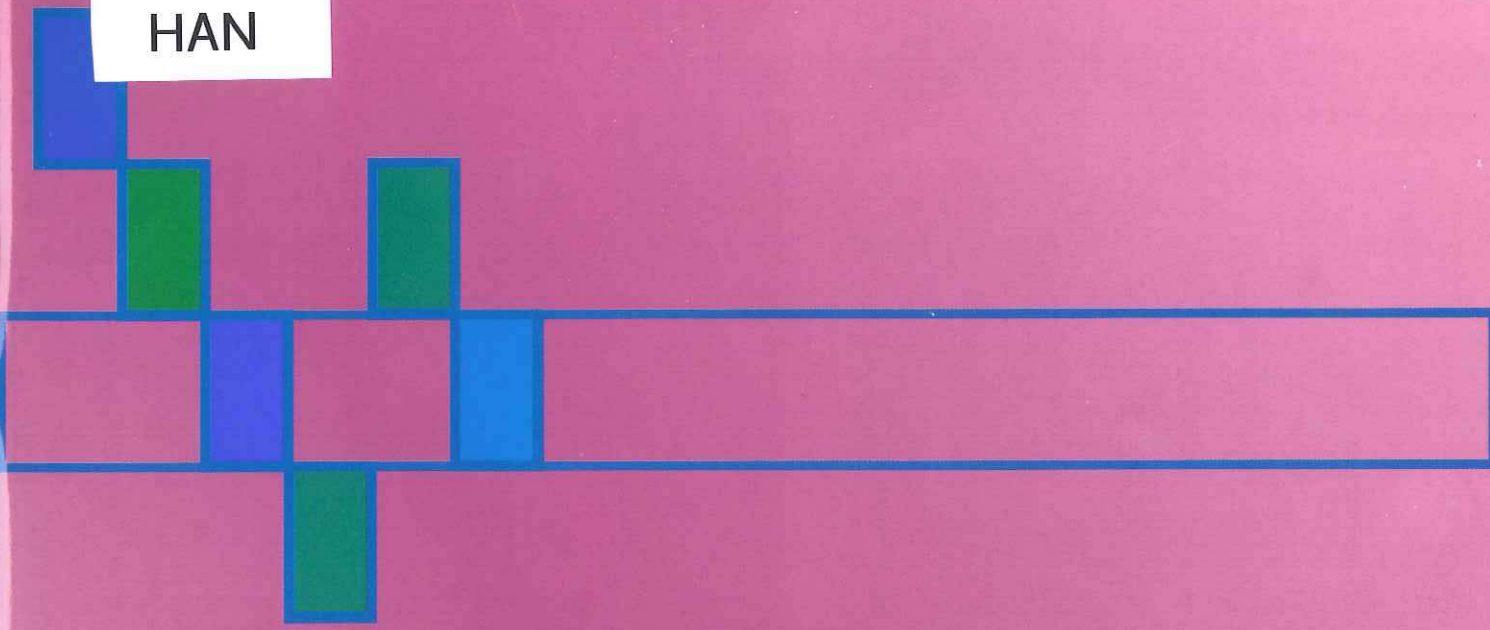# A feasibility study of the potential for compiling a health related database

Scottish Needs Assessment Programme

A feasibility study of the potential for compiling a health related database.

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Summary

The main aim of this study was to discover the potential for, and barriers to, combining routine sources of Scottish data on the determinants of health and health outcomes into a single dataset. The framework for this analysis was provided by a socio-ecological model of health devised by Evans and Stoddart[1]. This model, together with a review of the current use of indicators, defined the domains for which indicators, and therefore data, were required.

Starting from the research team's own knowledge of local and national data sources, common sense approaches (e.g. meetings with data users, simple questionnaires sent to local authorities, telephone and email enquires and internet searches) were used to extend the catalogue of data sources. Information about data from these sources was then inserted into relevant domains within the model. This exercise allowed comparisons to be made between the relevant characteristics of disparate sources of data (quality, comparability, coverage etc.) and identified domains for which few data are available. This large amount of information is summarised in a series of tables (Tables 1 – 12).

These results led to the conclusion that it would be feasible to create a combined dataset of indicators for Scotland using the range of data sources identified in this study. However, such a dataset would have some real strengths (e.g. data on the health service and some aspects of the physical environment) but more areas of weakness (e.g. routine data on poor physical function, measures of well being, valid indices of the social environment). In addition, data would be highly heterogeneous in terms of quality, coverage, geographical level and many other important parameters.

The key importance of this study is that it shows the potential for creating a practical resource which could be used to foster a more socio-ecological approach to policy making, planning, commissioning, implementation, monitoring and evaluation.

emphasise the role of environment and call for improvements in, for example, housing, amenities and benefits. Neither gives the whole picture. From this old debate a new consensus is emerging that acknowledges a complex interaction among many factors that influence health. This new model, which has been called the 'socio-ecological model of health', has informed many strategic documents including the World Health Declaration. The socio-ecological model of health is a model of the determinants of health but includes a broader range of health outcomes than just disease.

The key to understanding this model is to appreciate that the health status of a population is an emergent quality of a whole system of complex interactions that include genetic inheritance, the physical circumstances in which people grow up and then live (housing, air quality, working environment), the social environment (levels of friendship, support and trust), personal behaviour (smoking, diet, exercise) and, crucially, access to, or lack of, money and other resources that give us control over our lives. It is, also, now well understood that these complex and interactive determinants of health operate over the whole life span. For example, maternal deprivation and poor nutrition can affect birth weight and create influences that will manifest themselves forty or fifty years later as chronic disease in middle age while habits, values, skills and behaviours acquired during childhood have a profound influence on educational outcomes, job prospects and levels of disease.

The logical end point of this argument is that, if the determinants of health are multiple and interactive, policymaking must also have these qualities. We need government machinery which is capable of comprehending the whole system, as a system, rather than in its constituent parts. Such an approach would have a radical impact on policies governing transport, housing, benefits, education and much more. Indeed, once this broader understanding of health is accepted, almost all areas of policy are affected because almost all policies contribute to the complex web of interaction from which the health status of the population emerges. Is the conclusion, therefore, that health policy should drive all other policymaking? Quite the reverse. The health of the population is best served by abandoning health policy as a separate entity and embracing so called 'holistic government'.

Budgets

The biggest block in government for matching a systems model of health with a systems approach to policy making is the departmental budget system. It is institutionally difficult to shift money from one department to another even if the aim of the system as a whole may be one that *all* departments support in principle. This reinforces the 'departmental' culture and mind-set within government making *joined-up action* difficult. There are few incentives at present to encourage individual department heads to spend their own budgets in support of results which will be recorded as another department's success - for instance, spending a proportion of the health budget on improving the housing stock, or on better play areas for urban housing estates - even though both would have a positive impact on health.

Information

Apart from the technical machinery within government, the other main constraint against policymakers adopting the health model described above for the purpose of practical policymaking is a lack of appropriate information. The numbers flowing into government departments, being conditioned by the traditional model, provide little evidence to support either the notion that other policies are at least as effective in promoting health as 'health policy', or that money spent in one area can have a positive impact in others. Consequently, what is needed is an approach to information management that provides a better understanding of the multiple and interactive causes of ill health. To reach that point, government needs a different approach to information - to illuminate how health is created or destroyed and to evaluate the effectiveness of its policy interventions.

It is clear, but worthwhile emphasising, that information and indicators chosen in any such model are not value-free. The adoption of a systems model would be no different. Any set of indicators within the model would have their very own focus or set of assumptions, which are also affected by the way they are put together. In the adoption of any particular model of health, continual reflection on the approaches taken to 'model construction' and to the selection of indicators is vital.

An acceptance of ignorance is also necessary. The model of health is complex and interactive. It is, therefore, impossible to predict with confidence how it will react to intervention, still less how the myriad interventions of government in many policy areas

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simultaneously will affect results, particularly in the long term. There needs to be a culture in government which sees all policy as a continuing experiment, observed through appropriate mechanisms for monitoring which lead to adjustments to policy as necessary. It is a technique that is already built into the microchips which control even the simplest of machinery today, based on a discipline known as 'fuzzy logic'[4]. This approach may be more suited to the new Scottish Executive and Parliament who have stated their intention to try novel and consensual methods of working.

2. System indicators, systems thinking and models of health

Indicators, proxy measures, intermediate outcomes and targets

Terms like indicators, intermediate outcomes and targets are frequently used loosely and, sometimes, interchangeably. In this report we argue that the greatest requirement is for 'system indicators'. Consequently, that term needs to be defined and distinction made between it and the similar ideas listed above.

An 'outcome' is a, usually beneficial, intended effect of an intervention or policy. 'A fall in premature deaths' or 'an increase in the proportion of individuals capable of self care' are examples of health outcomes.

A 'target' is a succinct, and usually measurable expression of a policy objective. Thus, 'a 25% reduction in carbon dioxide emissions or a '40% reduction in premature heart disease' are both policy targets.

