI numbers. Every admitted patient in a hospital will have their own NHI number and this would be included in the MDS. However, NHI numbers are easily linked with names. Therefore, we propose that the software used for transmission of data between the public health units and the national centre use a confidential algorithm to encrypt the NHI number. The encrypted number would be transmitted and remain in its

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<sup>1</sup> International Programme on Chemical Safety. WHO Workshop on Strengthening the Evidence Base for Prevention of Exposures to Toxic Substances in Selected Western Pacific Region Countries: Report of the

encrypted form in the national database. This could be used to scan the national database for duplicates.

2. What type of analysis of the national data set would be carried out?

An effective surveillance system incorporates regular and standardised analysis of the collected data. Outputs of the analysis should be useful at both national and local levels. However, it is assumed that public health units will carry out a certain amount of analysis of their own data and that this capability will be incorporated in the software used for recording the data.

Specification of the national data analysis will depend on the final shape of the data set, but we suggest that, broadly, it should be sufficient for the following purposes:

- a) To identify time-trends in rates of chemical injuries, overall and at the level of age-sex categories, and at chemical class and/or product-specific levels
- b) To highlight differences in injury rates between public health unit areas
- c) To identify emerging hazards at a chemical class or product-specific level
- d) To provide data that may be used to justify and target chemical injury prevention campaigns
- e) To provide data that can guide national policy and regulatory developments

A standard set of tables should be developed in consultation with the users of the data. These might include, for example:

- Age-sex distribution of cases
- Time trends, overall and by age-sex categories
- Length of stay in hospital, as a surrogate for severity, overall and by age-sex categories

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Meeting. Singapore, 13-16 December 1999. IPCS/WPR-SING/Report.

- Local rates, overall and by age-sex categories
- Breakdown of implicated categories of chemicals, at broad category level and at a product-specific level if the data justify it.
- Distribution by intentionality
- Fatality numbers and case-fatality rates by area and by agent
- Proportion of cases where child-resistant packaging was involved.

**Are there other types of analyses that you think would be appropriate? If so, what are they?**

In addition to the routine analysis of hospital chemical injury notification data we suggest that the national surveillance system obtain from the NZHIS at periodic intervals (say, once a year) hospital discharge and mortality data for chemical injuries. The NZHIS data could be appropriately analysed and the results supplied to public health units. This would provide a check on the completeness of hospital notification of chemical injuries.

5. How would analysed data be fed back to suppliers, and how frequently?

A key component of a national surveillance system is the ability to feed back analysed data to the supplier of the original data. This acts as an incentive for continuing supply of the data and helps to fulfil one of the main criteria for surveillance systems – that they are tied to a capacity for rapid preventive or remedial action. Analysed national notifiable disease data are fed back to suppliers every month in a standardised format in the New Zealand Public Health Report. Consideration needs to be given to whether the NZPHR is the most appropriate vehicle for feedback of analysed data or whether a separate dedicated publication would be more appropriate.

We believe that the frequency of feedback of analysed data could be less than that of communicable diseases. Three or four-monthly feedback may be quite sufficient.

**How frequently should analysed data be sent back to public health services, and what would be the best way to do it?**

5. Would data be collected and transmitted from PHSs to the national surveillance centre using an existing software system or via another purpose-built system?

Probably the only existing national surveillance data collection and transmission software that could be considered potentially suitable for the purposes of transmitting chemical injury surveillance data would be the EpiSurv software used in the notifiable disease surveillance system. A module like that used by Auckland Healthcare could be added to this software for capture of chemical injury data. The advantages of this arrangement would be that the chemical injury data would “piggy-back” on the notifiable disease data every time it was transmitted. This might reduce the number of transactions necessary. The disadvantage might be that the computer dedicated to notifiable diseases might have to be used for poisoning notifications. This could cause conflicts of priority and might not be appropriate if the teams handling notifiable disease and poisoning notifications were not co-located. Co-location is unlikely to be the case in every public health unit. Therefore, a more flexible, and probably cost-effective, solution would be to create a separate version of EpiSurv (with a different name) dedicated to chemical injury notifications. Such a system could be accessed through the EpiSurv program without actually being an integral part of it, and would have its own separate case numbering system. This would take advantage of the features and capabilities already built into EpiSurv.

