
Executive summary

Health Council of the Netherlands. Health and the environment: monitoring options. The Hague: Health Council of the Netherlands, 2003; publication no. 2003/13.

Request for advice and Committee

On 12 May 2000, the government ministers with responsibility for Health, Welfare and Sport (VWS) and Housing, Spatial Planning and the Environment (VROM) asked the Health Council to identify 'the conditions to be met by monitoring programmes used in support of policy in the area of environment and health'. They cited the following range of situations which lend themselves to monitoring: environmental incidents, perceived health problems which citizens ascribe to local environmental factors, health assessments of various policy scenarios and in tracking trends in the repercussions of environmental policy in order to protect public health.

In response to the Ministers' requests, the President of the Health Council appointed a committee on 9 October 2001. In drawing up its report, the Committee had access to the results of interviews conducted with thirty experts. It also had at its disposal a list of relevant environmental factors, indicators and registration systems, which had been prepared at the Health Council's instruction. Finally, it incorporated the findings of the *Invitational Conference on Small Area Health Statistics*, which was organised by the Health Council.

Monitoring

In this advisory report, the word 'monitoring' is taken to mean the periodical measurement, analysis and interpretation of indicators for environmental factors which are rele-

vant to health, or for health problems which can be ascribed to environmental factors. There are multitudes of environmental factors. Accordingly, the Committee has limited the scope of this report to the monitoring of chemical and physical agents. Biological environmental factors, such as biogenic allergens and toxins, have been given no further consideration in this report. The same applies to the monitoring of external safety risks.

The three monitoring applications addressed by the Committee were:

- surveillance of exposure to environmental factors which are known to be hazardous
- identification of possible health effects caused by suspect environmental factors
- verification of exposure situations or health problems that are a source of concern.

Criteria for monitoring

The first of the ministers' requests concerned the conditions to be met by monitoring programmes used in support of policy in the area of environment and health.

In response to this request, a set of assessment criteria has been developed. These are summarised in the following box.

Criteria for the social relevance of environmental risks:

- Understanding of the relationship between exposure and effect
- Severity and scope of the problem

Criteria relating to the objectives of monitoring:

- Objectives of risk surveillance:
 - verifiability in terms of policy or standards
 - intervention perspective
- Objectives of risk identification:
 - social concern

Methodological criteria:

- Measurability / reliability
- Interpretability

Criteria for measurement and registration programmes:

- Representativity and completeness
- Extent of geographical coverage
- Sufficiently detailed scaling level
- Continuity / periodicity

Current monitoring programmes

The second question concerned the practicality of current measurement and registration programmes in terms of answering questions about the influence of environmental factors on health.

After taking stock of the relevant environmental factors, indicators and registration systems, it was found that, in their present form, few of the Dutch monitoring programmes are fully effective in identifying and assessing the health effects of environmental pollution. On the one hand, environmental factors have relatively minor effects on health. This makes it difficult to detect the effects in question, which are often non-specific in nature. On the other hand, there is little or no harmonisation between the various monitoring activities.

Those programmes that are of practical value in the monitoring of exposure indicators are the Dutch National Air Quality Monitoring Network and the five-yearly study of dioxins and polychlorinated biphenyls (PCBs) in breast-milk conducted by the National Institute of Public Health and the Environment (RIVM). Those concerned with the monitoring of health indicators are the Netherlands Medical Registration System for hospital data, the Cause of Death register and the Dutch Cancer Registration System.

The major limitations of most health registration systems are their coarse-meshed nature (especially in geographical terms), the fact that many are not up-to-date and that they are not accessible for secondary analyses, partly because of data protection legislation.

Linkage of monitoring programmes for environment and health

The members of the government also asked the Health Council to indicate whether the linkage of current monitoring programmes for environment and health would have any added value in terms of providing answers about the effect of environmental factors on health.

Only under certain conditions can the linkage of environmental and health data elucidate the causal relationships between exposure to environmental factors and health problems.

When it comes to specific questions with a clear public-health interest, environmental and health registration systems can be linked on an ad-hoc basis, provided that this is done at an adequately detailed scaling or aggregation level, preferably at the post-code level. This approach is of practical use in surveillance of the health effects of specific exposure situations, in answering questions in the event of concern about locally

elevated rates of cancer or congenital anomalies and in providing answers for scientific research into cause and effect relationships. This requires a privacy procedure that can be quickly completed.