A 'proxy' indicator is a measurement that stands in place of an outcome that is capable of conceptualisation but not of measurement, or at least easy measurement. For example, the UK government recently published 'sustainability counts'[5] that were intended to monitor progress towards truly sustainable and life enhancing development. Included in the list was 'populations of wild birds'. This is a proxy because the intended outcome is to maintain the diversity of ecosystems and their species for which a measure of the population of wild birds is a proxy measurement rather than an important outcome in its own right.

An 'intermediate outcome' is a loosely used description of two main types of indicators. First, they can be applied to what is defined as a 'systems indicator' below. Second, they

are applied to 'measures of processes' that contribute to a final outcome. For example, clot busting drugs can reduce deaths for myocardial infarction. The number of patients receiving this treatment and the delay from 'pain till needle' are two measurements of process that will be associated with final outcomes. Alternatively, where poverty is a problem and income is difficult to measure, uptake of benefits is an 'intermediate indicator' that has been employed. The problem with this terminology is that it suggests a very linear process with cause leading through process (intermediate outcome) to effect. The problem is that many factors contribute in a complex system to most outcomes. Survival from myocardial infarction is no more dependant solely on drug therapy than poverty on benefits uptake.

For these reasons, it is better to consider 'systems indicators'. That is, the primary intellectual task is to model the system of causation as accurately as possible and then determine which indicators in which part of the system provide the best measures of the systems performance. We have grown used to this approach when analysing the economic performance of a nation. A whole variety of 'systems indicators' are used including imports and exports, inflation, public sector borrowing, growth, productivity and so on.

Systems thinking and smoking

The same logic could be applied to health issues and, to illustrate, the history of the decline in smoking prevalence is a good example. The prevalence of smoking is now declining in the United Kingdom and most other developed countries. In retrospect, many steps can be identified in a system of causation for this trend. The start can be traced to the original research that demonstrated the association between smoking and lung cancer. This was followed by the acceptance of smoking as a health hazard among key subsections of the population (doctors for example), then the wider social acceptance of the ill effects of smoking.

The process of dissemination involved the media, activists, health education campaigns and opportunistic advice to stop smoking in the primary care setting among many other processes. Evidence of changing attitudes to smoking was then seen in the adoption of workplace smoking policies and other policies that created smoke free environments in

public places. During this time health education campaigns were frequent and a health lobby encouraged government to increase tax and regulate the advertising of tobacco. In essence, a highly complex, interactive but somewhat unpredictable set of activities led over a period of decades to a significant change in the population's attitudes and behaviour. During this period it also became clear that a system of beliefs, norms and motivations, coupled with facilitating and inhibiting factors, interact in each individual to determine whether or not they become a smoker. This is, of course, expressed differently in different groups in society with, for example, the prevalence of smoking among teenage girls rising in recent years and women, in general, finding it more difficult to stop smoking. All the above must be understood as a complex system in which smoking is the final outcome but norms, beliefs, workplace smoking policies, smoke free transport, and many more factors act as 'system indicators'.

A model of health

The diagram (Figure 1) shows a model of health devised by Evans and Stoddart. The model recognises the complexity and diversity of health by having three outcome boxes: disease, function and well being.

Figure 1: Evans and Stoddart Model
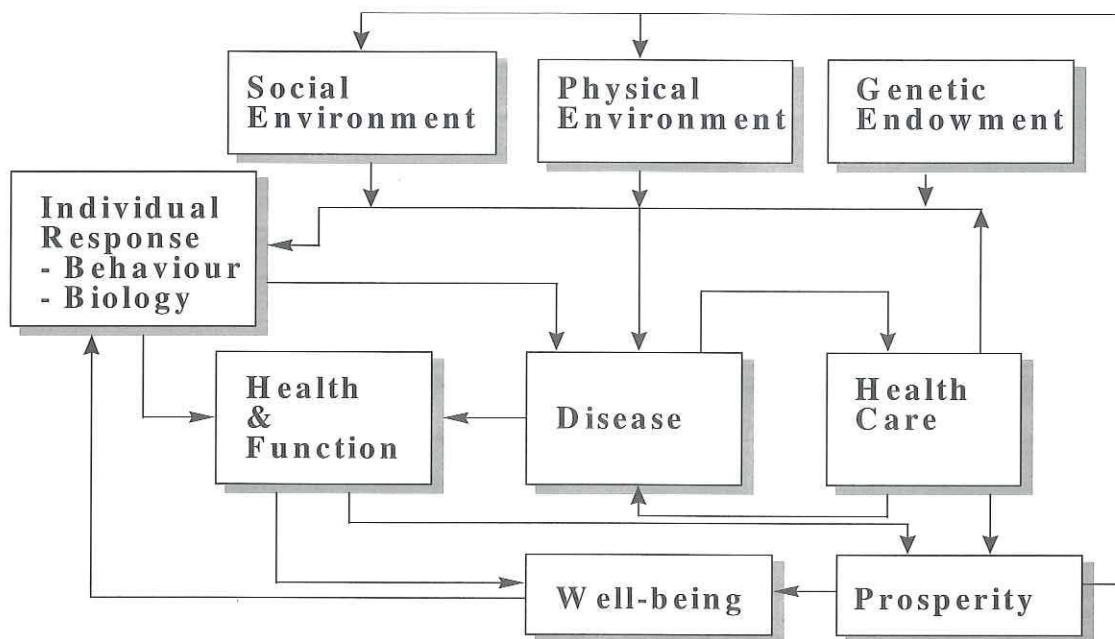
The model also employs the 'Health Fields Concept' set out in the early 1970s by Lalonde, then Canadian Minister for Health.

- The model is complex in that it identifies several major fields of influence on health status and their interactions (e.g. physical environment, social environment, individual response etc.).
- The model is not linear but has multiple feedback loops.
- The model explicitly acknowledges a broader definition of health; with the broader outcomes of disease, well being and health and function.
- Health care is only one of the fields and not the most important.
- Key drivers of the model are the physical environment (e.g. the built environment, air, water and so on) and social environment (e.g. family, work, networks).
- The inclusion of the social environment as a separate category reflects recent research.
- The crucial role of wealth as a determinant of health is recognised.

The Evans and Stoddart model is viewed in this paper as both a 'snapshot' of how different parts of the model may interact at any given time, and as a dynamic entity. The

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latter incorporates a time element so that secular trends can be accommodated within it and understood.

Lifestyle is not the key issue

Lifestyle does not feature as a separate health field. Rather, individual response (behavioural and biological) comes between the physical and social environment and final health outcomes. This reflects the fact that individual behaviour can be influenced by the environment but, also, that individuals can take action to modify the harmful effects of the environment on their health. In this way the new model moves away from the sterile either-or debate between those who champion lifestyles and those who prioritise environment. Whether an individual becomes the victim of an adverse physical and social environment or is able to contribute to its modification will depend on whether they have acquired lifeskills and personal resources and the degree to which they are supported or empowered to do so.

Influence of wealth on health

Wealth influences health. Prosperity has a direct effect on well being and poverty is associated with higher rates of disease and decreased life expectancy. Wealth is also required to improve the social and physical environment and provide funds for health care. The model illustrates this but highlights the fact that each area of expenditure is in direct competition with the others for the same resources. More expenditure on health care may mean less money for better housing, improved transport or more effective education. Hard choices must be made by government about which areas of expenditure are going to improve health most.

Distribution of wealth

The importance of the distribution of wealth as a determinant of health has emerged in recent years. The key finding in this body of research is that in countries that are already industrialised and wealthy, such as European Union countries, North American countries and some parts of East Asia, the distribution of wealth is a more important determinant of health than the absolute level of wealth, as measured by Gross Domestic Product (GDP). Countries that have a narrower or more even distribution of wealth enjoy longer life expectancies than countries with similar or higher GDPs but wider distributions of wealth.

The countries that have shown the fastest improvement in health in recent decades have been those with the fairest distribution of wealth. This research also shows that wide discrepancies between rich and poor have adverse health outcomes for the vast majority in a society and not just the poor. The mechanism of action that explains these now well established observations is not known but our understanding is improving. The most likely explanation is that countries with fairer distributions of wealth may have a higher proportion of citizens who feel included in the fabric of society.

3.   Aims

It is worth stating the original aims of the research project before detailing our approaches to this work. These aims were:

1. To undertake a feasibility study into the potential for compiling and collating all relevant sources of data on lifestyle and health related behaviour for Scotland and one health board (Argyll and Clyde).
2. To catalogue and assess the feasibility of collating routine data sources on key aspects of the physical environment, the social environment and indices of poverty and prosperity for Scotland and one health board.
3. To assess the feasibility of combining these data sources into a single database.
4. On the basis of this detailed knowledge about relative strengths of these data sources, to produce a draft set of intermediate health outcome indicators for use at national and local levels.
5. To assess the feasibility of using the combined dataset (and our thinking on intermediate outcome indicators) to model the interactions between determinants of health (for Scotland as a whole and for an individual health board).

4. Methodology

Creating a framework for analysis of data

The model adopted in this study to provide a framework for categorising data was devised by Evans and Stoddart. The previous section comments on the important qualities of this model that make it suitable for these purposes. A more detailed discussion of the Evans and Stoddart model and other recent socio-ecological health models is provided in Appendix I.