Again, the final technical solution to this question should be the subject of more detailed discussion with experts once general agreement on the nature of the chemical injury surveillance system has been reached. The answer is also dependent on which agency is given the role of the national surveillance centre for poisoning notifications.

**Which would suit your public health service best: an extension of EpiSurv or separate stand-alone surveillance software, probably based on the EpiSurv model?**

5. Which agency would operate the national surveillance system?

The answer to this question is a matter for decision by the Ministry. However, we note that ESR has extensive experience in development and operation of national surveillance systems linked to Public Health Services and has developed the EpiSurv software, which could be adapted to existing systems used by public health services to collect data on chemical injury notifications.

The National Poisons Centre is another option for a national surveillance centre. Although less experienced in the area of surveillance generally, the NPC has the greatest knowledge base in New Zealand on poisonings and appropriate treatments. To be an effective surveillance centre, the NPC would need to develop strong ties with the Public Health Services and develop the capacity to maintain, manage, and analyse a large notifiable disease database for regular reporting to the Ministry and local agencies.

Overall, we believe ESR would be the most cost-effectiveness option, because of its extensive experience in developing and operating national surveillance systems, including its capabilities in surveillance software development and operation, and its strong ties with public health units and regulatory agencies.

6. Should the national surveillance system be operated as a sentinel surveillance systems?

Sentinel surveillance systems have been used successfully in a number of circumstances, including influenza surveillance in New Zealand. They operate most effectively when it is not necessary to obtain information on all cases of disease, and are most effective at detecting trends and alerting to the arrival of emerging diseases. Sentinel systems are economic, but often suffer from the problem of not being representative, as they are generally reliant on the goodwill and voluntary participation of the surveillance data providers. The distribution of such providers may not be such that it captures a representative sample of disease cases.

In theory, a sentinel system might be used to provide information on chemical injuries. However, it would have certain disadvantages. Firstly it would be contrary to the requirements of the Toxic Substances and HSNO Acts, which require all poisonings or chemical injuries to be notified. Although the law could be changed, it would be difficult to change it to require a sentinel system. The reason is the general principle that the law must be applied even-handedly. As such, it could not reasonably be used to compel only a sample of hospitals or public health units to supply chemical injury data. In other words, participation in a sentinel system would need to be entered into voluntarily. However, given the wide range of activities that hospitals are currently engaged in, there could be no assurance that there would be sufficient voluntary suppliers of data or that data received would be sufficiently representative for the national system to be effective.

Taking these issues into consideration, we believe that a sentinel system would not be appropriate for chemical injury surveillance at this time, but might be reconsidered at some time in the future.

9. Who should be responsible for ensuring notifications by hospitals?

For it to be effective the new surveillance system would need to ensure that there was good compliance with the legal requirements for hospital admissions involving poisonings/chemical injuries to be notified. Although it is intended to produce written material for the guidance of hospital staff, there will also need to be some training of hospital staff in regard to their responsibilities under the legislation. We believe that the most effective system would be for the training of hospital staff to be carried out locally by PHS staff trained as trainers. These trainers could be trained at a national training day. A local training capacity would help to maintain the relationships between the PHS and local hospitals.

**Do you agree with the approach of training local trainers to train hospital staff? If not, what approach would you use?**

## **E. Recommendations**

1. That the Ministry of Health agree to development and implementation of a national surveillance system for poisonings that would be extended to chemical injuries when the HSNO Act comes into force.
2. That the details of the national surveillance system be along the lines proposed in this report, but addressed in greater detail.
3. That the Ministry consider recommending an amendment to section 143 of HSNO Act that (1) defines or replaces the word “admission”; and (2) requires notifications of chemical injuries by hospitals to be done in a timely fashion.
4. That the national surveillance system be designed to facilitate public health interventions and research, in addition to fulfilment of statutory obligations under the Toxic Substances and HSNO Acts.

<b>Do you agree with these recommendations?</b>
---

## **F. Acknowledgements**

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## **G. References**

Hanzlick and Parrish. (1996). The role of medical examiners and coroners in public health surveillance and epidemiological research. *Annu. Rev. Public Health* 17:383-409.

Klaucke DN, Buehler JW, Thacker SB, et al. (1988) Guidelines for evaluating surveillance systems. *MMWR* 37:1-18.

Last JM (1995). *A Dictionary of Epidemiology*, Third Edition. New York: Oxford University Press.

