The late 1970s and early 1980s saw the development of a number of large scale, community based health promotion programmes in the United States and Europe, most of which were directed towards reducing modifiable risk factors for coronary heart disease (1-5). These community based programmes were born out of a growing consensus on the content, strategy, and methods for the prevention of coronary heart disease which emphasised the importance of lifestyle and behavioural change on a population-wide basis (6, 7).

Fundamental to the achievement and maintenance of lifestyle and behavioural change is success in influencing a range of predisposing factors. These include those relevant to the individual (such as knowledge, attitudes, and skills), those relevant to the wider social group (social and cultural norms), and factors in the wider environment (such as regulation of exposure to hazards, and access to goods and services). Influencing social norms and changing the wider environment generally require a total community response and hence the rationale for a community based approach. More practical reasons include (i) the opportunities to utilise the existing resources and networks within communities to provide a structure for programme delivery; (ii) the enhanced impact from combining complementary individual and environmental approaches to achieving change; and (iii) the greater potential for creating reproducible and self sustaining programmes in "real life" settings than those from narrowly defined studies of volunteer populations in controlled settings (8).

These new intervention approaches have posed special challenges for developing appropriate and manageable evaluation designs that can be maintained throughout the life of a health promotion programme. This paper uses the evaluation of the Heartbeat Wales programme as a case study to assess the sorts of difficulties that can be encountered and how they may be overcome.

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HEARTBEAT WALES

During the early 1980s several health bodies in the United Kingdom were becoming conscious of the need to respond to the high level of cardiovascular disease in the country through preventive strategies. The UK government's Welsh Office and the then national agency for health education, the Health Education Council, agreed to establish a community based demonstration project in Wales. This decision was supported in 1983 by a consensus conference, sponsored by the major UK health organisations, which recommended a comprehensive range of actions by government, agriculture, education, health services, and the media (9).

The "Welsh Heart Programme" was at first administered through the University of Wales College of Medicine and then subsequently by the Health Promotion Authority for Wales. The directorate responsible for the management of the programme was recruited at the end of 1984 and the programme was launched publicly as "Heartbeat Wales" in March 1985 for an initial five-year period. The long term goal of the programme was to develop and evaluate as a demonstration project, a regional strategy that would contribute to a sustained reduction in coronary heart disease incidence, morbidity, and mortality in the general population of Wales, particularly among those under the age of 65. Desired health outcomes for the first five years were defined as improvements in non-smoking, healthy nutrition, physical exercise, hypertension control, and cardiopulmonary resuscitation (10).

When the programme was established there were three strategic aims, namely:

(i) Leadership—to coordinate, support, initiate, and monitor action at local and regional levels which would encourage improvements in modifiable risk factors and behaviours for coronary heart disease prevention.

(ii) Demonstration—to stimulate, disseminate, and assist the development of strategies and programmes to promote health and prevent coronary heart disease throughout the UK and overseas.

(iii) Experimentation—to research, develop, and evaluate a range of new projects and initiatives for heart health promotion, and provide feedback on their feasibility and impact.

These aims gave direction to the development of the evaluation strategy, which also took into account the essential elements of the intervention that sought changes in both personal behaviours and environmental factors (10, 11). Measures to monitor both these changes were built into the evaluation design, which also recognised the need to balance measurement of outcome with investigation of the process of achieving change (12).

Evaluation Design Problems and Solutions

At the time of constructing the evaluation design there were relatively few well tested models for the evaluation of community based programmes. Those that existed had been developed from relatively small and more tightly defined interventions, in individual communities, towns, and cities (populations 100–200 000). Wales is a comparatively large country, however, with a substantially greater population (2.8 million), defined by nine health districts. The experience provided by these other projects had already indicated a number of basic problems in applying experimental designs to community based programmes. These included the impracticality of artificially assigning individuals into intervention and control groups within communities because of the constraints this places on the development of an intervention strategy. These constraints include effectively preventing the use of the media, and the use of existing community networks and infrastructures—all of which cannot be controlled to reach defined individuals within a community, but represent part of the attrac-
tion of adopting a community based approach. Further problems associated with the difficulties of tracing the causal pathways in communities (which are generally longer and harder to trace than in studies on volunteer individuals), and with achieving high levels of penetration and participation from the whole population had also been identified (8, 13, 15).