Identifying local sources of information

A series of meetings were held with representatives of two local authorities (Argyll & Bute – largely rural; and, Inverclyde – largely urban) to explore how much information each could provide to the same level of detail and quality. At an initial meeting with each council, the Evans and Stoddart model was presented and discussed. Questionnaires were then sent to representatives from departments (Planning, Social Work, Housing and Education) to elicit information about data held by councils of relevance to the model, including: possible break-downs (e.g. age, sex); source; recording system; availability on a geographic basis; date first recorded; frequency of updates; dates of any major revisions to recording; cost of access; confidentiality issues; and quality issues. These responses were amplified by discussions with a wider range of staff. A parallel process took place within Argyll and Clyde Health Board to establish its sources of data and their parameters.

Identify national sources of information

This work was progressed via a combination of web-site searches, telephone conversations, e-mail and written correspondence and literature reviews. The main output was a series of tables showing potential sources of information relevant to health (e.g. education, the economy, health-related behaviour). Within each of the tables and for each data item identified, a summary was provided of data attributes: source; recording system; date first recorded; frequency of updates; potential break-downs (e.g. age, sex); lowest

geographic level available; dates of major revisions; geographical comparability; measures normally applied (e.g. crude rates, percentages, etc.); definitions and further detail.

Consideration was given to parameters of each data source. Two key 'screening' criteria for choosing and rejecting data sources were employed. First, data had to be available on a routine basis or collected through surveys that would be repeated. Second, data coverage had to be national (i.e. collected across Scotland and, preferably, able to be broken down by geographical area within Scotland). However, as an exception to this general rule, a number of potential data sources only available across parts of the former Strathclyde region are commented upon because of their potential utility.

Other data attributes are clearly important when considering the usefulness of data to this model. These include data quality, coverage, comprehensiveness, comparability, relevance to the model, issues of access and cost. A more extensive discussion of relevant data attributes is provided in Section 6.

Set sources of data within the model

The first task was to review the degree to which available sources of data could be used to provide information relevant to each field in the Evans and Stoddart model. This work identified those areas or domains of the model for which data sources are scarce or non-existent at a national and/or local level. It also provided information on the characteristics of data that are available.

Second, a review of indicators currently being employed in health and related work was carried out to discover what indicators/targets are currently being used for health, poverty, social exclusion, community planning, government departmental spending and sustainability. From this work, possible indicators were assigned to each domain within the model. Finally, available sources of data (identified during the first two stages) were matched to the desired indicators and the strengths and weaknesses of data noted.

Definitions

As the work progressed a need for clarity in the use of terminology arose. To achieve consistency, the following definitions were adopted:

Domain refers to the 'fields' or boxes within the model (e.g. physical environment, health care, prosperity).

Constructs are the intellectual concepts which make up the domain e.g. the physical environment domain is made up of a variety of constructs that include air quality, water quality, quality of the built environment etc.

An **indicator** is a piece of information (or datum) about a construct that provides a meaningful description of (or proxy for) part of the construct e.g. for air quality this might include the levels of key pollutants in the atmosphere.

Available data simply refers to data that are actually available for current use as a possible indicator.

5. Results

Creating indicators and identifying data for each of the domains
(Tables 1 – 12)

Figure 2 provides a diagramatic representation of the domains and constructs of the modified Evans and Stoddart model that is referred to in this section. Some of the domains correspond directly to the Evans and Stoddart model, whilst others have been expanded or modified. For the purposes of this study we have not tried to define the links in the modified model, but accept the links demonstrated in the original model (see Figure 1).

The constructs within the **social environment** domain (Table 1) include civil status, family structures, social networks, employment patterns and levels of trust. This is one of the more difficult domains to conceptualise (i.e. define the relevant constructs and their relationships) and for many of the desired constructs (e.g. social networks, levels of trusts) indicators have not been well described and data are not available. Two important 'sub-domains' were created because more indicators and data were identified than were easily

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Figure 2: Domains and constructs of the modified Evans and Stoddart model

Educational
Environment (a sub-
domain of Social
Environment)
Parental Participation
Pupil Participation
Exam Performance
Exclusions from school
Post School Education
Lifelong Learning

Physical Environment
Air Quality
Water Quality
Climate
Land Condition/Usage
Energy Usage
Waste
Quality of Built
Environment.
Road Congestion
Access to shops, work &
leisure
Scenic/Aesthetic Value

Population
Dynamics (a sub-
domain of Social
Environment)
Population
Births
Deaths
Migration
Teenage
Pregnancy
Abortions
Premature Deaths
Life Expectancy
Disability free
life expectancy

Social Environment
Civil Status
Family Structure
Household Structure
Social Networks
Personal Support
Levels of Participation
Levels of Trust
Freedom from Violence
Freedom from Crime
Employment
Discrimination
Ethnicity
Status - collective & ind.

Biological
Environment
(modified and
expanded from
Genetic Endowment)
Biodiversity
Pathogenic Infections
Emergent Infections
Genetic Pool

Health and Social
Service Use
(modified and
expanded from
Health Care)
GP/Dental
Consultations
Admission to Hospital
Continuing Care
Care in Community
Immunisation
Coverage
Screening Uptake
Social Work Contact
Probation & Prison

Individual   Response   -
Behaviour
Smoking
Alcohol
Drug Use
Exercise
Diet
Sexual behaviour
Stress
Transport Choices

Health & Function
Disability - defined
Need for Care/Support
Institutional Care
Ability to carry out activities of
daily living activities
Ability to take part in exercise &
other leisure activities
Disability Benefits

Prosperity
Levels and Patterns of Spending
Nat. & Reg GNP
Levels & Patterns of
Employment/Unemployment
New jobs created
Amenities
Health of Business
Ind. & Household Income
Proportion defd. as 'Poor'
Benefits Uptake
Eligibility for free school meals, clothing
allowance, etc.
Housing Tenure
Access to Financial Services
Car ownership

Well-being
General Well-being
Satisfaction with place of
living
Satisfaction with work and
place of work
Optimism and hope for
future
Suicide Rate

Disease
Community Morbidity
Hospital Morbidity
Chronic Physical & Mental
Illness
Sickness Absence from
Work
Accidents
Causes of Death

Individual Response -
Biology
Genetic Endowment
Biological Measurements
e.g. Blood Pressure,
Cholesterol
Individual Response e.g.
reaction to stress, allergies

included under the original single heading. These sub-domains were the **educational environment** (Table 2) with constructs such as parental participation, exam performance and post school education and **population dynamics** (Table 3) which includes demographic patterns and forecasted changes in population.

The **physical environment** (Table 4) includes constructs such as air quality, climate, land condition/usage, quality of the built environment, road congestion and access to shops, work and leisure. Compared to other domains, indicators are not difficult to devise and many data are available.

The **genetic endowment** domain proved easy to conceptualise in general terms but difficult to define in terms of specific constructs for which indicators could be identified. From these discussions, the idea of a **biological environment** domain emerged (Table 5). The constructs within this domain encompass the genetic make up of the population but also include constructs such as biodiversity and patterns of infection.

The **individual response** domain is complex because it encompasses behavioural (Table 6) and biological responses (Table 7). There has been a tendency in the past to unduly emphasise individual behavioural factors without considering the wider determinants of health (i.e. the other domains in the model). The position of this domain emphasises the complexity of interactions and connections between social environment, physical environment and genetic endowment, on the one hand, and disease, function and well being on the other. The constructs in the sub-domain of **individual response – behaviour** include smoking, drinking, stress, and transport choices. The constructs in the sub-domain of **individual response – biology** include biological measurements such as blood pressure and lung function. Data availability varies enormously across the constructs in these complex domains.

The constructs created for the **health and function** domain (Table 8) include disability, need for care/support and ability to carry out activities of daily living. Although these constructs are relatively easy to create and some data are available to support them, compared to the 'disease' domain, data are relatively incomplete.

The **disease** domain (Table 9) includes community morbidity, hospital morbidity, causes of death and sickness absence from work. It is closely related to the **health care** domain (Table 10) that describes responses (appropriate or otherwise) to disease by the provision of health care services. For these purposes, this domain has been labelled "health and social service use" since the dividing line between the two arenas is often arbitrary and a response to disease and illness requires both services to varying degrees. Constructs include primary medical and dental care, screening uptake, continuing care, social work contact and care in the community. Between them, these two domains provide the most detailed sources of data in the model.

The **well-being** domain (Table 11) includes indicators such as general well being, satisfaction with place of living and optimism or hope for the future. Although these are increasingly being recognised as important determinants of disease as well as health, few data are collected in this domain.

The **prosperity** domain has key influences on the physical and social environment, creates the funds for health care expenditure and impacts directly on well being. Constructs in this domain include levels and patterns of spending, national and regional GDP, levels and patterns of employment and business start-ups. Data sources in this domain have crucial weaknesses (Table 12).