Whittaker M. (1994). *Poisoning Notification and Surveillance in New Zealand: The Current Status and Future Direction*. National Toxicology Group, University of Otago, Dunedin.

## Appendix 1 - A Proposed Minimum Data Set for Chemical Injury Surveillance

These data fields are based on what has already been developed by Public Health Services in Auckland, Hutt Valley Health, Southland Public Health, and Marlborough Public Health.

<b>Patient information</b>	<b>Categories or text fields</b>	<b>Compulsory or Optional</b>
Name	Searchable text	C
Address	Searchable text	C
Date of birth	Searchable text	C
Sex	M/F	C
Ethnicity	NZ European/Pakeha Maori Pacific island person Asian Other (searchable text)	O
Occupation	Searchable text	O
<b>Substance information</b>		
Chemical common name	Drop down list	O
Product name	Searchable text	C
<b>Exposure/incident information</b>		
Exposure setting:	Private home Workplace School Other (searchable text)	O
Container type	Bottle/jar Child resistant packaging? Bulk container Foil/plastic sealed wrap Other	O
Date/time of exposure	date	O
Type of injury	Poisoning Ingested Inhaled Absorbed through skin/eye Corrosive burns Explosive damage Other (searchable text)	C
Intentional vs. unintentional	Intentional Unintentional Indeterminate	O
Symptoms or signs	Searchable text	O
Hospital name/ID	From a national list	C
Treating physician's	Searchable text	C

<b>Patient information</b>	<b>Categories or text fields</b>	<b>Compulsory or Optional</b>
name:		
Date presented	date	C
Admitted to ward/short stay unit?	Y/N	C
Length of admission	# days	
Outcome	Discharged Died	C
Follow up action	Yes Referred to GP PHN Child/family unit Other (searchable text) No	O
Comments	Searchable text	O

## Appendix 2. IPCS Chemical Incident Data Harmonisation and Collection

### **DRAFT** **Guidelines**

This form is to be completed by the Chemical Accident Emergency Centre or the Poisons Centre or other Public Health Agencies. Usually this type of information is recorded for incidents when the incident is reported very soon after the event.

It is suggested that the name of the person recording the information is recorded and that person signs the form. Any subsequent changes should be initialled and dated.

Summary of IPCS recommended data fields discussed at the WHO IPCS meeting in Singapore (November 1999):

1. EXPOSURE TIME AND PLACE
2. COMMUNICATION
3. PATIENT DETAILS
4. CIRCUMSTANCES OF EXPOSURE
5. MAIN ACTIVITY AT TIME OF EXPOSURE
6. LOCATION OF EXPOSURE
7. ROUTE OF EXPOSURE
8. PRODUCT IDENTITY
9. CHEMICAL TYPE
10. MANAGEMENT
11. SEVERITY GRADING
12. OUTCOME
13. COMMENTS

#### **Reporting Details:**

##### *Date and time report completed:*

The date and time that the report was completed, expressed in the standard format of dd/mm/yy and hh:mm (24 hour clock) respectively.

##### *Date of Incident:*

The date and time of the start of the incident, expressed in the standard format of dd/mm/yy and hh:mm (24 hour clock) respectively.

##### *Regional Centre Code:*

Refers to the WHO regional office responsible for the country concerned. Please indicate AFRO, EMRO, EURO, etc.

##### *Incident Reference Number:*

A unique incident identification number, assigned **centrally** at the WHO Collaborating Centre for an International Clearing House for Chemical Incidents. Please leave blank.

##### *Reporting Organisation:*

Refers to the official body employing the reporting person.

*Name of Contact Person:*

The full name of the person completing the report form.

*Address:*

The full postal address at which reporting person can be contacted.

*Telephone/Fax Numbers/E-mail address:*

The telephone and fax numbers at which the reporting person can be contacted. The country and area dialling codes should be included, as well as extension numbers, where applicable. Full E-mail address should be given as an alternative mode of communication, if available.

*Geographical Location of Incident:*

Enter full details about where the incident occurred: street name; area/district or local name; town/city; province/state/county; country; postal/zip code; Ordinance Survey reference; grid reference. For remote areas enter into the grid reference box the latitude and longitude, as this is useful information to have in the case of a transportation accident.

**Type of Location:**

*Type of Area:*

Select from options; more than one option may be selected.

*Type of Site:*

Select one to describe the site where the incident occurred.

*Comments on Location:*

Free text.