A number of solutions to these problems have been proposed and tested. The commonly advocated solution in the mid 1980s was the use of a quasi-experimental design based on comparison of change between matched populations in intervention area(s) and separate reference area(s). These were generally supported by additional evaluation studies to improve confidence in the causal nature of observed net differences between the populations (8, 13). In most examples these designs were non-random, as the intervention areas were generally chosen on an opportunistic basis. The supporting studies usually examined the impact on targeted community networks and the process of diffusion of the intervention. As part of this approach, measures for use in population surveys were developed to determine programme exposure (that is, awareness and participation) among the target population (8, 13).

The evaluation of the North Karelia programme was based on comparisons between a single intervention and single reference community, as too is the Pawtucket Heart Health programme (1, 16). The Stanford and Minnesota programmes have used several intervention and reference communities (2, 3, 17). The basic evaluation design for the Heartbeat Wales programme was established using this quasi-experimental approach. It was constructed in such a way as to allow both internal comparison of differences in outcome between the nine health districts (each of which was to receive a contrasting intervention) and external comparisons between Wales and a large single matched reference area of similar size. At its simplest, the intention was to measure change in the population risks for coronary heart disease (and associated predisposing factors) after the "input" of a coordinated and relatively well resourced community based intervention, and to compare this with change in the reference area with no corresponding input, conducting "business as usual."

The reference area was selected after examination of available health, social, and economic data as being closest in profile to Wales at baseline. Full details have been published previously (18). As a result of the difficulties experienced in the North Karelia programme, which shared a common boundary with its chosen reference area, a geographically separate area was deliberately selected to reduce problems of media overspill and more general contamination that might occur along a shared border. The reference area consisted of 16 health districts which fell within two health regions.

The basic outcome evaluation design was based on three population surveys in 1985, 1988, and 1990 in both Wales and the reference area. The intervention in Wales was expected to develop during 1986 and reach an optimal level of investment and impact during 1987-89, after which it was anticipated that investment might decline if the programme was not funded beyond its initial period. A range of indicators was used at baseline in Wales and the reference area to enable the tracking of changes in knowledge, attitudes, and behaviour relating to coronary heart disease risk. Measures to identify exposure to and involvement in the programme were also developed for the follow-up studies. In Wales, a clinical survey was also undertaken to extend the range of data available to include blood pressure, serum cholesterol, and physical fitness and to validate self reported behaviour. In addition, a range of separate studies to examine the impact of the programme on community systems (such as the health and education services) and among targeted professional networks (such as GPs) was initiated in Wales, to help identify supportive changes in the health promotion infrastructure and to enable a better understanding of the observed health outcomes (12).
The Health Education Council had indicated that there would be no major provision of additional resources for heart disease prevention in the rest of the country (including the reference area) pending the outcome of the Welsh “demonstration” programme. Furthermore, no substantial new coordination of existing efforts in the reference community was envisaged at the time. Nevertheless, as Heartbeat Wales had been established as a national demonstration project, some diffusion of new ideas was anticipated as the intervention developed. This, it was hypothesised, would dilute, but not substantially compromise, any observable outcomes. Further details of the survey methods used in the baseline and follow-up studies are available, together with an overview of previously published results and separate studies to examine the reliability and validity of the data collected (18-22).

When Heartbeat Wales was established, a record keeping framework and a range of specific studies were set up to document the programme’s progress towards its stated objectives (10, 22). Most of these studies have been completed as planned, and a basic system of record keeping has been established through a structured annual planning and reporting process at both national (all Wales) and district levels. Separate studies have documented progress in the development of the overall nutrition strategy (23); the catering accreditation project entitled Heartbeat Awards (24), the introduction of healthy catering services in hospitals (25); the costs and benefits of the smoking education programme (26); collaboration with local and national bodies in promoting exercise in the community (27); the development of heart health programmes in different settings, such as worksites (28) and schools (29); and developments within professional groups, such as general practitioners (30) and health visitors (31). No attempt was planned or made to establish such detailed record keeping or to undertake comparable studies in the reference community. This was not considered necessary nor was it affordable at the time Heartbeat Wales was established.