Sources of available data

The data that are available were not, of course, designed to support this model and come from a wide variety of sources which for convenience can be split into two broad categories, operational and survey. Operational data cover information collected on a regular, often continuous, basis to serve a function e.g. hospital discharge data, death registrations, benefit recipients, unemployment counts, air quality monitoring, police reported crimes. The survey data referred to includes the Census, various UK-wide socio-economic surveys (Table 13) and a number of purely Scottish surveys (Table 14). The quality and appropriateness of the data sources is commented upon in Tables 1 – 12 and in the following section.

6. Data attributes relevant to a health information database

This is a technical section that examines data criteria that are important (quality, coverage, comprehensiveness, etc.) if any given data is to be of use. Comment is also made on how well current data matches such criteria. Readers with less interest in technical data issues may wish to move directly onto the discussion section.

Quality

It has not been possible, nor was it intended, within the remit of this work to audit thoroughly the accuracy and quality of data sources identified. However, for most of the data sources investigated it has been possible to draw out general points with relation to accuracy and completeness.

There are fewer reservations about data from systems employing instrument measurements, such as those that have been used over long periods to monitor climate and air quality, than other operational systems that are more directly dependent on the accuracy of human recording, and thus more prone to human error. For the latter, quality is often dependent on the purpose of recording, the range of usage of derived data and relative importance of accuracy; it is often observed that quality flows from use.

Decisions on what levels of 'stable' disaggregation are possible with a given data item are made easier if the data in question are subject to validation at input and audited for accuracy. To give two contrasting examples. Most ISD recording schemes are subject to validation checks and subsequent quality assurance checks[6] and thus the accuracy of such data are reasonably well known. The CACI PayCheck system, which provides household income estimates down to postcode level, is sketchily described in terms of how, and from what other data, the system derives its own figures and thus, it is very difficult to judge the accuracy of this information at any population level.

In the absence of national and validated recording schemes, it is often only from local users and contributors to systems that knowledge about accuracy can be gauged. For instance, in relation to Council held data, particular reservations were expressed about the accuracy of Community Care Referrals when compared nationally due to different

recording criteria being applied within different councils and the lack of up-dating to referral group type.

In contrast to operational data, the quality of survey data is often simpler to ascertain through reporting of the methodology applied (including mode of survey, sampling technique, sample size, response rate and geographical coverage).

Coverage

In the context of this study, data sources have been ignored – with a few notable exceptions – if data are not collected nationally across the whole of Scotland. Statistics on population, vital events, hospital discharges, education, unemployment and crime are good examples of just such data that have clear national coverage. One of the purposes of this study has been to identify sources that allow geographical comparisons to be made within Scotland down to small areas (e.g. postcodes) and which also allow comparison to overall Scottish figures.

Many of the UK wide ONS surveys fail to fulfil these criteria because the size of their Scottish sample often only allows overall Scottish indicators to be derived and because of the exclusion of the remoter parts of Scotland from their sample (Table13).

Similar problems occur with Scottish surveys. It is notable that the major source of adult health lifestyle information, the Scottish Health Survey (SHS), while allowing for international comparisons, is of limited use for intra-Scottish comparisons due to the size and structure of the sample taken. The Scottish House Condition Survey (SHCS) provides nationally comparable data but regional data are only available where Councils have bought booster samples. The Scottish Household Survey (SHsS) will over the next 4 years build up to provide information that is comparable at a Local Authority level.

Data on the physical environment present their own problems due to the site-specific nature of recording and thus the requirement to interpolate between recording sites.

Comprehensiveness

Comprehensiveness, or completeness, is important if accurate and comparable measures are to be drawn from a data source. It is worth emphasising that a measure that has acceptable coverage (in this context coverage of all of Scotland) may still not be comprehensive. As an example, estimates from the Scottish Crime Survey of 1996 suggested from a comparison of the prevalence of a selection of crimes reported by the interviewees versus those reported by police forces, that only around 37 % of crimes are reported [7].

A similar problem is apparent in estimates of disease prevalence based on hospital 'linked' data available from ISD. These data do cover the whole of Scotland but exclude patients treated privately and those who are treated by Primary Care Services and never present at hospital. The magnitude of this under-recording is dependent on the disease or illness and disease/illness management.

Of other sources, benefit statistics are also known to underestimate need because not all of the eligible population actually take up their benefit entitlements. Recent unpublished work for the Scottish Office examining the development of indicators of poverty or low income[8] confirmed that benefit uptake understates low income across Scotland because of non-claiming and because most definitions of poverty would include more than just benefits data. This work found that, while receipt of means-tested benefits, in particular Income Support, correlated well with low income households, there were noticeable differences in benefits uptake between affluent and less affluent areas, between the elderly and non-elderly and to lesser degree between urban and rural areas. Benefit fraud, and its extent, is obviously another complicating factor in the use and interpretation of such data.

Comparability

This is a key attribute for determining the utility of data and is dependent on quality (commented on earlier), common classifications and methodologies for data collection, trend information and availability at commonly used spatial levels.

Within Scotland, health lifestyle information provides a good example of how different approaches to surveys can hinder comparison. Although there is considerable concurrence between the topics covered by both the SNAP surveys and the Scottish Health Survey, variations in the mode of survey (postal questionnaires vs. interviews), actual questions asked and sample structures make direct comparison between these two survey streams extremely problematic.

In contrast to this, the government statistical service is making efforts to establish harmonised concepts and questions across a range of government surveys in order to produce, where possible, common classifications, definitions and standards to improve the comparability of their social statistics[9]. The SHsS has adopted these harmonised questions, where possible, to facilitate comparisons.

Temporal continuity of data is important for monitoring trends and variations in trends, but is often either unavailable due to the newness of recording schemes or changes in definitions governing recording which create a discontinuity. A good example of the latter is the changes that have affected the claimant unemployment count over time and serves to illustrate how difficult it can be maintaining comparable information through time even with a long established recording schemes[10,11].

Variation in the availability of data by geographical scale is a significant encumbrance to comparability among the range of data sources and particularly restricts comparisons at small area level across ranges of sources. Table 15 illustrates the range of geographical levels at which selected data relevant to the model are made available.

This table highlights the limitations that data holders place on release of their data. DVLA, for instance, will not normally release details on car registrations below the level of Postcode District, although car registrations are held down to full postcode level.

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DVLA are by no means unusual; most organisations have guidelines on the release of data to avoid personal identification and breaches of data confidentiality.

Analysis of data across such a potentially wide range of geographical units would inevitably require the application of GIS techniques in order to address geographical incompatibilities[12] and to avoid misrepresentation when presenting data at fixed area bases[13].

A final simple point in relation to geographic comparability is that until more organisations routinely collect **postcoded** data comprehensively, spatial comparison of data even within their own systems will be greatly hindered. Postcodes can be the building blocks for comparisons at various geographical levels (Local Authority, Parliamentary Constituency, Health Board, Local Healthcare Co-operative, Social Inclusion Partnership (SIP), Electoral Ward, Postcode Sector, etc.) and, as such, their recording can add greatly to the utility of any geographically based data set.

Survey data versus operational data

There are both advantages and disadvantages pertaining to both types of data. Overall, survey data may have higher accuracy – or at least there is a better understanding of accuracy based on the methodology applied - and survey data normally permit multivariate comparison across a wide range of variables that relate to individuals. However, survey data by design only cover a sample of a population, and thus may lack the geographical detail that can be derived from routine operational data, such as death registrations, hospital discharges and the claimant count.

It is worth commenting that, currently, there are relatively few surveys providing comprehensive Scottish coverage at a national and regional level within Scotland. An exception to this is the Census, providing data down to output area.

However, the decennial nature of the Census and the relative infrequency of many other sources of survey data, has led to research into the use of routine operational data for a number of purposes. Examples are Raab's work on higher education participation rates[14], Scottish Office commissioned work looking at the use of receipt of benefits as an

indicator of low income[8] and work carried out for the Scottish Office on revising the Scottish Area Deprivation Index by the Department of Urban Studies, Glasgow University[15]. Interestingly, their report emphasises that the old index, built solely from Census data, needed revision because of the evidence of social, economic and physical changes since the census and concluded that there should be continued work within government data holders to maximise the utility of socio-economic data. Possibly the most relevant example of this trend to health has been the review of NHS resource allocation in the NHS in Scotland, which has recently reported its recommendations, including the use of Income Support and Unemployment data, alongside other Census variables, as indicators of need in relation to morbidity and life circumstances[16].

In comparison with surveys a key weakness of operational data is the lack of breadth of information that can be derived from surveys. It is notable that the NHSiS are planning to use the CHI as a universal patient identifier across a range of NHS recording systems[17]. Currently, within the NHS, ISD hold linked databases of hospitalisation in Scotland, set up through the use of probability matching techniques[18,19], which provide longitudinal data on patient hospital morbidity and mortality that are unique in coverage and extent within the UK.

In the context of longitudinal data, the extension of the British Household Panel Survey within Scotland is worthy of comment. This survey, begun in 1991, is to be extended in Scotland to include around 2000 households (compared to 500 currently). The survey collects a variety of socio-economic and health data from individuals that can be followed up longitudinally enabling study of the dynamics of change among individuals' circumstances and health over a number of years.