Studies of this kind are also described as 'ecological'. However, conclusions about policy can only be drawn on the basis of research into the likelihood of a causal relationship existing between health effects and exposure to the environmental factors in question. 'Semi-ecological' research (in which aggregated measures of exposure are linked to individual health data and confounders) is very promising in this regard.

To improve its ability to interpret any associations between exposure to environmental factors and health problems, the Committee urges that, in future, health registration systems include more information on general risk factors, such as lifestyle (e.g. smoking), socioeconomic status and profession. This would then make it possible to adjust for these potential confounders at individual level. Where this is not yet the case, geographically aggregated data on smoking and socioeconomic status from other sources can also be used.

Improving and supplementing current registration programmes

Finally, the ministers asked the Health Council to identify the modifications required to increase the practical value of currently measured and recorded data, as well as the supplementary forms of monitoring required.

The following list of suggestions put forward by the Committee cannot be regarded as exhaustive.

Environmental measurement programmes

Environmental measurements should mainly be taken in places where a lot of people could be exposed to relevant concentrations. For this reason, the Committee recommended that the Dutch National Air Quality Monitoring Network be supplemented by taking air measurements at traffic junctions in housing estates. More specifically, they propose that the use of PM₁₀ as an indicator of inhalable particulates should be supplemented by measurements of PM_{2,5}* or even finer particulates. The Committee also urges that there should be a more systematic monitoring of contaminants in food and of contaminants in the indoor environment of newly-built houses.

Since people spend the vast majority of their time indoors, the Committee recommends that a study be carried out in the near future into the extent of exposure to envi-

* PM₁₀ and PM_{2,5}: particulate matter, particles with an aerodynamic diameter of less than 10 or 2.5 µm respectively

ronmental factors indoors, particularly nitrogen dioxide, volatile (and semi-volatile) and semi-persistent organic substances, and asbestos. More information is also required concerning the numbers of asbestos fibres in tap water after it has passed through asbestos-cement piping. The results of such a study could, if necessary, provide the basis for the development of an indoor-environment monitoring network to identify trends in exposure.

In order to monitor the risks associated with long-term exposure or to establish the exposure of the general population, model-based calculations must be combined with measurements. This applies not only to air pollution but also to physical agents such as sound and electromagnetic fields. In order to provide further support for the current national noise model, it is recommended that a more systematic measurement of noise load in the domestic environment be carried out. Calculation of the field strength per source is sufficient for the monitoring of exposure to electromagnetic fields produced by outdoor sources.

Biological monitoring programmes

For several years, the Surveillance Programme Man, Food and Environment of the Inspectorate for Health Care provided a good basis for monitoring the body burden of persistent environmental contaminants in blood or urine. With the cessation of the collection of blood and urine samples via municipal health services, we have lost a cost-effective means of collecting material and background information in a representative random sample of the adult population. The Committee feels that it is important to look for alternatives to this programme. The monitoring programme for contaminants in breast milk still offers a good basis for monitoring the body load of persistent* compounds. A welcome extension to this programme is the inclusion of bromine compounds that are used as fire retardants. Because of their persistence, these compounds are increasingly present throughout the environment.

It would also be desirable to set up a specific biological monitoring programme for high-risk groups, such as new-born babies. If umbilical cord blood or heel stick samples are systematically collected and stored, this would facilitate studies into the significance of contaminants such as persistent organic compounds or heavy metals in the occurrence of developmental disorders. With this in mind, the Committee recommends that the possibility of keeping systematically collected human tissue samples in long-term storage be examined.

Before new biomarkers are incorporated into a biological monitoring programme, research is needed to expand the arsenal of instruments available for biomonitoring pur-

* persistent: poorly biologically degradable and, as a result, accumulating in the environment

poses. In this context, the development of exposure biomarkers would be particularly useful, using methods that have proved their worth in the field of occupational toxicology. It is not expedient to develop monitoring programmes for effect biomarkers, while their usefulness and expressiveness remain unproved. However it is important to carry out studies to validate current methods of measuring specific effect biomarkers for additional substances, such as those for protein adducts and possible DNA adducts, or other indicators of genotoxic damage. In doing so, consideration should be given to the relationship between these indicators and damage to health.

Health registration programmes

The Committee feels that people generally have overblown expectations with regard to the monitoring of health effects resulting from environmental pollution. By no means all of the symptoms or disorders which could be related to environmental factors or which are a cause of concern are systematically recorded. Furthermore, recording this information does not always lead to a solution, for instance when the data are not available at the required scaling level. Disappointment can be avoided if those involved are first given an explanation of the limitations of monitoring programmes.