The outcome evaluation for the Heartbeat Wales programme was thus based on the premise that there would be no substantial additional investment in heart disease prevention in the rest of the UK for a period of five years. It became apparent as Heartbeat Wales developed, however, that the level of interest was considerable and the transfer of ideas and projects was occurring earlier than was anticipated at the initial planning phase. It was realised that the specific transfer of components of the Heartbeat Wales intervention to the reference area could have a considerable impact on the validity of the basic Heartbeat Wales evaluation design. For this reason a study was undertaken during 1990-91 to assess the extent to which key inputs of the Heartbeat Wales programme had also occurred in the reference community. The implications for the assessment of differences in health behaviour and risk factor changes between Wales and the reference area, the basis for the outcome evaluation, would also be considered.

METHODS

In the UK, only health authorities have a specific responsibility to coordinate a range of health promotion programmes through different settings including community health centres, worksites, the media, and schools. Most have therefore established a discrete health promotion service and employ staff to provide local leadership and coordination. Given this central role, a reasonable way of assessing the extent of heart disease prevention activity is to carry out a review of relevant activity either directly undertaken or coordinated by the health authorities. This was the approach adopted in this study for both Wales and the reference area.

A series of semistructured interviews was conducted with each of the nine district health promotion managers in Wales and their 16
counterparts in the reference area by a trained interviewer (SM). In addition, the two relevant regional health promotion managers were asked to supply information on activities relating to heart health promotion for their respective regions in the reference area between 1985 and 1990. The Health Education Authority in England also provided details of their “Look After Your Heart” programme. The Heartbeat Wales intervention database was also scrutinised for regional type activities across Wales.

The questionnaire which formed the basis for the interviews was developed and piloted in districts outside the study area. It covered three substantive areas of the Heartbeat Wales intervention, as follows:

(i) Coordinating, monitoring, and communicating—This covered records of the planning process for heart health interventions, and of research and evaluation activity. It also included records of the adoption of programmes or projects with distinctive identities and logos, as well as the proactive use of the media.

(ii) Creating new resources—This covered two major resource inputs: money and staff. It included reference to records of financial allocations from district health authorities, including money earmarked for specific coronary heart disease prevention projects, as well as external funding obtained for coronary heart disease projects. It also included records of staffing levels, both for “general” health promotion activities, and of staff specifically dedicated to heart health promotion.

(iii) Developing supportive environments—This included records of special projects directed towards influencing the environment in its widest sense and details of relevant supportive policy development.

Although these three themes account only partially for the wide range of programme activities which operated at both national and local level in Wales, they are recognisable as forming key inputs that would distinguish the programme in Wales from “business as usual” in the reference area. As inputs, they can be quantified in such a way as to allow for a comparison between Wales and the reference area.

The respondents were interviewed face to face and were given guidance on what constituted heart health activity. This included project or programme work on smoking, exercise, blood pressure screening, cardiopulmonary resuscitation, and nutrition. Respondents were told that the purpose of the interview was to obtain a detailed account of heart health promotion within their district or regional boundaries over the previous five years. No reference was made to Heartbeat Wales before the interview, and all questions about respondents’ knowledge and views of the programme were asked towards the end of the interview. Although every effort was made to obtain answers to all questions, an explanatory background and adjustments to information were often needed to qualify the responses. This required supplementary qualitative notes to be taken, and their subsequent qualitative notes to be interpreted in the construction of Tables 1–3.

Such a method of gathering information has certain difficulties. It relies heavily on gaining access to the relevant people and records over a five-year period. Although there were some consistencies in financial record keeping across the districts, the level of detail in these records varied considerably between health authorities. Several of those interviewed, 6 of 9 in Wales and 10 of 18 in the reference area, had been employed either in their present managerial position or within the regional or district health authority throughout the period 1985–1990. Where the current manager had not been in the district for that period of time, it was necessary to involve other staff who had knowledge of the developments during that period.