Local versus national

As has been stated earlier, one of the aims of this study has been to ascertain sources of data that can be compared across and within Scotland. For this reason information that is available in some parts of Scotland but not nationally has not been commented on in the main. However, local data still have their own validity for comparisons on a smaller scale and local datasets could make use of localised surveys, such as those carried out by SNAP and SIPs; SIP surveys, in particular, may not be comparable

nationally but do provide valuable local information. In a West of Scotland context a couple of other key data sources, that cannot be reproduced nationally, are worth mentioning: the Voluntary Population Survey (carried out in Councils that formed part of Strathclyde Region Council) and the postcoded educational information held by SEEMIS on every pupil attending school; again available for those schools within Strathclyde Region.

Cost

Perhaps surprisingly, relatively few of the data sources relevant to this model would cost money to access; assuming requests for data were made by a recognised NHS or Local Government organisation. Some of the information is already freely available on Internet web sites (e.g. Air quality data, School Exam Performance). The main data sources identified that would charge for access are CACI (for access to their Household Income system – PayCheck), DVLA (for access via their agents to car registration data), ONS (for employment/unemployment and survey data made accessible via the NOMIS system) and HESA (for access to Higher Education data). Other organisations might also charge a fee if there is a significant amount of new work in meeting a request for data extraction.

7. Discussion

Main findings

This study shows that it is feasible to compile a dataset of potentially useful indices using routine and semi-routine sources of data. However, the resulting dataset would vary enormously across its domains in the completeness and quality of data available. Alternatively, if constructs were only included where data are available and of good quality, many domains would be largely vacant.

Limitation of the study – incompleteness of data

The main weakness of the study is that, within the time available, it has not been possible to identify all the potentially useful sources of data. This limitation can hopefully be addressed through the process of dissemination and readers are asked to contact the authors with their comments on alternative data sources of relevance to the model, which have not been identified.

Limitation of the study - problems of definition

A more subtle limitation of the study emerged through discussions within the research team and between the researchers and those who provided information. The term 'indicator' is used widely and indiscriminately to refer to each of the following: a benchmark to measure organisational performance (e.g. waiting times); an objective of a programme or policy (e.g. numbers of needles exchanged); an objective of a programme or policy that is of sufficient importance to be declared a 'target' (e.g. premature deaths from heart disease); a traditional health outcome (e.g. life expectancy); a traditional social outcome (e.g. numbers living independently); a traditional economic outcome (e.g. household income); data used as a proxy for a more fundamental construct (e.g. free school meals uptake as a proxy for poverty); intermediate health outcomes (e.g. decreased smoking as an intermediate step towards reduced lung cancer rates).

In response, this study chose to concentrate on indicators that could genuinely inform the chosen socio-ecological model of the determinants of health (the Evans and Stoddart model). This illustrates the importance of determining the framework in which data are to be embedded. Consequently, at the risk of adding further terminological confusion, the indicators in Tables 1 – 12 are best understood as 'systems indicators'. That is, they provide information about the system that creates or destroys health and about a range of broad health outcomes.

What makes a 'good indicator'?

It is clear that the quality of an indicator depends on its fitness for purpose and the characteristics of the data from which it is derived. This study reviewed eleven documents that included indicators from an importance source (see Table 16). Each had different purposes and, therefore, each made different, but overlapping, choices of indicators. As a consequence of this review and the results obtained, we did not produce a draft set of intermediate outcome indicators for use at national and local levels. Our assessment is that this would require further detailed work beyond the 'systems indicators' in tables 1 -12.

Practical benefits of sharing information

Clearly the data required to populate this model covers a wide spectrum of organisations and, whether this model or an alternative socio-ecological model is preferred, to produce data for such a model would require information and resources to be shared. This is already happening to service the ever-widening set of joint-planning agendae that involve a greater range of partner organisations than ever before. Examples of these are (health board led) Health Improvement Programmes, (local authority led) Community Plans, Community Care plans, monitoring and evaluation of Social Inclusion Partnerships, the emerging role of Local Health Care Cooperatives and many other joint-planning priorities.

In order to satisfy demand for information from these at times competing needs, inter-agency information sharing has to happen and, in so doing, the benefits of pooling resources and expertise become evident. From the local evidence we have gleaned from this project and its spin-offs, the impetus for information sharing can itself be a catalyst for improved understanding and joint-working. The description "knocking at an open door" has been used, specifically in the context of information sharing at the health/local authority interface.

Quality issues

Joint working and information sharing can also provide the focus and purpose for improving data recording quality; an issue commented on in more detail in Section 6. A key example in this respect is the need for organisations to have comprehensive client/patient data with mandatory key fields such as age, sex and postcode on all records. Postcoding is vital if detailed small area analysis is to be made possible and equally to allow aggregation to the range of other aggregation levels required for planning.

A menu of administrative geographies

Across the health boards and local authorities the cake often needs cut in a variety of ways: health board; parliamentary constituency; council; council split into health board areas; SIP areas; Local Healthcare Cooperative areas; postcode sectors; wards. This list is not definitive, as other ad hoc aggregations are often required, but the common theme emphasised is that, in order to build up information for such diverse and overlapping parts, postcoded records are needed to provide the base.

Access

Access is a key issue and undoubtedly varying mechanisms to share data work across Scotland. While the project did not aim to investigate these, there are a few brief points worth making. For data sharing to work, good working relationships between partners need to be established to ensure confidence. Equally, clarity is required over what data are available and at what level of detail. It is worth making the point that direct access to confidential data (i.e. that data which might be identifiable according to the Data Protection Registrar) is not required for most planning purposes, rather what is required are anonymised aggregations of such data at a minimum level of aggregation.

Existing published datasets

There are a few examples of nationally accessible datasets that have been made available and could be built on. These include ISD's recently published 'Scottish Local Authorities Compendium of Health Statistics (web site: http://www.show.scot.nhs.uk/isd/), which, although it is a welcome development, focuses mainly on healthcare and a few social care statistics, presented either at local authority or health board level. Similarly, the Accounts Commission publishes an annual report of Performance Indicators for Scottish Local Authorities (web site:http://www.accounts-commission.gov.uk/index2.htm), which presents council level indicators of service provision some of which are of relevance to health. ISD also produce SKIPPER, a package on CD containing a broad range of high level health indicators gathered mainly from recording systems within the NHSiS. The latter, while extremely useful for investigating NHS provision, does not extend beyond service led indicators.

The value of a dedicated socio-ecological dataset

Despite the value of these packages individually and a plethora of other web-site data of practical use to planners and policy makers, no single source for such information exists. The value of a single source - on top of its contribution to fostering understanding of a socio-ecological model of health - would be to simplify the process of data gathering, to avoid health boards, local authorities, government and other bodies duplicating effort to obtain the same information, to facilitate access to information at a range of geographical levels and to raise the quality of a range of data to agreed standards. Since the bulk of this work was completed the Review of the Public Health Function in Scotland[20] has emphasised the need for 'shared information systems with local authorities' and suggested that one of the roles of the proposed Public Health Institute in Scotland might be '(to) produce and disseminate a public health 'common' dataset'.

Importance to health planning and policy making

A number of key points emerge regarding the importance of this study.

- The key importance of this study is that it shows that a practical tool could be developed to foster a much more socio-ecological approach to policy making, planning, implementation, monitoring and evaluation.

- Subsets of the data in the proposed dataset could be used, quite practically, to inform the planning and monitoring of a wide variety of interventions including Community Plans, Health Improvement Programmes and SIPs.

- The creation and use of such a dataset would highlight key deficiencies in current data and, potentially, lead to a change in data collection policy (e.g. fewer health services activity data and more on function, well being and social environment).

- Creation of the suggested dataset combined with actions to improve the range and compatibility of the component data, opens up the possibility of creating a computer model of the determinants of health in Scotland; a dataset which would facilitate research into the relationships between health outcomes and their determinants, help identify key determinants both locally and nationally and help to validate models of health.

- With or without a computer model, the combined dataset would be useful for conducting Health Impact Assessments - noted in the Government's public health White paper.

8. Future research

There are two key sets of research questions. The first concerns more technical issues relating to data, data sources and the creation of a local/national combined dataset. The second relates to the changes in attitude and practice that such a dataset might be used to foster. Proposals will be developed to pilot the idea of a combined dataset, first for a

local area and then, if successful, nationally. The next stage will be to measure the influence this tool has on policy and practice.

9. Dissemination

Presentations of this work have been made to a research group within Argyll & Clyde Health Board, to officers from Inverclyde and Argyll & Bute Councils, who have assisted the research, and to a meeting of the ISD/Health Board Liaison Group in Edinburgh. A paper is in preparation which will be submitted for publication in a peer reviewed journal and further opportunities for presentations will be sought. The authors would welcome the opportunity to discuss and present this work to interested parties.

10. Conclusions

- It would be feasible to create a combined dataset of indicators for Scotland using the range of data sources identified in this study.

- Such a dataset would have some real areas of strength (e.g. data on the health service and some aspects of the physical environment) and more areas of weakness (e.g. routine data on poor physical function, measures of well being, genuine indices of the social environment).

