Effect and stage models in community intervention programmes; and the development of the Model for Management of Intervention Programme Preparation (MMIPP)

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SUMMARY
Recent years have seen the development of a number of diagrammatic 'models' bearing on community intervention programmes. There have been two basic types, one involving actual or hypothetical causal relationships (effect, or how-it-works models) and the other, sequences of activities or events (stage, or how-to-do-it models). A selection of such models, with their roots in different theories of social change, health education and health promotion, are reviewed in the light of this distinction. Both types of model are important.

Existing stage models for health promotion programmes imply an ordered or cyclical set of activities, in which preparation is followed by implementation, maintenance, evaluation and revision. In the second part of the paper a new and more detailed type of stage model is presented for the preparatory phase. In practice, this phase involves a series of parallel but interdependent activity streams. These add up to a complex process that needs to be carefully planned and managed. In such circumstances it is important to be able to convey to the various people and organisations involved how their different contributions mesh together. The new model is designed to help with this. It has been developed in the light of experience of planning community-based disease prevention programmes in Stockholm and elsewhere, with the objective of making the lessons learned available for others in a compact and accessible form.

Key words: community-intervention; management model; planning

INTRODUCTION: EFFECTS AND STAGES

Over the last 20 years, a number of diagrammatic 'models' have been developed in the context of health promotion. Typically they consist of a set of elements (usually represented by boxes), and a set of relationships that link them together (usually arrows). The two most common types of link are between cause and effect and between stages in a desirable sequence of activities. An alternative approach, in which circles represent events and arrows processes is used in some project
management models such as the Critical Path Method (CPM; see, for example, Moore, 1985).]

In cause–effect links the boxes usually contain events or variables, and the arrows indicate that event A causes event B (or can be expected to), or more usually, that changes in variable A will result in changes in variable B. The intention is descriptive: how will it work? If a link appears in the model, it implies that there is empirical evidence or a priori grounds for believing that A affects B. A connected set of causal relationships can be put together to form a ‘causal’ or ‘effect’ model; for health promotion, Figure 1 is a basic example, similar to that given in Chapter 1 of Green and Kreuter (1991).

Where the arrows indicate desirable sequence however, the boxes usually represent activities, and an arrow implies that it is a good thing to do A before doing B. Doing A first is expected to increase B’s effectiveness or efficiency, but ethics or equity could also be involved. Again, a connected set of staged activities can be put together to form the familiar goal-seeking or programme planning model characterised by Figure 2. Usually the intention is prescriptive (how to do it) even though there may be research evidence suggesting that the approach is effective.

The point of both effect and stage models is to develop a shared understanding among the many people and organisations involved in a particular programme of work, and to communicate it. Both kinds of model are needed, but for different reasons; stage models represent the plan of action, and effect models represent the scientific justification for it.

One problem is that all that many readers ‘see’ are boxes and arrows. Experience with Stockholm programmes suggests that this can confuse as much as clarify unless the nature of the links involved is explicit. Confusion is only to be expected because a link that is intended to indicate an effect can easily be understood as indicating sequence if a time-lag is involved (such as between a change in a risk factor and a change in incidence). Equally, a link that is intended to show that A should be done before B can be interpreted as showing that A causes B because, for example, community diagnosis should affect the form of an intervention programme.

This confusion is all the more likely when links of both kinds appear in the same model—or are mixed up with links of other quite different kinds. An effect model could contain links that were actually hypothetical (A might affect B), theoretical (according to a particular school of thought, A affects B), or aspirational (it would be a good thing if A affected B). In Figure 1 for example, the link between intervention and behaviour could be any of these three until good research evidence can establish it as an empirical fact. Confusion could be avoided if the nature of each link in any particular effects model were explicitly signalled or discussed, indicating the strength of the evidence and/or the theoretical justification in each case.

Similarly, a stage model can contain links that are necessary rather than desirable (B can only occur after A, but is not caused by it in any scientific sense; to take a trivial example, a community cannot be analysed until it has been chosen).

Our aim in the first part of this paper is to clarify and illustrate these distinctions by reference to a number of models in the published literature. In the second part we will go on to suggest a development of stage models that may be of value for managing the preparatory stages of a community intervention programme.

Fig. 1: The basic causal or ‘effect’ model for health promotion.