These problems of access were compounded by the difficulty of collecting comparative data from districts that organise programmes in radically different ways. The standard format adopted for collecting this information helped to overcome some of these
difficulties but could not compensate for missing or inaccurate data. Only a summary of the full range of information collected is presented in the results section.

**RESULTS**

The results of the enquiries into interventions mediated through health authorities are presented under the three aspects discussed above.

**Coordinating, Monitoring, and Communicating**

Table 1 provides summary information concerning a range of indicators of relevance to leadership and coordination. Heartbeat Wales was launched as a uniquely dedicated heart disease prevention programme in March 1985, and subsequently became absorbed within the Health Promotion Authority for Wales during 1987 and 1988. During the corresponding period in England, the Health Education Council (and subsequently the Health Education Authority) launched, in 1987, the Look After Your Heart (LAYH) programme for England in conjunction with the UK government’s Department of Health. Although this programme was not specifically targeted at the reference area, it offered a focal point for activity and an important new source of funding for heart disease prevention, including the reference area. In addition to this England-wide activity, one of the two regions within the

<table>
<thead>
<tr>
<th>TABLE 1. Coordinating, Monitoring, and Communicating in Wales and the Reference Area</th>
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<td>Wales (9 districts)</td>
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<td>(1) Regional coordination</td>
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<td>(2) Creation of intersectional teams for heart health promotion</td>
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<td>(3) Providing health status information to decision makers and the media</td>
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<td>(4) Collaborative projects with the media</td>
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established its own regional strategy for coronary heart disease prevention in 1988 using the name “heartbeat” in the title.

One important objective in establishing Heartbeat Wales was to generate intersectoral support for coronary heart disease prevention. Table 1 (section 2) shows that the intersectoral teams needed to facilitate such an approach were established in all districts in Wales by the end of 1986. In the reference area, 7 of 16 districts had established comparable groups between 1985–1988 and 12 of 16 by 1990.

As intended, Heartbeat Wales established a comprehensive research and evaluation strategy to complement the intervention. This provided a wide range of information to support the planning and management of projects. No comparable information was available in the reference area in 1985, although three districts and one region now have reasonably well funded and properly integrated research programmes in operation. In the case of one district and one regional health authority, these were reported to be “modelled on Heartbeat Wales.”

As a large scale programme designed to reach three million people, Heartbeat Wales needed to collaborate with the Wales based and UK-wide media. As indicated in Table 1, section 4, several of the television programmes that were developed in Wales to support the project were subsequently modified and networked throughout the UK, and therefore into the reference area. Considerable resources were also invested by Heartbeat Wales in creating a strong corporate image for the programme. As a consequence of this, awareness and recall of the Heartbeat Wales programme were high in Wales from 1986 onwards. In 1986, 53% of adults had heard of Heartbeat Wales when prompted (32), a figure which rose to 71% by 1989 (33). Although no equivalent programme image existed for the reference area as a whole, two of the districts and both regions had developed coordinated programmes with distinctive identities and logos by 1990. Interviews with respondents clearly established that Heartbeat Wales had been an important influence in both stimulating the establishment of heart health activities, as well as guiding selection of content.

All of the 18 health promotion managers in the reference area had heard of and read about Heartbeat Wales. Thirteen stated that they had had direct personal contact with the programme through such things as conferences, visits or tours, professional relationships, and the use of Heartbeat Wales publications and resources.

Creating New Resources

Table 2 indicates the resources invested directly in coronary heart disease prevention within three categories—dedicated staff, operational budget at the district level for heart health from external sources, and operational budget at the regional level. The data are presented in absolute terms, and then per 100,000 population (in brackets). In Wales the staff devoted to heart disease prevention and the cash available at the district level rose substantially between 1985 and 1988, but declined between 1989 and 1990. At the regional level in Wales resources increased between 1985 and 1988, fell in 1989, and rose again in 1990. In the reference area, a similar pattern of resource deployment can be observed at the district level. There seems to have been a sustained increase in budgets at the regional level, however, reflecting Health Education Authority/Department of Health expenditure since 1987 on their LAYH programme, and a specific one-off grant in 1990 in support of a special, year-long initiative. Overall, cash investment in heart health promotion seems greater in the reference area than in Wales for 1989 and 1990.