- Data within the combined dataset would be highly heterogeneous. Data would have very different attributes (discussed in Section 6) and would be relevant to very different population levels (for some examples see Table 15). For these reasons, bringing these data together would provide a richer descriptive model. However, the technical problems involved in creating a 'predictive model' are profound.

- Such a combined dataset would have clear practical value as a resource for health boards, local authorities, government and other bodies, which could also be used to foster improved data quality and to facilitate the provision of information at a number standard geographical levels.

- There are considerable potential benefits to adopting an integrated systems model of health within government at all levels. We would suggest that the proposed Public Health Institute in Scotland should both lobby for the adoption of such a model and work on populating the public health 'common' dataset with the range of relevant data we have outlined. Such a resource could, and should, be a shared resource for all public sector, academic, voluntary and community organisations with an interest in health in its widest sense.

- We recognise that this is not a simple task and it requires engaging with, and winning over, politicians and a wide range of professionals in the civil service, local authorities and the NHS.

Acknowledgements

Glossary

AES	-	Annual Employment Survey
BHPS	-	British Household Panel Survey
CHI	-	Community Health Index
CMR	-	Continuous Morbidity Recording Scheme
DETR	-	Department of Environment, Transport and Regions
DVLA	-	Driving and Vehicle Licensing Agency
FES	-	Family Expenditure Survey
FRS	-	Family Resources Survey
GHS	-	General Household Survey
GPASS	-	GP Patient Administration System
GRO(S)	-	Registrar General for Scotland
ILO	-	International Labour Organisation
IPS	-	International Passenger Survey
ISD	-	Information and Statistics Division of the NHSiS
HESA	-	Higher Education Statistical Agency
LFS	-	Labour Force Survey
MAFF	-	Ministry of Agriculture, Fisheries and Food
NHSiS	-	National Health Service in Scotland
NES	-	New Earnings Survey
NFS	-	National Food Survey
NES	-	National Expenditure Survey
NTS	-	National Travel Survey
ONS	-	Office for National Statistics
RUHBC	-	Research Unit in Health and Behavioural Change
SCS	-	Scottish Crime Survey

SCIEH	-	Scottish Centre for Infection and Environmental Health
SEDD	-	Scottish Executive Development Department
SEEdD	-	Scottish Executive Education Department
SEEnvD	-	Scottish Executive Environment Department
SEJD	-	Scottish Executive Justice Department
SEEMIS	-	Strathclyde Education Establishment Management Information System
SEPA	-	Scottish Environmental Protection Agency
SHCS	-	Scottish House Condition Survey
SHS	-	Scottish Health Survey
SHsS	-	Scottish Household Survey
SIPs	-	Social Inclusion Partnerships
SMR*	-	Scottish Morbidity Record (e.g. SMR01 – acute inpatients and day cases; SMR00 – outpatient referrals; SMR04 – mental health & learning disability inpatient and day cases; SMR50 – geriatric longstay patients; SMR02 – maternity inpatient and day case records; SMR11 – neonatal special care discharges)

* in the context of mortality this acronym denotes Standardised Mortality Ratio

SNAP	-	Scottish Needs Assessment Programme
VPS	-	Voluntary Population Survey

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Table 1 Social Environment

Construct	Practical Indicator	Available Data	Strengths	Weaknesses
Civil Status	Single - Unmarried, Divorced, Separated, Widowed; Living as Couple	Census; SHsS; SNAP Lifestyle Surveys	Census - most detailed geog. scale, national & trends; SNAP - regional comparisons	Census - out of date; SHsS -This survey begins in the summer of 1999 and will take time to build up representative data from across Scotland; SNAP - only 6 HBs have used the core questions
Family Structure	Lone Parents	Voluntary Population Survey; Births (GRO(S)); Census; SHsS; SHCS	National; Trends	VPS - only in old Strathclyde; RG Births- only available since 1996; Census - out of date; SHsS - comments as above; SHCS - regional comparisons only for Councils that boosted their sample
	Large Families	Voluntary Population Survey; Census; SHsS; SHCS	National; Trends	VPS, Census, SHsS & SHCS - comments as above
	Elderly Living Alone	Voluntary Population Survey; Census; SHsS; SHCS	National; Trends	VPS, Census, SHsS & SHCS - comments as above
Household Structure	Multiple Adult Occupancy	Voluntary Population Survey; Census; SHsS; SHCS	National; Trends	VPS, Census, SHsS & SHCS - comments as above
	Single Adult Occupancy	Voluntary Population Survey; Census; SHsS; SHCS	National; Trends	VPS, Census, SHsS & SHCS - comments as above
	Children in Household	Voluntary Population Survey; Census; SHsS; SNAP; SHCS	National; Trends	VPS, Census, SHsS, SNAP & SHCS - comments as above
Social Networks	Neighbourhood Contacts	local surveys by SIPs		None nationally
	Contacts external to Neighbourhood	local surveys by SIPs		None nationally
	Membership of Local Charities, Community Groups or Cooperatives	local surveys by SIPs		None nationally
Personal Support	Carer Support	Social Work Departments; SHsS; SNAP	National	Social Work - quality of data; SHsS & SNAP - comments as above
Levels of Participation	Activity in Local Charities, Community Groups, Neighbourhood Watch, etc.	SHsS	National	SHsS - comments as above
Levels of Trust	Neighbourhood Satisfaction	SHCS; SHsS	National	SHsS & SHCS - comments as above
Freedom from Violence	Violent Crime	Crime Recording by Police Forces	National; Trends	Under-reporting; lack of geographical detail; driven by police priorities
	Fear of Violent Crime	Scottish Crime Survey	National	National survey, no regional break-down
Freedom from Crime	All Crime Levels	Crime Recording by Police Forces	National; Trends	Under-reporting; lack of geographical detail;
	Fear of Crime	Scottish Crime Survey	National	National survey, no regional break-down
	Concern about Crime/Alcohol Abuse/ Drug Abuse in Neighbourhood	SHsS	National	SHsS - comments as above
Employment	Employment trends	ONS: LFS or Annual Employment Survey; Census; SHsS; SNAP; SHCS	National; Trends	Labour Force Survey: small sample; Employment Survey: excludes the self-employed; Census, SHsS, SNAP & SHCS - comments as above
Discrimination	*Requires further work*			
Ethnicity	Ethnic Background	Census; SHsS; SNAP	Census - national & most detailed geog. scale	Census, SHsS & SNAP- comments as above
Status	Social Class	Census; SHsS; SHS	Census - national & most detailed geog. scale	Census & SHsS - comments as above

Table 2 Educational Environment

Construct	Practical Indicator	Available Data	Strengths	Weaknesses
Parental Participation	School Board Member	SHsS; Educational Authorities		Education Authorities: Confidentiality might restrict access; SHsS -This survey begins in the summer of 1999 and will take time to build up representative data from across Scotland
	Active in Parent Teacher Assoc.	SHsS; Educational Authorities		Comments as above
Pupil Participation	Non-Attendance - Authorised or unauthorised	Educational Authorities	National; trends	School as opposed to postcode based currently
	Involved in extra curriculum activities	Schools		Probably not available nationally or easily accessible locally; confidentiality would be an issue
Exam Performance	Leaving school without a qualification	Scottish Executive Education Department (SEEdD); SEEMIS	National; trends	SEEdD: School as opposed to postcode based currently; SEEMIS - postcoded to residence of pupil, but only covers Strathclyde
	Leaving school with X exams at Grade Y (to be defined)	SEEdD; SEEMIS	National; trends	Comments as above
	Leaving school by destination	SEEdD	National; trends	School as opposed to postcode based currently
	Highest Level of Qualification Attained	SNAP; Census; SHsS	Census - most detailed geog. scale, national & trends; SNAP - regional comparisons	Census - out of date; SHsS - see comments above; SNAP - only 6 HBs have used the questions
Exclusions from School	Permanent Exclusions & Temporary Exclusions	SEEdD	National; trends	School as opposed to postcode based currently
Post School Education	Starting Degree Courses	Higher Education Statistics Agency (HESA)	National; Trends; Postcoded	Charge for access
Lifelong Learning	Attending Community Education Classes	Educational Authorities		Probably not available nationally or easily accessible locally
	Mature Students Enrolled for Further Education or Higher Education	SEEdD Further Education Statistics; HESA	National; Trends; Postcoded	HESA - charge for access