Fig. 2: The basic planning or ‘stage’ model for health promotion.
EFFECT AND STAGE MODELS FOR HEALTH PROMOTION: A SELECTIVE REVIEW

There are no formal selection criteria for inclusion in this review, and there will be no attempt at judging the relative merits of the models described. The intention is to make the point that although they may differ in scope, intent and paradigm, effect models have one essential structure, and stage models have another. The difference between models within each category lie mainly in the detail with which each link or stage is described.

Effect models

Borland (1992) presents a generalised effect model for health promotion, with a number of interlinked effect-chains, and this is shown in slightly adapted form in Figure 3. On the one hand, public education programmes seek to affect knowledge, attitudes, intentions and social norms in the population, and thus health behaviour. On the other hand, advocacy reaches into the political process with the objective of changing the social and physical environment. Healthy behaviour and a healthy environment are expected to combine to reduce the incidence of disease. This is a generalised model, and the strength of the evidence for each link as causal will depend on the nature of the intervention and the risks it targets. Thus it is best taken as theoretical/hypothetical.

Another example was provided by Sanderson and Svanström (1988) with their model of how community intervention can be expected to change diet and thus reduce cancer incidence.

The structure is generally similar to Borland’s; action involving members of the population is expected to strengthen demand for healthy food, and action on the environment (in this case food producers and providers) to affect supply. To be effective, action is taken at a number of levels. Members of the population are reached as individuals, as members of organisations and groups, and as members of communities. Providers are reached directly, but also via their own organisations and legislation. Although this was a model of a more specific situation than Borland’s, the causality of some of the links was still only partly established, and others were mainly theoretical. In fact the intervention programme was seen quite explicitly as providing an opportunity for research into the links it assumed.

By recognising that different groups and organisations are reached through different kinds of channel and respond to different kinds of intervention, the Sanderson/Svanström model begins a process of disaggregation. This is taken further in one of the several models associated with PATCH (Planned Approach To Community Health; Kreuter, 1992) described by Cook et al. (1992). In this the ‘process’ effects of intervention, for example, are broken down into increases in amounts of information available, of resources, of awareness, and of community ownership. Its features reflect the programme’s roots in the community health promotion paradigm, in which the intention is to increase the community’s capacity to reduce its own burden of disease. Since 1985, PATCH has been taken up in large numbers of communities in the USA, with state and local health agencies providing leadership. On this
basis it should be possible to signal which of the links in Cook et al.'s model have been demonstrated empirically in a variety of settings, and which are more vulnerable to context or the specifics of the targets and strategies involved.

This concern leads naturally to the 'Research Agenda' model (Figure 4). Described by Green (1992) as a 'map' of causal relationships, this is intended as a generalised framework for identifying and classifying research studies. Six areas are identified: types of programmes, levels of influence, targets of change, short-term outcomes, intermediate outcomes and long-term outcomes. Each area is broken down in more detail; 'targets for change', for example, break down into lifestyles, social norms, environments, policies and resources. The whole point of the Research Agenda model is that some of the links are well-researched but others not at all, and the strength of the scientific evidence supporting different links in these kinds of model is generally highly variable. The model provides a structure and vocabulary for identifying important research questions, and can raise the issue at an early stage of what opportunities a particular intervention programme might offer for relevant studies.

Stage models
In recent years a number of how-to-do-it models for planning community intervention have been published. An illustrative selection of these will be described here, drawn from different theories of social change, health education and health promotion. In an attempt to analyse their points of similarity and difference, a rather artificial framework has been devised, based on the planning sequence (Figure 5). The process of forcing the models to fit this framework has meant a degree of selection and distortion. The interested reader should refer to the originals, as some of their richness and emphasis will have been lost.

Johnston (1988) described one of the first models rooted in community organisation; it was originally presented in 1976. Its 12 main steps are shown in Figure 5. The importance of effective community participation is recognised, with the health sector and the community working together on how best to achieve it; this is set in contrast to a more didactic 'health delivery' approach (Rifkin, 1983). For each step in the development of the community health programme, the objectives, purpose, action and information needed have to be specified. Johnn

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**Fig. 4: The Research Agenda model for health promotion.** From Lawrence W. Green (1992) The health promotion agenda revisited. *American Journal of Health Promotion, 6, 411–413.*
ston also indicates points to watch out for and avoid, such as: oversaturation of the field; jealousy of other regions; pride or self-satisfaction resulting in inability to accept new ideas from outside, etc.