Creating Supportive Environments

Table 3 indicates a range of special initiatives, largely outside of the health sector, directed towards influencing the environment.
## TABLE 2. Creating New Resources

<table>
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<th>Wales (2.88 million people)</th>
<th>Reference Area (3 million people)</th>
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<tbody>
<tr>
<td>(1) Changes in staff devoted to heart health at district level</td>
<td>1985–88 † from 1.5 (0.05) to 14 (0.49)</td>
<td>1985–88 † from 1 (0.03) to 7.5 (0.25) persons</td>
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<td></td>
<td>1989–90 ↓ 14.4 (0.5) to 8 (0.28)</td>
<td>1989–90 ↓ from 6.5 (0.22) to 3.5 (0.12) persons</td>
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<tr>
<td>(2) Changes in budget for health from external sources at district level</td>
<td>1985–88 † from £16 000 (£556) to £239 000 (£8300)</td>
<td>1985–88 † £9600 (£320) to £184 000 (£6130)</td>
</tr>
<tr>
<td></td>
<td>1989–90 ↓ from £165 000 (£5730) to £92 800 (£3220)</td>
<td>1989–90 ↓ £166 900 (£5560) to £97 000 (£3230)</td>
</tr>
<tr>
<td>(3) Changes in budget for regional heart health promotion (excluding research and evaluation, salaries, travel, and rent)*</td>
<td>(HBW) 1985–88 † from £193 060 (£6720) to £406 820 (£14 160)</td>
<td>1985–88 † from 0 to £254 050 (£8470)</td>
</tr>
<tr>
<td></td>
<td>(HBW) 1989–90 ↑ from £189 500 (£6600) to £261 430 (£9100)</td>
<td>1989–90 ↑ from £300 400 (£10 010) to £1 078 750 (£35 960)</td>
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LAYH = Look After Your Heart; HBW = Heartbeat Wales

Budgets relate to National Health Service financial years. Figures in brackets represent the number of staff or budget per 100 000 population.

*Data for the reference area include an apportionment of the LAYH national budget (excluding overhead costs and direct regional allocations) on a population pro-rata basis, but does not make allowance for other expenditure by the HEA on coronary heart disease prevention activity, for example, through its Smoking and Nutrition education programmes.

†This figure includes a special one year grant of £750 000.

## TABLE 3. Developing Supportive Environments

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<th>Wales (9 districts)</th>
<th>Reference Area (16 districts)</th>
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<tbody>
<tr>
<td>(1) Food labelling and nutrition education with Tesco Supermarkets</td>
<td>Developed initially in Wales 1985 and then maintained 1985–90</td>
<td>Applied UK-wide 1985–90</td>
</tr>
<tr>
<td>(2) Lean meat merchandising scheme with Meat and Livestock Commission through butchers</td>
<td>Developed and piloted in Wales 1988–90</td>
<td>Operating in three districts in the reference area 1988–90</td>
</tr>
<tr>
<td>(3) &quot;Super Ted&quot; fruit and vegetables promotion through supermarkets</td>
<td>Developed in Wales 1989–90</td>
<td>Applied UK-wide 1990</td>
</tr>
<tr>
<td>(4) Heartbeat Award Scheme for restaurant and work canteens</td>
<td>Developed and operating in Wales 1985–90 (all districts)</td>
<td>Operating in eight districts (1988–90)</td>
</tr>
<tr>
<td>(5) Make Health Your Business (joint Heartbeat Wales/CBI initiative) for commerce and industry</td>
<td>Developed and operating in Wales 1988–90 (all districts)</td>
<td>Look After Your Heart workplace programme operating in nine districts 1989–90</td>
</tr>
<tr>
<td>(6) Introduction of policies to restrict smoking in NHS premises</td>
<td>One district by 1985 All districts by 1988</td>
<td>Three districts by 1985 14 districts by 1988 All districts by 1989</td>
</tr>
<tr>
<td>(7) Introduction of policies to promote healthy catering in NHS premises</td>
<td>Four districts by 1985 All districts by 1988</td>
<td>One district by 1985 Nine districts by 1988 14 districts by 1990</td>
</tr>
<tr>
<td>(8) Healthy Hospital Award Scheme for NHS</td>
<td>Developed and operated in Wales from 1987</td>
<td>Not transferred up until 1990</td>
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</table>
These include those intended to improve the availability and labelling of food (sections 1–3), the availability of healthy choices in restaurants (section 4), and changes in worksite health promotion (section 5). Table 3 indicates how four of these special initiatives have also reached the reference area, either fully (sections 1 and 3) or with partial coverage (sections 2 and 4). The workplace programme, as conceived in Wales, was at least partly matched through the LAYH programme in nine of the districts in the reference area.

