Quantitative indicators for a healthy city—the Rotterdam local health information system

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Abstract
Study objective—The aim was to develop a local health information system for monitoring health status and for contributing to the development of local health policy.
Design—At district or even at neighbourhood level, data are collected on health status and factors related to health, including lifestyle, social and physical and environment, and the health care system. Data are collected from central and municipal Bureaus of Statistics, health care services, regional and municipal institutions, and by means of regularly performed local health surveys.
Setting—The 84 neighbourhoods of the Rotterdam Municipality.
Main results—In the local health information system three sorts of data are collected: data on health status, data on health risk factors, and socioeconomic and demographic data. Two examples of data on health status are given (mortality and mental health) which were analysed. These data show differences in health status between several districts in Rotterdam, which can be related to differences in socioeconomic status between these districts. Examples are given of the influence of the project on local health policy in Rotterdam.
Conclusions—The main conclusion is that the local health information system has great promise as an information system to give direction to local health policy. However, if this promise is to be fulfilled, it will be necessary to obtain data from more varied sources.

In 1977 the 30th World Health Assembly formulated a new general target for the WHO and its member states. This target implied that by the year 2000 all citizens of the world should have attained “a level of health which will permit them to lead a socially and economically productive life”. This was followed in 1984 by the adoption of the European Regional Committee of 38 specific regional targets. At the same time the European Regional Office initiated the so called “Healthy cities project”, which aims to make a contribution to health promotion in urban areas. One of the 38 specific targets mentioned above is that of conducting research for health. This research should provide knowledge about the health status and factors influencing the health status of the population concerned.

Community diagnosis based on different data resources (epidemiological research, census data, traffic accident data, etc) will play an especially important role. As in several other European countries, a number of cities in The Netherlands have shown interest in the healthy cities project. At the moment 17 cities are united in a Dutch “Network of healthy cities”. One of these is the city of Rotterdam.

In Rotterdam the healthy cities project is part of a bigger project called “social renewal”. The purpose of this project is to improve the living conditions among the disadvantaged. Public health is considered to be of major importance in this project. In the project efforts are made to lessen the rate of unemployment, to improve health services and disease prevention, and to stimulate research to obtain more information on health and on factors related to health. A fundamental part of this research is the development of a local health information system. This system is set up by the section of epidemiology of the Municipal Health Service for the Rotterdam area. In this system, information is gathered on health status, the health care system, lifestyles, and the social and physical environment. Using the information system it is possible to obtain insight into the health situation in Rotterdam and in the several districts into which the city is divided. In this way the local government can be advised on measures to improve the health of the disadvantaged.

The REBUS project
REBUS (Rotterdam local health information system) is meant to be a continuous health information system. This means that as far as possible and realistic the database will be updated annually. REBUS has two main targets: (1) the monitoring of health status and factors related to health of the citizens of Rotterdam at district or neighbourhood level; (2) aiding the development of a local health policy that reduces differences in health status.

In the first stage of the project, the information collected is mainly quantitative, but in a later stage qualitative information will also be gathered. The qualitative stage is still under development. In this paper we shall restrict ourselves to the quantitative data collection.

Rotterdam is divided into districts which are subdivided into neighbourhoods. Data collection will take place at neighbourhood and district level. Advantages of this method of data collection are: (1) many health related factors are related to a district or neighbourhood (e.g. traffic, noise, soil pollution); (2) much health care in The Netherlands is organised on a district or neighbourhood level; and (3) a neighbourhood forms in many
cases a recognisable geographical and social unit which can promote community participation.

In REBUS the following data are collected:

**Data on health status**—This means mortality and morbidity figures. Mortality figures are obtained from the national and the municipal Bureaus of Statistics. Morbidity figures are currently collected by means of health surveys. From these surveys data on subjective health, mental health, use of health care services, and specific health complaints are gathered. Methods to collect data from general practitioners, mental health institutions, hospitals, etc., are being developed.

**Data on health risk factors**—"Health risk factors" are not only concerned with lifestyle factors such as smoking, alcohol consumption, and sports. Aspects of the physical environment such as housing quality, pollution, and the amount of traffic are also implicated. Data on lifestyle are collected by means of health surveys; health risk factors from the physical environment are collected from regional and municipal institutions.

**Socioeconomic and demographic data**—Socioeconomic and demographic data which are collected are sex, marital status, education level, age, unemployment, and occupational level. Some of these data are collected by means of health surveys, others are collected from the national and municipal Bureaus of Statistics.

These data are collected to obtain an overall picture of the health of the inhabitants of the several districts and neighbourhoods of Rotterdam and of the factors which are related to their health. In order to give a more specific picture of REBUS, some data on health status are represented here. Mortality and morbidity figures in the form of data on mental health are shown. In these examples the data will be represented at district level.