From within the social work research tradition, Swedner’s (1982) model of community change involves five phases. Within the ‘actor’ paradigm that is proposed as essential for the research worker, the production of new knowledge becomes only one in a series of activities. Others include goal-formulation, tool-production, action planning, implementation and evaluation. The researcher is urged to participate in all these activities, in close cooperation with administrators, politicians and others. (This model is not included in Figure 5.)

Bracht and Kingsbury’s (1990) model is based on many years of experiment and research in a variety of fields, and draws on applied work in community organisation, social and community change, organisational development and community decision-making. It has been widely used. The five stages are community analysis, design/initiation, implementation, maintenance/consolidation, dissemination/reassessment. Each of these is again broken down into subgroups, as shown in Figure 5.

The PATCH programme has already been mentioned. Another of the models associated with it is described by Steckler et al. (1992). This is based on another variant of the standard planning stages; initiate, select community/core group, collect data, prioritise, plan, intervene, evaluate, institutionalise (Figure 5). It has a number of recurring themes (Nelson et al. 1986):

• active participation by a wide range of community members in process and in decision making;
• initial strategy development based upon existing community resources;
• development of skills and resources within the community.
• repetition of any step as time goes on to address new health priorities, target groups or interventions.

Dignan and Carr (1992) first presented their model in 1987 and have developed it since then. It combines approaches from health education and health promotion, and involves five main stages: community analysis, targeted assessment, programme plan development, implementation and evaluation. Each stage is subdivided. Implementation for example breaks down into gaining acceptance of the implementation plan, specifying tasks and resources, developing plan specifics and establishing programme management, before putting the plan into action.

The SESAME model, shown in Figures 5 and 6, (identify needs, build alliances, set targets, design implementation/mobilise resources, create supportive environments, create maintenance structures, monitor and evaluate, renew/reinforce/reorient) emerged from an international conference on health promotion in Sundsvall, Sweden in 1991 (Haglund et al., 1993). One distinctive feature is the emphasis placed on participation and involvement by members of the communities concerned from the very beginning. Another is its graphic representation of the cyclical nature of the process of renewal, reinforcement and reorientation of a prevention programme in the light of the results of formative evaluation.

One model in which effects and stages are intermingled is given by Goodman et al. (1993). By contrast, a model that includes both stages and effects but keeps them clearly separated is PRECEDE/PROCEED, shown in Figure 7 (Green and Kreuter, 1991). At the core of this is PRECEDE, an ‘effect’ model in which health promotion (seen as a combination of health education on one hand and appropriate policy, regulation and organisation on the other) works by predisposing to, enabling and reinforcing changes in behaviour and the environment. These changes in turn lead to better health and better quality of life. As a result of using PRECEDE in the context of the ubiquitous PATCH, it was realised that the series of links in this chain of causation correspond to a series of phases for programme planning, implementation and evaluation. These phases are the elements of PROCEED. The diagnostic phases start with social diagnosis of quality of life, and work upstream to an analysis of policy and administration. The implementation phase involves health promotional activity; evaluation of process, impact and outcome involve each downstream link in turn.

The need for a new model
Our conclusions at this point are that:

