

## Using information wisely: Developing a responsive public health information system

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### Abstract

*Informed decision making is the basis of public health. But, if the information is unreliable or insufficient, costly mistakes could be made. This paper summarises some of the common errors in using information. These may be relevant to clinical and public health in both developing and developed countries. It goes on to describe the vision for, and actions to develop a responsive public health information system.*

**Key words:** *Information, public health.*

### 1. Introduction

In recent years, there has been a revolution in information technology with great advances in data processing and dissemination of information. Public health is one area to benefit from this revolution as it is a discipline where decisions are taken based upon information. But, we constantly have to go back to basics. When the information is unreliable or insufficient, the mistakes can be costly.

A crucial question facing the public health practitioner is not “What can I do?” Or “What shall I do?” but rather, “Which information do I need to guide me on what to do?” Perhaps that question is not being asked often enough.

### 2. Using information wisely

This section highlights some errors in utilising information, quoting a few examples from the public health literature where decisions have been taken on the basis of unreliable information, insufficient information or even irrelevant information.

#### 2.1 Ask the right questions

We need information to answer bottom-line questions. For example:

- What are our health problems? Why do they arise?
- Who are our priority vulnerable groups?
- What can we do about them? What are our resources?
- Are our services effective?
- How will we know we have made a difference?

#### 2.2 Unreliable information

Information is generated by a simple or complex processing of data. When the data themselves are unreliable, the information end-product would be incorrect, however advanced the analysis.

*Weak surveillance systems:* This situation is particularly true in developing countries where surveillance systems are often overburdened by trying to collect too much information about too many diseases. This has led to situations where the data from recording units is not accurate and coverage is poor<sup>(1)</sup>. Weak surveillance systems had been identified as one factor leading to the failure of malaria eradication efforts in the sixties<sup>(2)</sup>.

*Non-representative data:* It is useful to refine the study question or problem statement, and to ask if the data available will help you answer that question. There may be selection biases in routine data sources. For example, hospital patients do not

necessarily represent persons with an illness in the community.

*Confounding:* Before and after effects could have been produced by factors other than the service or intervention. It is useful to ask if there have been any other changes that took place between the two assessments.

*Small sample sizes:* When data are to be analysed for subgroups, sample size is especially important. The larger the number of subdivisions, the smaller the numbers in individual subgroups, and the estimates for subgroups will be less reliable. It is especially important to exercise caution in using those estimates with a very wide 95% confidence interval.

### **2.3 Insufficient information**

Sometimes, the information available is not sufficient for the purpose required, either because the data has not been collected (e.g. weak information systems), not analysed sufficiently (e.g. breakdowns by subgroups may sometimes be necessary) or even because the current state of technology is limited (e.g. new diseases).

*Weak information systems:* Surveillance systems in developing countries tabulate data but usually do not analyse further to answer all the questions required for planning <sup>(1)</sup>.

*Breakdowns by subgroups:* The overall picture may sometimes mask differences or inequities for certain subgroups. When screening for cervical cancer was introduced in the UK, mortality dropped. But a breakdown by social class showed that mortality was still high for Class 5, and not enough women were coming forward for testing. After a policy was developed to increase the numbers of women coming forward from Class 5, mortality dropped even further <sup>(3)</sup>. Health equity audits are therefore a useful tool in addition to general health needs assessments <sup>(4)</sup>.

*Making predictions and extrapolations:* Predictions are as accurate as the data used to make them. In the case of new diseases or health risks (or evolution of old diseases), the lack of knowledge of the biology of those diseases and the limitations of current technology hampers prediction even more. This was the case in dealing with AIDS in the eighties <sup>(5)</sup>, and with BSE in the nineties <sup>(6)</sup>.

The Southwood report in 1989 predicted that for BSE, cattle would be a dead-end host with a total number of 17,000 to 20,000. In fact, just five years later, there were 137,000 confirmed cases of BSE among cattle and a link with Creutzfeldt-Jakob disease in humans <sup>(6)</sup>.

### **2.4 Selecting appropriate measures**

On deciding priorities, or for planning or evaluating services, the indicators to be assessed include measures of need, measures of input and effect. Each of these measures a different aspect of the service.

*Measuring need for services:* Utilisation rates may be used to measure need only if equity and accessibility are assured. Waiting lists have been used as an index of unmet demand, but in some cases, the length of waiting lists could have been deliberate for medical or social reasons or for allocation of more resources <sup>(7)</sup>.