Table 3 also highlights progress towards creating supportive environments within the health system (sections 6–8). Through policy development work and the Healthy Hospital Award Scheme, developed in Wales in 1987, the objectives of securing a policy commitment from the health system in relation to smoking, nutrition, and catering were met within Wales for all districts by 1988. In the reference community, all districts had achieved similar progress by 1989 in relation to smoking, and most (14 out of 16) had policies relating to nutrition and catering by 1990. The Healthy Hospital Award Scheme, however, had not been transferred to the reference area up until 1990.

**DISCUSSION**

The results need careful interpretation since the range of indicators selected are partial in their ability to describe the intervention in Wales and related activities in the reference area. The study is also retrospective, and relies on the frailties of human recall and health service oriented record systems. There may also be differences in interpretation as to what constitutes heart disease preventive programmes and in the classification of people as being “dedicated” heart disease prevention workers. Although the information for Wales was verified using the previously mentioned record-keeping system, this was not possible in the reference area.

The available information indicates that the Heartbeat Wales programme was largely successful in providing the programme “input” described in its original planning documents. The programme seems to have led to a clear increase in resources for coronary heart disease prevention, important public education programmes, and observable changes in related policy and infrastructure in Wales. Assessing whether or not this “input” has led to improved population health and reduced cardiovascular risks will be the subject of further reports detailing findings from the population surveys conducted in Wales and the reference area in 1985, 1988, and 1990.

The study has also shown a rapid uptake of heart disease prevention activities in the reference area. This uptake occurred through a number of ways, including:

(a) the pilot projects which were set up in Wales and very quickly became networked nationally;

(b) the England-wide intervention programme LAYH promoted by the Health Education Authority and Department of Health and Social Security;

(c) a general growth in interest in coronary heart disease prevention encouraged, for example, through national media initiatives, some of which emanated from Wales; and

(d) special one off events (such as the Lifestyle Heart Health exhibition in 1989), which may have further “legitimised” action already occurring in the reference area.

Such substantial developments in the reference area may undermine the usefulness of the basic quasi-experimental design established in 1985 to assess the health outcomes of Heartbeat Wales. There is clearly much less of a contrast in “input,” particularly in the latter years, between Wales and the reference area than was envisaged in the planning of the evaluation design. As a result, in future analysis of Heartbeat Wales data, greater emphasis will need to be placed on the range of process evaluation studies.
Finally, this experience points to the need to develop good quality exposure measures in population surveys. These assist analysis of outcome by distinguishing individuals who have clearly been exposed to the programme (or elements of the programme), and those individuals within communities who have not. Similarly, it may also allow for confirmation of unexpected exposure to programme elements in the reference community, if a reference community is to be used.

Acknowledgements The authors thank Jo Clarkson for fieldwork support; Alison McKellar and Sue Avery for their help in preparing this paper; and Les Irwig, Bob Spassof, and Paul Lincoln for constructive criticism.

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