• Any community health promotion programme should be based on an effect model and a stage model. These should be clearly distinguished to avoid confusion.
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<tr>
<th>Johnston</th>
<th>Green and Kreuter (PATCH)</th>
<th>Dignan and Carr</th>
<th>Sundsvall (SESAME)</th>
<th>Bracht and Kingsbury</th>
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<td>Promote with government</td>
<td>Idea initiated</td>
<td>Identify needs/problems</td>
<td>— assess community capacity</td>
<td>— select initial project area</td>
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<td>Consolidate health staff</td>
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<td>Build alliances</td>
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<td>Approach to community</td>
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<td>— define community</td>
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<td>— collect data</td>
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<td>— select initial project area</td>
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<td>Train to implement plan</td>
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<td>— synthesise data/set priorities</td>
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<td>— establish core planning group</td>
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<td>— plan implementation</td>
<td>Plan intervention</td>
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<td>— recruit planning group</td>
<td>Design implementation</td>
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<td>— develop programme goals</td>
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<td>— gain acceptance</td>
<td>— create supportive environment</td>
<td>— generate broad participation</td>
<td>— put plans into action</td>
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<td>— specify tasks/resources</td>
<td>— develop specific plans</td>
<td>— develop sequential workplan</td>
<td>— establish programme management</td>
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<td>— establish programme management</td>
<td>— integrate community values into programme</td>
<td>— create maintenance structure</td>
<td>— integrate activity into community</td>
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<td></td>
<td>— put plans into action</td>
<td>— establish ongoing recruitment plan</td>
<td>— develop sequential workplan</td>
<td>— disseminate results</td>
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<th>Evaluate</th>
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<th>Dissemination/reassessment</th>
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<td>Evaluate</td>
<td>Evaluate</td>
<td>Monitor</td>
<td>— update community analysis</td>
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<td>Revise</td>
<td>— clarify goals/objective</td>
<td>— determine criteria</td>
<td>Evaluate</td>
<td>— assess effectiveness of intervention</td>
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<tr>
<td>Expand established programme</td>
<td>— select design</td>
<td>— plan data collection</td>
<td>Renew</td>
<td>— chart future direction/modifications</td>
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<td>Extend to other communities</td>
<td>— plan analysis/reporting</td>
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<td>Reorient</td>
<td>— summarise and disseminate results</td>
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<td>Promote and train in new area</td>
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<td>Reinforce</td>
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Fig. 5: Stages in different models for health promotion programmes.
Most of the published effect models can be seen as developments of the basic causal model of Figure 1.

Most of the published stage models can be seen as developments of the basic goal-seeking model of Figure 2. A consolidated version might include the following: initiate, analyse/explore, prioritise, plan, implement, consolidate/maintain, evaluate, export/disseminate.

One important shortcoming of existing effect models as bases for intervention is that it is not
apparent how far they are evidence-based. In the context of a given programme they should indicate which of the links involved were empirically established and which were theoretical or hypothetical.

One problem with the stage models described is that they are all essentially conceptual. They are useful for communicating broad aims, but their linear nature (A then B then C, etc.) does not provide a sufficiently detailed basis for coordination and management of a programme (Grossman and Scala, 1993; Goodman et al. 1993). In particular, programme development will involve a variety of people in a variety of parallel but interdependent activities in which work on some will not have a secure foundation unless sufficient progress has been made on others. Coordination and a shared sense of purpose requires that the different parties involved have a clear picture of their own place in the wider scheme. Programme management requires targets and deadlines to be set and monitored, so that problems can be identified or, better, anticipated, and remedial action taken.

This problem is obviously not unique to planning and managing disease prevention or health promotion programmes. It is found, if in more extreme form, in the construction industry. People from many different trades work together on activities much must follow a certain order: plans, foundations, walls, roof, fittings, etc. A technique that has proved useful in this and many other project planning contexts has been the construction of activity networks. These identify the activities necessary to achieve a particular result, show their interdependencies, and involve estimates of the time and resources that will be needed for each.

This kind of approach provided the starting point for a new type of planning and management model for health promotion. It was first devised in Sarajevo in 1989. It focuses particularly on the early stages of the programme, during which the natures of both intervention and evaluation are being defined.

**MODEL FOR MANAGEMENT OF INTERVENTION PROGRAMME PREPARATION (MMIPP)**

This model (Figure 8) consists of a diagram in which time runs from left to right, and which has two main features:

- **horizontal bands** which distinguish broad categories of programme development activity, viz.:
  - O, organisation activities O1, O2, O3, etc.
  - S, strategy activities S1, S2, etc.
  - T, targets/objectives activities T1, T2, etc.
  - E, evaluation activities E1, E2, E3, etc.
  - F, funding activities F1, F2, etc.

- **vertical bars** which mark the ends and beginnings of different phases:
  (1) getting started;
  (2) community analysis;
  (3) initial programme design;
  (4) programme preparation and development;
  (5) programme implementation and review.

Specific activities are labelled in terms of these two categories. Thus getting started on organisational development (forming the programme development team) is O1, and so on. The significance of the different stages is that activities to the right of a vertical bar cannot begin in earnest until sufficient progress has been made with all activities to its left.