Table 3 Population Dynamics

Construct	Practical Indicator	Available Data	Strengths	Weaknesses
Population	Population Estimates	GRO(S); CHI; Census	National; Trends; CHI - postcode detail	GRO(S): lack of small area detail; CHI: population inflation? & access issues; Census - out of date
	Population Forecasts	GRO(S)	National; Trends	GRO(S): lack of small area detail;
	Concentration/Sparsity	GRO(S); CHI; Census	National; Trends; CHI - postcode detail	GRO(S), CHI & Census - comments as above
	Age Structure	GRO(S); CHI; Census	comments as above	comments as above
Births	Births	GRO(S)	National; Trends; Postcoded	
Deaths	Deaths	GRO(S)	National; Trends; Postcoded	
Migration	Migration	GRO(S); CHI; Census	National; Trends; Postcodes/Output Areas	GRO(S) - only available at council level; Census - out of date; CHI - issues of access
Teenage Pregnancy	Teenage Pregnancy	ISD	National; Trends; Postcoded	likely to be under-recorded
Abortions	Abortions	Notifications to Chief Medical Officer, SODoH	National; Trends; Postcoded	likely to be under-recorded
Premature Deaths	Accidents	GRO(S)	National; Trends; Postcoded	
	Suicides	GRO(S)	National; Trends; Postcoded	Problems in confirming suicides
	Murders	GRO(S)	National; Trends; Postcoded	
	Deaths caused by Disease	GRO(S)	National; Trends; Postcoded	
Life Expectancy	Life Expectancy	GRO(S)	National; Trends	
Disability Free Life Expectancy	*Requires further work*			

Table 4 Physical Environment

Construct	Practical Indicator	Available Data	Strengths	Weaknesses
Air Quality	Ozone; Nitrogen Oxides; Carbon Monoxide; PM 10 particles, Sulphor Dioxides; Hydrocarbons; Lead; Trace Elements; Acid Rain	UK Air Quality Monitoring Network	Quality; trends	very limited regional covera
Water Quality	Bathing Water Quality	SEPA		limited no. of beaches
	Watercourse Quality	SEPA	National	
	Drinking Water Quality	Regional Water Boards	National; trends	widely varied regional deta
Climate	Temperature; Rainfall; Sunshine; Wind; Solar Radiation; Snow	MET	National; trends	patchy regional coverage
Land Condition/Usage	Land Coverage	Macaulay Land Use Institute (MLUI)	National	
	Soil Profile	MLUI	National	
	Industrial Sites	Scottish Executive Development Department (SEDD)	National; trends	
	Vacant and Derelict Land	SEDD	National; trends	
Energy Usage	Energy Usage	Power and Oil Companies (mainly)		No readily available figures Scotland or within Scotlan currently
	Household Fuel Consumption	SHCS	National; trends	SHCS - regional compariso only for Councils that boost their sample
	Energy Efficiency Rating of Homes	SHCS	National; trends	as above
	CO2 Emissions	SHCS	National; trends	as above
Waste	Waste Water Treatment Compliance with Standards	Regional Water Boards	National; trends	
	Waste Produced (tonnage)	SEPA1	National	Last available figures in 199 at local authority level
Quality of Built Environment	BTS Properties (Below Tolerable Standard)	SHCS	National; trends	SHCS - regional compariso only for Councils that booste their sample
	Dampness and Condensation	SHCS	National; trends	comments as above
Road Congestion	Vehicle Registrations	DVLA	National; trends	Indirect measure of road use
Access to shops, work & leisure	Access to Public Open Spaces	SHCS	National; trends	Limited proxy indicator
Scenic/Aesthetic Value (speculative)	Heritage Sites/Monuments	Historic Scotland	National	Subjective
	Archeological Sites	Historic Scotland	National	Subjective
	Listed Buildings	Historic Scotland	National	Subjective
	SSSIs (Sites of Special Scientific Interest)	Scottish Natural Heritage	National	Subjective
	National/Country Parks & Nature Reserves	Local Authorities, NTS, RSPB, etc.	National	Subjective

1. SEPA plan to publish a major strategy report on 'Waste' later this year(1999), which will clarify their their approach to monitoring the collection, disposal and regulation of waste.

Table 5 Biological Environment

Construct	Practical Indicator	Available Data	Strengths	Weaknesses
Biodiversity	Species Distribution	RSPB; Biological Records Centre	National; trends	
	Flora and Fauna Diversity	Biological Records Centre	National; trends	
	Habitat Distribution	Environmental Information Centre	National; trends	
Patterns and Trends of Pathogenic Infections	Notifiable Diseases	ISD/SCIEH	National; trends	
	Sexually transmitted Diseaes	ISD - ISD(D)5	National; trends	bias to where clinics based and excludes non-GUM clinics e.g. GP practices
	Infections notified to GPs	ISD - CMR recording	CMR - postcoded	CMR: recording limited to 7% of population; quality
	Infections leading to hospitalisation	ISD - SMR01	National; trends	
Patterns and Trends of Emergent Infections	Notifiable Diseases	ISD/SCIEH	National; trends	
	Sexually transmitted Diseases	ISD - ISD(D)5	National; trends	bias to where clinics based and excludes non-GUM clinics e.g. GP practices
	Infections notified to GPs	ISD - CMR recording	CMR - postcoded	CMR: recording limited to 7% of population; quality
	Infections leading to hospitalisation	ISD - SMR01	National; trends	
Genetic Pool	Population/Individual Profile - *not practical at present*			

Table 6 Individual Response – Behaviour

Construct	Practical Indicator	Available Data	Strengths	Weaknesses
Smoking	Children Smoking	RUHBC Health Behaviour in Scottish school children; ONS Survey of secondary school Children;	National; Trends	regional geographical cov
	Adults Smoking	Scottish Health Survey; SNAP; SHsS	SHS - national picture; SNAP - local picture	SHS - limited regiona comparisons; SNAP - only have used the questi
	Smoking during pregnancy	CHI data; SMR02 – smoking during pregnancy	National; Trends	Data quality
	Exposure to Passive Smoking	SNAP	SNAP - local picture	SNAP - only 6 HBs have u questions;
Alcohol	Children's Alcohol Consumption	RUHBC Health Behaviour in Scottish school children; ONS Survey of secondary school Children;	National; Trends	regional geographical cov
	Adult Alcohol Consumption	Scottish Health Survey; SNAP; Supermarkets/Off License Chains?	SHS - national picture; SNAP - local picture	SHS - limited regiona comparisons; SNAP - only have used the questions; A to EPOS data uncerta
Drug Use	Drug Use by Children	RUHBC Health Behaviour in Scottish school children; ONS Survey of secondary school Children;	National; Trends	regional geographical cove
	Adult Drug Use	SNAP; ISD Drugs Misuse Database; Home Office;	Drug Misuse Database: Trends	SNAP - only 6 HBs have u questions; ISD database - l geographical comparis (postcode district); availabi services potentially bias prev estimates
Exercise	Children's Physical Activity	RUHBC Health Behaviour in Scottish school children;	National; Trends	regional geographical cove
	Adult Physical Activity	Scottish Health Survey; SNAP	National; Trends	SHS - limited regional comparisons; SNAP - only 6 have used the question
Diet	Children's Diet	RUHBC Health Behaviour in Scottish school children;	National; Trends	regional geographical cove
	Adult's Diet	Scottish Health Survey; SNAP; Supermarkets' EPOS data; NFS; NES	SHS - national picture; SNAP - local picture	SHS - limited regional comparisons; SNAP - only 6 have used the questions; EI access to data?; NFS & NI small Scottish samples
	Obesity	Scottish Health Survey; Health Board Lifestyle Surveys;	SHS - national picture; SNAP - local picture	SHS - limited regional comparisons; SNAP - only 6 have used the questions
	Eating Disorders	Hospital Discharges; Specialist Clinics?		Hospital figures - an underestimate of true figu
Sexual Behaviour	Pregnancy (teenage pregnancy)	SMR02 – Maternity records; Bulletins	National; Trends; Postcode level detail	Under-recording
	Abortions	Notifications to CMO	National; Trends; Postcode level detail	Under-recording
	Miscarriages	ISD -SMR01/SMR02	National; Trends; Postcode level detail	Under-recording
	Adult Sexual Behaviour	SNAP; SCIEH; ISD - STD data	SCIEH, STD Figures: Trends	SNAP - only 6 HBs have use questions; SCIEH - limite geographical comparison; S data - bias to where clincs based
Stress	Self-reported Stress	CMR recording; Scottish Health Survey	Scottish Health Survey: national; to be repeated	CMR - only covers 7% of Sc Population; only a few relev questions in Scottish Health S
Transport Choices	Mode of Transport to Work	SHsS; NTS		SHS - This survey begins in summer of 1999 and will take to build up representative data across Scotland; NTS -sm Scottish sample
	Mileage; Frequency of Usage; Access to a car; Reason for Usage	SHsS; NTS		SHS & NTS - comments as a

Table 7 Individual Response – Biology

Construct	Practical Indicator	Available Data	Strengths	Weaknesses
Genetic Endowment	Population/Individual Profile - not practical at present			
Biological Measurements	Blood Pressure	Scottish Health Survey (SHS)	national picture; comparison wrt social class, region & behaviour	limited regional comparisons; only cover population from 16 - 64 years of age
	BMI	SHS	ditto	ditto
	- Height	SHS; SNAP	SNAP - regional comparisons	SNAP - only 6 HBs have used the questions
	- Weight	SHS; SNAP	SNAP - regional comparisons	SNAP - only 6 HBs have used the questions
	- Waist/Hip ratio	SHS	""	""
	Respiratory Symtoms	Scottish Health Survey	national picture; comparison wrt social class, region & behaviour	limited regional comparisons; only cover population from 16 - 64 years of age
	- Phlegm production	""	""	""
	- Breathlessness	""	""	""
	- Wheezing	""	""	""
	Lung Function	""	""	""
	- FEV1	""	""	""
	- FVC	""	""	""
	- PEF	""	""	""
	Total and HDL-cholesterol	""	""	""
	Fibrinogen	""	""	""
	Haemoglobin	""	""	""
	Vitamin C	""	""	in addition to other comments only 15% of survey were tested for vitamins and caretonoids, thus not a nationally comparable sample
	Vitamin A & Carotenoids	""	""	""
	Vitamin E	""	""	""
Individual Response	Reaction to stress	Important - needs development		
	Allergies	Uncertain: Laboratory Test Results?		
	Illness/Disease	**Feedback -------->>>Disease Domain**		