**Two examples of data on health status**

**Mortality figures**

Data on mortality by cause of death are collected by the National Bureau of Statistics. These data are available for the whole Rotterdam area, but not at the level of district or neighbourhood. They are used to compare overall mortality and cause specific mortality for Rotterdam and for The Netherlands as a whole. Data on total mortality also are collected by the Municipal Bureau of Statistics, and are available at neighbourhood level. These data are used for the analysis of total mortality at neighbourhood level. Mortality figures are of course influenced to a large extent by the age distribution of the population under study. Thus when analysing mortality figures it is necessary to correct for the differences in age distribution between the index population (e.g., the population of a district) and the reference population (e.g., the population of Rotterdam).

Standardisation is a commonly used method, and a distinction must be made between direct and indirect standardisation. Direct standardisation, using the age specific mortality of the index population, results in a comparative mortality figure (CMF). Indirect standardisation, using the age specific mortality of the reference population, results in a standardised mortality ratio (SMR).

The standardised mortality ratio is subject to less random error than the comparative mortality figure and it can be calculated without knowledge of age specific mortality figures of the index population. On the other hand standardised mortality ratios of different index populations cannot be compared with each other, but only to the reference population. Large differences between standardised mortality ratios and the comparative mortality figure are seldom found in practice.8

Direct standardisation, resulting in a comparative mortality figure, is used for a comparison of Rotterdam with The Netherlands. Because no age specific mortality data are available at district level, calculation of district mortality figures in Rotterdam is done by using the indirect method, resulting in a standardised mortality ratio. Calculations were made over the period 1983–1987, for males and females. A CMF/SMR value below 100 indicates a lower mortality, a CMF/SMR value above 100 indicates a higher mortality than the mean value for the reference population.

After standardisation, the mortality for males was shown to be higher than the average in The Netherlands (CMF, males = 111.2). For females the mortality was more or less the same level as in The Netherlands (CMF, females = 98.2). Standardised mortality ratio values were calculated for each district in Rotterdam using the total of deaths in 1983–1987. In this way, random effects due to low numbers of deaths are avoided as far as possible. The geographical distribution of the values is shown in fig 1. In a number of cases, high values were found in districts where one or more nursing homes are located. These nursing homes have a predominantly female population, and the female standardised mortality ratio values in these districts were above 105. As can be seen in fig 1, other factors besides the presence of nursing homes can contribute to increased mortality in certain districts. Some socioeconomic and demo-
graphic characteristics of the districts with increased mortality are shown in the table.

From these figures it can be calculated that those districts showing high percentages of unemployed and poorly educated people also show high mortality rates.

**Morbidity figures: data on mental health status**

Another example of health data collected in REBUS are data on mental health. Information on this is collected using health surveys. Health interview surveys have been carried out in the United States for some time, examples being the "Rand Corporation health insurance experiment" and the "Health interview survey". An overview of health (interview) surveys can be found in the report *Feeling the nation's pulse*. In The Netherlands a health interview survey is held every year. In Rotterdam local health surveys were begun in 1983, and mailed questionnaires rather than interviews are used. From 1987 onwards health surveys have been held yearly in Rotterdam. These surveys are part of a larger survey in which several municipal departments in Rotterdam take part. Every department sends in questions about subjects which are relevant to them. The epidemiology section of the municipal health service for Rotterdam area is one of the participants in this large survey, with questions on subjects like subjective health, somatic complaints, visits to the general practitioner, seeking help for mental problems, etc.

The questionnaire is sent to a random sample of 3000 citizens in the age group of 16 to 70 years who have the Dutch nationality (from 1988 the age range has been extended to 16-75 years). The response rate for the 1987 survey was 63% (n = 1891) and is representative of the Rotterdam population with respect to age, sex, and socio-economic status.

Mental health was measured by the "affect balance scale" which was developed by Bradburn in 1969 and translated and adapted for the Dutch population by Ormel. It is a short (eight item) but valid and reliable instrument to obtain a global indication of the prevalence of mental health problems in a population. The scale measures two concepts, "pleasant feelings" and "unpleasant feelings". Only the second concept was analysed because the four items which measured this concept turned out to be the most valid. As an indication of the prevalence of mental health problems a cut off point was established based on other research in The Netherlands in which the scale was used. To get an indication of how to interpret the differences between districts, a stepwise logistic regression analysis with four independent variables (districts, age, sex, and marital status) was carried out. On the basis of this analysis differences between districts due to differences in age, sex, and marital status could be corrected by means of direct standardisation. In fig 2 the prevalence of people who scored above the cut off point in the 17 districts is shown. These are the results before correction by direct standardisation. However the differences between the districts remain significant after standardisation. Some socioeconomic and demographic characteristics of the districts with a rather high prevalence of mental health problems are given in the table. From these characteristics it may be assumed that these districts are characterised by rather high percentages of unemployment (with one exception, district A) and high percentages of single (not married, divorced, or widowed) people. This last result may be an indication of problems of loneliness. After weighting for differences in age, sex, and marital status (direct standardisation), the percentage of people with psychosocial problems was lessened in districts A and B. This means that in these districts marital status may play a role in the genesis of psychosocial problems. In the other districts unemployment may play an important role.