It should be emphasised that the model presented here is only an example. In this case, the initiative for the study came from a group of clinical and social research workers interested in disease prevention, and the starting point was a disease (diabetes). Other programmes may take a community or group within a community (e.g. the homeless), a risk factor (diet, exercise) or an intervention channel (workplace, schools) as their starting point, in which case the details of the model would be different, in the early stages at least.

**Stage 1: getting started**

For a disease-based programme, the tasks that would ideally be completed before starting the second, community analysis, stage are as follows.

(O1) Choose who should be involved in programme development and set up a programme development team. At this stage it may also be helpful to draw up a broad stage or planning model.

(S1) Identify possible localities for intervention. The kinds of criteria involved are the capacity that the community appears to have for
**Fig. 8:** An outline model for managing the preparatory stages of a community intervention programme.
supporting the project, and the extent to which it seems ready to do so. Review the scientific literature. For a disease prevention programme this would cover the epidemiology and aetiology of the disease in question, and evaluation studies of any similar prevention programmes elsewhere. On this basis build an effect model of how the programme is expected to achieve its objectives, identifying the main causal links and assumptions involved. Ensure that the scale of effort being considered is in proportion to the evidence (or the scope for research).

Obtain seed funding and identify potential sources of longer-term financial support.

**Stage 2: community analysis**

Identify community and professional leaders in possible intervention areas and discuss the programme with them. One repeated message from other studies has been the importance of involving the right people and of linking up with pre-existing local initiatives (Haglund et al., 1990; Mittelmark et al., 1993; Elder et al., 1993; Schwartz et al., 1993).

Draw up a profile of possible collaborating organisations in possible intervention localities.

Undertake community diagnosis: demography, epidemiology, and particular health risks in the community concerned. Goodman et al. (1993) have suggested that overemphasis on 'traditional' risk factor surveys can be unproductive. Collaborators should be involved, and focus groups may have a role to play. An analysis of 'readiness to change' (Prochaska, 1992) is also important at this stage. How many people are already contemplating taking more exercise?

Identify any aetiological issues that may be illuminated by such an intervention programme. Interest in and commitment to the programme on the part of professional leaders and scientists will be greatly enhanced if there are outstanding aetiological questions which could be usefully studied in the context of an intervention study.

Pursue funding for intervention and evaluation.

These activities should be going on in parallel, the first tasks of the programme development team. (It may be useful to have two development teams. One might be action-oriented, concentrating at this stage on the identification of community and professional leaders, and collaborating organisations and perhaps sources of funding; the other might be more analysis oriented, concentrating at this stage on community diagnosis.) Both the action-oriented and the analytical work will need to draw on the review of the scientific background if the right questions are to be asked, the right people are to be approached, and the members of the programme development team are to inspire confidence during technical discussions with professional and community leaders.

**Stage 3: initial programme design**

Assemble panel of programme advisors. On basis of discussions with community and professional leaders, a standing panel can be set up. Again, there may be existing structures to build on. As well as providing advice on strategic issues, this panel may act as 'guardians' of the programme in political and professional circles. Given the likely diversity of their backgrounds, it may be helpful to use the effect models developed in stage 1 to help communication.

Choose an initial set of intervention channels.

Choose risk factors for intervention. A key theme for this stage is prioritisation. On the basis of the community diagnosis, the survey of intervention channels and discussions with community and professional leaders, the most relevant risk factors and channels for intervention can be chosen, as well as possible population groups for targeted intervention—during the early stages of the programme, at least.
Begin development of evaluation strategy. Ideally this should cover qualitative aspects as well as quantitative (Lancet, 1993), and costs as well as benefits. The evaluation literature, assessment techniques and relevant measuring 'instruments' (including questionnaires) can be reviewed. It may be necessary to carry out preliminary studies involving the development and testing of new measuring instruments, and/or the validation of existing ones. The scope for using routine data sources for evaluation purposes can be investigated. Ultimately the form and scope of evaluation will depend on pressures from the community and the budget, as well as methodological factors (Nutbeam et al., 1990). However, it should be possible to determine not just whether the programme has met its targets, but which aspects of the programme were particularly effective or ineffective, and if targets are not met, why this was so. In many programmes a mechanism for systematic and continuous assessment of progress is built in (Bracht and Kingsbury, 1990). The results of this assessment process can be used in a process of continuous improvement in the intervention programme (Haglund et al., 1990).