In more specific terms, the Committee takes the view that health registration systems must be more accessible for the purposes of secondary analysis. The need to protect people's privacy demands that efficient privacy procedures be developed. One way in which this could be done is to make prior agreements concerning standard analytical procedures.

The monitoring of health indicators in high-risk populations can have added value. High-risk populations can either be groups with a high level of exposure (e.g. in certain underprivileged neighbourhoods) or groups with a high level of sensitivity, such as children.

There is concern about the possible toxic effects on the reproductive system of materials such as persistent organic compounds. Accordingly, it is also important that a single, easily accessible and up-to-date national registration system for congenital anomalies be created from the various existing registration systems. Ideally, this registration system would be expanded to include data on developmental disorders which are not recorded until a considerable period of time after birth. Partly for this reason, the Committee recommends that youth health care registration systems be further harmonised and computerised. Ideally, other reproductive disorders (e.g. subfertility) should also be added to such a national monitoring system.

For some questions, such as those concerning perceived risk or perceived health, there would be little sense in consulting existing registration systems. For this purpose, it would be better to collect new data through targeted research. It might therefore be

useful to collect data on people's state of health, the perceived nuisance and relevant determinants at regular intervals (e.g. every five years), at the level of the individual. This will depend on the specific situation and population concerned and the availability of suitable indicators. The 'Local and National Monitor' project run by the Dutch Association of Municipal Health Services and RIVM is very promising in terms of following national trends in self-reported symptoms and disorders in relation to the environment. The questionnaire used in this health survey has a separate module, entitled 'environment', which contains questions on health and environment. It is therefore of the utmost importance that all municipal health services actually implement this module in their health survey.

Standardisation and evaluation

In the interests of comparing data, in terms of time and place, it is essential that the methods and techniques used should be better harmonised at national level. These should also be standardised at international level, as far as possible. Accordingly, it is recommended that the indicators and instruments developed by the WHO be used wherever possible. This simplifies the process of making local, national and international comparisons, as seen in the framework of the European Directives on air pollution and noise.

Dependent on the current scientific situation or on indicator trends, new environmental factors or health indicators can be added to existing programmes or the monitoring of specific indicators can be suspended. It is therefore recommended that monitoring programmes be regularly evaluated. Naturally, cost-benefit ratios have an important part to play here. Monitoring provides only a part of the information required for risk management or health protection.

Meta information systems

Monitoring by means of measurement and registration programmes is just one element of a knowledge-based system. In general, meta information systems, such as the reports State of the Environment and Environmental Outlook (prepared by RIVM for the Dutch government) are better suited to answering questions about the influence of environmental factors on health. These documents monitor the scientific situation, on the basis of measurement data and literature.

Three types of expertise networks are required to compile and open up meta information, dependent on the type of monitoring involved (surveillance, identification or verification of risks):

- a knowledge and information centre, which collects and provides information on the risks of environmental factors which are known to be hazardous
- a platform for risk identification, which focuses on identifying presently unknown health risks from environmental factors and on developing novel insights
- an expertise platform for health and environmental monitoring, that exists primarily to verify exposure situations or health problems (or clusters thereof) wherever there is concern.

As far as the latter is concerned, the *Invitational Conference on Small Area Health Statistics* revealed that there is clearly more support for an expertise platform than for a single centre in which all health and environmental registration systems would be gathered together. Dependent on the specific question being posed, this platform would facilitate efficient cooperation with experts in the various fields involved, and with experts in the field of health registration systems, environmental registration systems and the registration of confounders. It would also make it possible to coordinate different studies with one another.

Conclusion

All things considered, the Committee concludes that, following testing against a set of core criteria, few monitoring programmes are fully effective in the surveillance and identification of the health effects of environmental pollution.

It takes the view that data protection legislation, which usually prevents the linking of databases, poses significant limitations on the use of health registration systems. In that connection, the Committee recommends that, when evaluating the Personal Data Protection Act, consideration be given to problems associated with the provision, linkage, analysis and presentation of health data at a low aggregation level. Furthermore, health registration systems generally do not contain or provide any information about personal risk factors which might disrupt a possible relationship between environmental and health indicators. The Committee therefore concludes that people generally have overblown expectations with regard to the monitoring of health effects resulting from environmental factors.

In view of the complexity of research involving aggregated databases, the Committee feels that it would be useful to establish an expertise platform for health and environmental monitoring, which could facilitate research of this kind. The Committee also feels that it would be useful to identify other possible health risks of environmental factors (e.g. from the literature) in a more systematic way than has hitherto been the case.