*Meteorological Conditions/Topography at Time of Incident:*

Enter the speed and direction of the wind, the temperature, humidity. Items for describing the terrain and topography are to be selected from the ALOHOA list provided.

*Probable Cause of Incident:*

(Authority list) Select from the options provided the most probable initial event to have caused the incident:

**Poor road conditions:** The initiating event of the incident involved poor road conditions including inadequate marking, poor surface. This does not include ice or mud on the road.

**Inadequate packaging/loading:** The initiating event of the incident involved inadequate or improper loading or packaging of a container, improper or incorrect labelling.

**Equipment failure:** The initiating event of the incident involved mechanical failure, electrical faults, poor maintenance, etc.

**Human error:** The initiating event of the incident involved operator failure to follow appropriate procedures or to respond appropriately, eg failure to clean out tanks or equipment adequately. This does not include system planning or engineering flaws or design faults.

**Improper storage:** The initiating event of the incident involved improper storage of chemicals including material corrosion, incompatible packaging, poor storage temperature control, etc.

**Sabotage/Terrorism:** The initiating event of the incident involved deliberate human action committed with malice or intent to harm.

**Weather conditions:** The initiating event of the incident involved adverse weather conditions such as ice, snow, heat, rain, mud slides, etc.

**Natural events:** The initiating event of the incident involved natural events such as earthquakes, flooding, hurricanes, etc.

**Inadequate system planning:** The initiating event of the incident involved inadequate system planning, systems quality control, or poorly controlled or unmonitored discharge not involving the above categories.

**Contamination of unknown origin:**

**Other:** The initiating event of the incident involved a cause other than those listed above.

*Comments:*

Brief description of incident (free text).

*Materials/Substances/Products involved:*

Enter the details of the chemical(s)/product(s) involved in the incident. Where applicable include trade names, CAS numbers, UN numbers, the amount involved (qualified by the appropriate units) and indicate their specific involvement in the incident. The recording of the CAS number is encouraged. If the product name is recorded, the names of the chemical ingredients should also be recorded. This may be obtained from an MSDS if available. Enter "unknown" for the chemical name if the chemical is not yet known.

*Site Monitoring:*

Enter the chemical tested for, the medium tested (air, water, soil), location sampled, time sample taken and the result. Also enter the units of each type of measurement. Possible measurements would include colorimetric tubes (eg Drager tubes) and other direct monitoring instruments such as BID and CGI. Enter analytical methods used. Interpretation of results should relate to existing guideline levels or occupational exposure levels, where known.

*Type of Incident:*

**Fixed site and/or Transportation:**

Select from the options provided to describe the type of incident; multiple entries possible.

*Natural Events:*

The initiating event of the incident involved natural causes, such as earthquakes, hurricanes, flooding.

*Note: Think it best to combine Natural Events with Weather Conditions, or be very specific in definitions for natural events - volcanoes, hurricanes, earthquakes.*

**Other:**

Event which is not covered by the above, eg algal toxins, red tides, etc.

**Fire:**

Select this option where hazardous chemicals have been involved in a fire.

*Explosion:*

Select this option where hazardous chemicals have been involved in an explosion.

**BLEVE/Fireball:**

Select this option where the incident involves a Boiling Liquid Expanding Vapour Explosion and/or a fireball.

*Release:*

**Airborne:** Select this option where as a result of the incident hazardous chemicals have been released into the air or dispersed into the atmosphere.

**Waterborne:** Select this option where as a result of the incident hazardous chemicals have been released into a watercourse (eg bore hole, well, river, lake, sea, etc), or into drinking water supplies.

**Groundspill:** Select this option where as a result of the incident hazardous chemicals have been released onto a hard surface (eg earth, road, aircraft runway, etc).

*Contamination:*

**Food:** Select this option where food has been contaminated with hazardous chemicals.

**Consumer Goods:** Select this option where consumer goods (other than food) have been contaminated with, or contain, hazardous chemicals.

*Comments:*

Free text

*Impact of Incident:*

[See/use Authority lists and cross references]

*Type of Impact:*

**Destruction of Property:** Select this option where the incident has resulted in physical damage to properties (eg buildings, vehicles, etc).

**Destruction of Land:** Select this option where the incident has resulted in a change to land use or restriction of human access.

**Environmental Contamination:** Select this option where the incident has resulted in contamination of the environment. Indicate from the list which media has been affected (eg air, water, soil, etc).