Stage 4: programme preparation and development

Set up a programme implementation organisation. Once the risk factors, intervention channels and intervention community have been determined, the next stage can begin. Decisions will have to be made as to the structure of the implementation organisation. Bracht and Kingsbury (1990) suggest a core planning group involving a local organiser/ coordinator selected on the basis of the local culture and structure.

Develop intervention strategies in collaboration with intervention channels. Bracht and Kingsbury identify some key elements for effective strategies, including broad citizen participation and the integration of community values into the programme's materials and messages.

Carry out in-depth qualitative studies in the intervention population. Cooperation and intervention materials may be refined on the basis of extended interviews and focus groups.

The strategy for summative (outcome) evaluation should become specific, with design, survey instruments and control groups chosen.

Stage 5: programme preparation and development (second stage)

Set target and intermediate objectives. With a clearer idea of what is practicable in terms of the response of collaborating organisations and the results of the depth interviews with members of the community concerned, 'target' and intermediate objectives can be agreed between the various participants. It may be that apparent disagreements about objectives are really differences of perspective as to what are means and what are ends, and again the effect model can be useful.

Carry out baseline surveys in intervention and reference populations.

Stage 6: programme implementation and review

Begin programme activities.

Continue development of intervention strategy.

Periodic review of objectives.

Periodic surveys for formative and summative evaluation.

Pursuit of funds continues.

The programme now enters its implementation phase. The search for new collaborators and new approaches to intervention will continue. There will be regular feedback from 'formative' or 'process' evaluation studies showing which specific intervention activities appear to be reaching which process targets. Intermediate outcome studies will show the extent to which, for example, risky behaviour has changed, and if all goes well,
eventually the expected effects on morbidity and mortality will be seen.

DISCUSSION

The MMIPP model was derived principally from experience of developing the Stockholm Cancer Prevention Programme (Haglund et al., 1988). The sequential linkages between the different preparatory activities are in reality a good deal more intricate than the model suggests, and a degree of arbitrary simplification was necessary to reduce it to six parallel phases. In this form it is offered only as a starting point. To become useful for management purposes, a number of modifications and additions would be necessary.

- The model was developed in the context of a 'top-down' disease prevention programme for diabetes (Burström et al., 1994). This initial choice is treated here as a 'given', determined by the programme's progenitors. In other cases the programme's original defining feature could be a risk factor, a community, an intervention channel, or some combination of these. Some more recent programmes have focused on particular ethnic or demographic groups within a community (Bogan et al., 1992; Shea et al., 1992). These, and particularly community-based programmes, would require some alterations to the model structure.
- The various activities involved are described in rather general terms. As the programme begins to take shape, the descriptions can become more specific. Then, when changing circumstances mean that there have to be changes in strategy in mid-development, bringing the model up to date can help managers think through the implications.
- Names need to be attached to the various activities. Dates and timescales need to be attached to the various phases, based on how long the longest activity in each phase is expected to take. This helps to schedule the time of programme staff. Ideally the staffing balance would be such that for each phase, each activity took about the same amount of time. If not, and/or if some activities are set back for unforeseen reasons, it may be possible to arrange staff moves between activities.

CONCLUSIONS

The main conclusion is that at least three types of box-and-arrow diagram may be helpful:

- an effect model to provide the scientific justification for the programme,
- a broad stage model, probably linear/cyclical in structure, for overall planning of the programme;
- a more detailed stage model, probably including many linked parallel activities, for management of the preparatory stages.

There may well be others. An interdependent parallel activity model of the implementation/maintenance stages is an obvious possibility. It may also be useful to have a model of the evaluation strategy (e.g. Sanderson et al., 1988).

The MMIPP model has provided part of the basis for preparing the Stockholm Diabetes Prevention Programme. Also it has proved sufficiently flexible to have been used in Masters courses in both disease prevention and health promotion, and for continuing education of practising health planners. People with scientific, clinical and administrative backgrounds have been able to appreciate what is expected of them, and what they can expect of others, if they decide to undertake or participate in such a programme. However, it is offered here as a source of ideas rather than as a prescription. It has not been formally evaluated. It was designed for a particular context; organisers of other programmes would have to consider what modifications they would need to make. And participating in the progress of constructing such a model is an important activity in itself.

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