**Discussion**

Because REBUS is a system in which data on health status, data on health risk factors, and socioeconomic data are collected, it is relatively easy to locate districts with health problems, and it is also relatively easy to identify factors which may be related to these health problems. This

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**Socioeconomic and demographic data of some Rotterdam districts**

<table>
<thead>
<tr>
<th>District</th>
<th>A</th>
<th>B</th>
<th>G</th>
<th>K</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inhabitants</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-19 years (n)</td>
<td>2102</td>
<td>10269</td>
<td>1003</td>
<td>7098</td>
<td>127294</td>
</tr>
<tr>
<td>20-34 years (n)</td>
<td>5644</td>
<td>13880</td>
<td>12154</td>
<td>6775</td>
<td>151244</td>
</tr>
<tr>
<td>35-44 years (n)</td>
<td>5580</td>
<td>12485</td>
<td>12855</td>
<td>7742</td>
<td>190769</td>
</tr>
<tr>
<td>65 years or older (n)</td>
<td>2681</td>
<td>3730</td>
<td>5790</td>
<td>2423</td>
<td>90993</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married (%)</td>
<td>34</td>
<td>32</td>
<td>35</td>
<td>36</td>
<td>42</td>
</tr>
<tr>
<td>Not married (%)</td>
<td>49</td>
<td>54</td>
<td>48</td>
<td>49</td>
<td>42</td>
</tr>
<tr>
<td>Divorced (%)</td>
<td>10</td>
<td>10</td>
<td>9</td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td>Widowed (%)</td>
<td>7</td>
<td>5</td>
<td>7</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Education low (%)</td>
<td>50</td>
<td>65</td>
<td>77</td>
<td>78</td>
<td>71</td>
</tr>
<tr>
<td>High (%)</td>
<td>50</td>
<td>35</td>
<td>23</td>
<td>22</td>
<td>29</td>
</tr>
</tbody>
</table>

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**Figure 2** Prevalence of mental health problems for males and females by Rotterdam district, 1988
information could be important for local health policy. The information obtained from the REBUS project will make it possible in the future to see if, and in what way, a specific health policy would be desirable for a certain district. Even at present, and in spite of the fact that the results are on neighbourhood or district level, they already have an influence on local health policy.

An example is given by districts G and K in figs 1 and 2. The mortality rates and the high percentage of people with psychosocial (and other health) problems in district K led to discussions with citizens and local politicians. These discussions played an important role in choosing this district as one of the target areas for the "social renewal project" mentioned above. This means that in this district a concentrated effort is made to improve the social and health condition of the inhabitants. In district G the health professionals and the inhabitants themselves developed plans, in discussion with the representatives of the municipal health service, on the basis of the results shown in figs 1 and 2. These plans are directed towards an improvement in ambulatory mental health services and towards discussing the institution of preventive programmes to influence lifestyle factors such as smoking and alcohol consumption. These examples show that even now data from REBUS can influence local health policy.

However, the coming years will be especially important in the plan to increase the influence of REBUS on local health policy. On the one hand more specific research will be needed, for instance research on factors which may explain the high percentage of people with mental health problems in certain districts. On the other hand more attention must be paid to the political and social relevance of REBUS data. To ensure this, several project groups have been formed, working in specific neighbourhoods or districts. In these project groups, researchers, representatives of several municipal departments, and people working in health care participate. In this way it is hoped to make REBUS scientifically and politically as relevant as possible.

All in all, the prospects are good that in the future the REBUS project will able to to give a good picture of the state of health of the citizens of Rotterdam, to gain insight into the differences in health between different districts, and finally to learn something about the factors which influence health and differences in health. However, to reach these targets, a number of problems must be overcome. Three main problems arise when collecting data from several municipal and regional institutions. First, not all the institutions involved use the same geographical division of districts and neighbourhoods. Therefore in a number of cases some way of data conversion has to be devised before the data are suitable for REBUS. Second, data are at present collected from existing sources, and hence the most useful indicators are not always obtained. Third, not all institutions use compatible hardware and/or software which leads to problems with data transportation. Furthermore the sources of information for morbidity are limited and will remain so in the near future. The most important sources at present are health surveys in which only a few health topics can be handled. These data are only collected for a particular age group (latterly 16 to 75 years). Another limitation is that the two most important immigrant groups (Turks and Moroccans) are not part of the sample.

Interpreting the results, a few points should be kept in mind. The results are on neighbourhood or district level, so statements about individuals cannot be made. Furthermore, not all health related factors are related to a neighbourhood (eg, labour conditions) or are homogeneously distributed over a neighbourhood. Also, the problem of small numbers might appear when areas like districts or neighbourhoods are compared, because of small population figures. The aggregation of data over a longer time interval may alleviate this problem somewhat. Finally some caution is required in the interpretation of results from health surveys as a measure of health as such. There is of course a strong correlation between perceived health and health diagnosed by a general practitioner or specialist, but there is not a one to one relation between the two.

So in the future it will be essential to work towards an expansion of the different sources of data on health. Data from general practitioners and from mental health organisations are especially important in this respect. Furthermore the data from the health surveys must necessarily be broadened. Only in these ways will the optimal use of REBUS be possible.

16 Omzel H. Meeste met lewen van een moeilijk leven (Difficulties with life or a difficult life). Groningen: Konstapel, 1980.
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