**People/Animals exposed:** Select this option where the incident has resulted in exposure of people and/or animals to the chemicals released.

**Other:** Select this option where the incident has resulted in impacts other than those identified in the other options provided.

*Vulnerable Zone:*

Estimate area considered to be potentially at risk of contamination. In particular, indicate schools, nursing homes, hospitals or other health care facilities within this area. This can be determined by a calculation.

*Area of Impact:*

**Surface:** Enter the surface area exposed to the chemical(s) released as a result of the incident and indicate the appropriate units of measurement. Indicate the validity of the measurements stated by selecting either known/measured or estimated options.

**Length (river/shoreline):** Enter the length of a river or shorelines affected by the chemical(s) released as a result of the incident and indicate the appropriate units of measurement. Indicate the validity of the measurements stated by selecting either known/measured or estimated options.

**Volume of Water:** Enter the volume of water affected by the chemical(s) released as a result of the incident and indicate the appropriate units of measurement. Indicate the validity of the measurements stated by selecting either known/measured or estimated options.

*Risk Area:*

(free text) This may include the boundaries of the affected area.

**Comments:**

(free text) Enter any other comments here.

*Impact of Incident*

Complete table.

*Effect on Human Population/Animals:*

*Affected Human Populations / Animals:*

Complete the table as appropriate.

*Signs and Symptoms for exposed persons:*

Indicate symptoms reported or observed in exposed individuals (INTOX Authority list).

*Animals affected:*

Complete table

*Profiles of Casualties:*

Complete table.

*Emergency and Other Services involved in Incident:*

Free text.

*Response Actions Taken:*

(Authority list)

Select one or more actions taken:

**Agencies contacted:** List by time and date agency and individual or groups notified of incident and/or contacted to provide further information or advice.

**Firefighting:** Action taken by emergency fire services to control, contain, mitigate and/or prevent further damage. This will include fire control, plume knockdown, containment of water run-off and cooling of vulnerable chemical stores.

**Containment:** Action taken by emergency services such as fire or environment services personnel to restrict spread of chemical contamination (eg control of chemical spill, airborne release or food/water contamination).

**On-site Clean-up and Decontamination:** Action taken by emergency services such as fire or environment services personnel to control further chemical contamination (eg by safe removal of chemical spill, containers that are leaking or damaged by fire or explosion, or contaminated soil, to a recognised landfill or incineration facility).

**Neutralisation:** Action taken by emergency services such as fire or environment services personnel to reduce chemical toxicity by controlled dilution, absorption and/or biological/ecological means.

**Remediation (off-site):** Actions taken following on-site clean-up and removal of hazardous substances, such as renewing, topsoil, planting trees or sowing grass.

**Evacuation:** Action taken by emergency services such as police or public health personnel as a result of rapid assessment of possible adverse health effects arising from chemical exposure leading to removal of a defined population in a controlled manner from an area at risk.

**In-place sheltering:** Action taken by emergency services such as police or public health personnel as a result of rapid assessment of possible adverse health effects arising from chemical exposure leading to a decision to keep people at home, in office, school, hospital or other buildings with windows and doors shut to prevent initial chemical ingress.

**On-site triage:** Action taken by medical professionals to identify casualties in need of immediate resuscitation, urgent life-saving medical treatment or those who need treatment but can wait or may be transported to a separate treatment facility. This also includes identification of others who are already dead or expected to die.

**On site decontamination:** Action taken by emergency personnel such as paramedics or medical professionals to remove chemicals on clothes, skin or hair of individuals at risk to reduce harm from primary and secondary contamination.

**On site medical treatment:** Action taken by emergency personnel such as paramedics or medical professionals to provide immediate first aid, basic life support and medical care at the site of the incident.

**Other:**

*Comments:*  
(free text)

**Effects on the Environment:**  
Complete table.

**Biological Monitoring (human)**  
Free text.

**Epidemiological Study**  
Free text.

**Environmental Monitoring/Modelling**  
Free text.

**Public/government inquiry**  
Free text.

**Definitions:**

It should be noted that the definitions on the short report format:

“7.0 Response/Public Health and Other Actions” relate to environmental decontamination (ie on-site clean-up - decontamination (area)

whereas the definitions given in the long report format relate to decontamination, and treatment, of humans.

No action is mentioned relating to contaminated livestock/crops/vegetation (ie destruction/incineration).