*Assessing effect of services:* From 1950 to 1980, ischaemic heart disease incidence and mortality rose rapidly in the UK and many developed countries. Many treatment improvements including more intensive care units were introduced during this period, but the incidence continued to rise. It seemed that services were ineffective. It was only when the causes of the increased incidence were worked out and more emphasis placed on how to prevent ischaemic heart disease that a significant decline occurred <sup>(3)</sup>.

*Measuring inputs:* In assessing costs of services, one important aspect to be tackled is "Cost to

whom?" Different results would be obtained if the assessment was of costs to the health care service, staffing/workforce, or cost to just part of the service such as the hospital or primary care service, or cost to the public <sup>(7)</sup>.

*Choice of denominator:* Numbers are important, but percentages, rates and ratios yield different aspects of information. Standardisation to account for inherent differences in compared populations is also important here.

### 2.5 Trade-off measures

Even with the availability of reliable information, choices and trade-offs may have to be made.

*Statistical significance versus clinical importance:* Statistical significance is usually arbitrarily set at 95% confidence. There are  $\alpha$  and  $\beta$  errors involved. Also statistical significance does not imply clinical/biological importance <sup>(7)</sup>.

*Association and causation:* Association does not imply causation even if all the Bradford-Hill criteria are fulfilled <sup>(8)</sup>. The pathways of influence could be so complex that any interventions planned may not work out as expected <sup>(7)</sup>.

*Screening procedures:* No screening test can be 100% accurate. The decision whether to implement a screening procedure needs to be weighed upon sensitivity and specificity, cost-effectiveness and the prevalence of the disease or risk factor in the population <sup>(9)</sup>.

## 3. Developing a responsive public health Information System

Used wisely, information is our best resource. It is easy to say that trained epidemiologists should be involved in most public health work. But in most developing countries, there is a scarcity of trained authorities. We need to develop our own skills in using information, but we also need to improve the information resources we use routinely. This section gives examples of actions to improve the public health information we use routinely.

### 3.1 Agree the vision

- Our vision is to have timely and relevant information, consistently accurate, and at the right level on:

Demography	Mortality	Services - Activity
Morbidity	Lifestyle	Resources
	Other holistic measures	

- We need a proactive, knowledge-base system that is internet based, subject-classified, and updated each time new data becomes available

### 3.2 Agree Information standards

We need to agree and take account of

- Standards on validating data and carrying out checks on completeness and accuracy
- Communication standards e.g. preface to all reports stating data sources, methodology and assumptions.
- Disclosure policies and data sharing protocols

### 3.3 Develop an action plan

The annual programme of work should take account of data updates and reporting schedules.

Public health Information requirements (examples of actions)

#### Set up

1. A database of PH information arranged in tables and charts including targets and key performance indicators. This should include historical data and current position, predict future projections, and set targets and trajectories
2. Prepare maps of PH indicators at small area level – sourced from national and regional databases, activity/uptake of services

#### Validate

3. Develop quality assurance mechanisms – rules on data entry, validation checks on analytic outputs
4. In particular, validate information reported to higher levels to drive continuous improvement

in reporting and assure future submissions/reports

5. Develop disclosure guidance and data sharing rules to maintain confidentiality of individuals and sensitive information

#### Maintain

6. Update indicators on the intranet as new information becomes available in-year
7. Monitor progress annually and quarterly towards targets
8. Ensure new targets are picked up, incorporated into performance monitoring and lead managers are made aware to put in necessary actions (maintenance in-year)

#### Report

9. Develop a forward programme of reports on PH key areas –user friendly reports.
10. Prepare quarterly monitoring reports that include year to date and forecast annual position on targets
11. Prepare annual reports on key targets and services

#### Liaise with others

12. Develop understanding of information, sources, and validation among PH managers
13. Agree data sharing protocol with partners
14. Liaise with other government departments on pooling data resources and information e.g. Geographical Information System (GIS) facilities for mapping
15. Supply data for equity audits, to identify and work with vulnerable groups and hotspot areas

#### Organisational development

16. Update GIS capabilities in the organisation
17. Develop analytic capacity and professional development through training
18. Maintain PH information meetings between information analysts and PH managers
19. Maintain links with regional, national and international systems e.g. WHO

#### **4. Conclusions**

- Information is an important resource that we cannot afford to neglect.
- We should do the best we can with the available resources.
- We also need to improve, maintain and sustain our information resources.

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