Table 8 Health & Function

Construct	Practical Indicator	Available Data	Strengths	Weaknesses
Disability - *dependent on definition, many other potential indicators*	Amputations	ISD - SMR1	National; trends; postcoded	
	New Referrals to Limb Fitting Centres	ISD - SMR44	National; postcoded	only 60% of amputees referred
	Longterm Limiting Illness or Disability	Census; SHS; SHsS; SHCS	National; Trends; Census - small area detail	Census: out of date; SHS - limited regional comparisons; SHsS -This survey begins in the summer of 1999 and will take time to build up representative data from across Scotland; SHCS - regional comparisons only for Councils that boosted their sample
Need for Care/Support	Needs of Inpatients with Learning Disability	ISD - DANIS		only used in 2 Trusts currently
	Requirement for care in household	SHsS; SHCS	National; Trends	SHsS & SHCS - comments as above
	Carers in household	SHsS; Census; SNAP	as above; SNAP - regional comparisons	SHsS - comments as above; Census - new question for 2001; SNAP - only 6 HBs have used the questions
	Hours of care provided	SHsS; Census; SNAP	ditto; SNAP - regional comparisons	SHsS - comments as above; Census - new question for 2001; SNAP - only 6 HBs have used the questions
Institutional Care	Continuing NHS Geriatric Care	ISD - SMR50; SHRUGS	National; postcoded	SMR50- New scheme; data quality issues SHRUGS - covers 87% of all GLS beds
	Care & Dependency within Nursing & Residential Homes	ISD- SHRUGs		initiated in Nursing Homes within GGHB 62 % of residential homes use the system
Ability to carry out activities of daily living	Adaptations to Home	SHCS; SHsS	National; trends	SHCS & SHsS - comments as above
	Barrier Free Housing	SHCS	National; trends	SHCS - regional comparisons only for Councils that boosted their sample
	Longterm Limiting Illness or Disability with Impaired Mobility	SHCS	National; trends	SHCS - comments as above
	Difficulties with activities	SHsS	National; trends	SHsS - comments as above
Ability to take part in exercise & other leisure activities	No national indicator known			
Disability Benefits	Disability Living Allowance - Care Component/Mobility Component	DSS; SHsS; SHCS	National; trends; DSS (ward level data)	SHCS - sig. under-reporting, limited regional breakdowns
	Attendance Allowance	DSS; SHsS; SHCS	comments as above	comments as above
	Industrial Injury/Disablement Benefit	DSS; SHsS; SHCS	National; trends	DSS -limited regional detail; SHsS & SHCS - comments as above
	Severe Disablement Benefit	DSS; SHsS; SHCS	National; trends	DSS - only 5% sample; SHsS & SHCS comments as above
	Statutory Sick Pay (not a benefit)	DSS; SHsS; SHCS	National; trends	DSS (via Inland Revenue) no within Scotland break-down; SHsS & SHCS comments as above
	Disability Premium with Income Support/Housing Benefit	DSS; SHsS; SHCS	National; trends	DSS - Disability Premium with IS availab by postcode district; SHsS & SHCS - comments as above
	War Disablement Pension	SHsS	National; trends	DSS -limited regional detail; SHsS - comments as above
	Invalid Care Allowance	SHsS	National; trends	DSS -limited regional detail; SHsS - comments as above
	Other benefit for people with disabilities	ditto	National; trends	DSS -limited regional detail; SHsS- comments as above

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Table 9 Disease

Construct	Practical Indicator	Available Data	Strengths	Weaknesses
Community Morbidity: by condition	GP Consultation Rates	ISD - CMR; GPASS	postcoded	CMR: recording limited to 7% of population; quality; GPASS - covers ~ 81% of GP practices but concerns over quality & comparability
	Prevalence	ISD - CMR	postcoded	comments as above
	First presentation	ISD - CMR	postcoded	comments as above
Hospital Morbidity: by condition	Discharges	ISD - SMR01	National; trends; postcoded	
	First Discharges	ISD -Linked Data	National; trends; postcoded	only 20 years data linked
	Multiple Discharges	ISD -Linked Data	National; trends; postcoded	only 20 years data linked
	Prevalence	ISD -Linked Data	National; trends; postcoded	only 20 years data linked
	Child Morbidity	ISD - Linked Data; CHI - Child Health	National; trends; postcoded	linked data needs updated; CHI - quality; coverage
	Notifiable Diseases in Children	ISD(D)3	Trends from 1989	
	Congenital Abnormalities	SMR2/SMR1/SMR11/RG Stillbirths/RG Deaths	Trends from 1981; postcoded	requires updating
Chronic Physical and Mental Illness	Admissions	ISD - SMR04	National; trends; postcoded	quality
	Discharges	ISD -SMR04	National; trends; postcoded	quality
	First Discharges	ISD -SMR4 Linked Data	National; trends; postcoded	requires updating; quality
	Multiple Discharges	ISD -SMR4 Linked Data	National; trends; postcoded	requires updating; quality
	Prevalence	ISD -SMR4 Linked Data	National; trends; postcoded	requires updating; quality
Sickness Absence from Work	Sickness Absence from Work	DSS - Statutory Sick Pay/Incapacity Benefit/Severe Disablement Allowance		SSP: only Scottish overall figures; Incapacity Benefit - 5 % sample; differences in eligibility for various benefits make interpretation difficult
Accidents	Accidents requiring In-patient treatment	ISD -SMR01	National; trends; postcoded	
	Accidents treated at A&E (no admission)	ISD - ISD(S)1	National; trends;	Not postcoded on national basis
	Road Traffic Accidents	Scottish Executive Transport Statistics	National; trends; grid referenced	
	Deaths from Accidents	GRO(S)	National; trends; postcoded	
Causes of Death	Deaths by Cause	GRO(S)	National; trends; postcoded	

Table 10 Health and Social Service Use

Construct	Practical Indicator	Available Data	Strengths	Weaknesses
GP/Dental Consultations	GP Consultations	ISD - CMR; GPASS	postcoded	CMR: recording limited to 7% of population; quality; GPASS - covers ~ 81% of GP practices but concerns over quality & comparability
	General Dentists' Consultations	DPD	Trends from 1985	not postcoded; private dentistry missing
	Community Dental Consultations	ISD - SMR13	Trends from 1985	not all postcoded
Admission to Hospital	Admissions to and disharges from hospital by type e.g. acute, mental health, learning disabilities, paediatrics and maternity	ISD - SMR01, SMR00, SMR04, SMR02, SMR11	Trends; QA on data;	No accurate information on private treatment or treatment outside Scotland. Quality concerns about some schemes.
	New Outpatient Referrals & Attendances	ISD - SMR00	Trends - data back to 1991; QA on data;	No accurate information on private treament
Continuing Care (in NHS)	Occupied Bed Days in Geriatrics, Mental Illness, Pyschogeriatrics & Learning Disabilities	ISD -SMR50, SMR04	National; Trends; Postcoded	SMR50 only from 1995 and concerns about quality of data
	Beds available in Geriatrics, Mental Illness, Pyschogeriatrics & Learning Disabilities	ISD(S)1	National; Trends	
	Case Mix Complexity of Geriatric Long Stay patients	ISD - SHRUGS		SHRUGS: not comprehensive - covers 87% of Geriatric Long Stay patients
Residential Care in Commmunity	Residents in Nursing Homes	ISD - ISD(S)34	Client Group recorded from 1996	
	Residents in Residential Homes	Local Authorities	National; Trends	
	Community Care Placements	Local Authorities	National; Trends	quality, comparability, postcoding?
Immunisation Coverage	Primary Immunsiation Uptake	ISD - ISD(S)13 part 2	National Trends from 1970s	
	Pre-school Booster Immunisations	ISD - ISD(S)13 part 3	National; trends	
Screening Uptake	Cervical Screening	ISD(D)4 & CHI; SNAP	Nat. Trends - 1995 onwards; Postcoded; QA	
	Breast Screening	Scotish Breast Cancer Screening Programme; SNAP	Nat. Trends - 1991 onwards; Postcoded; QA	
Social Work Contact	Community Care Assessments/Reviews by Client Group	Local Authorities	National; Trends	Quality, comparability and comprehensiveness of postcoding nationally
	Community Care Services Provided by Client Group	Local Authorities	National; Trends	comments as above
	Home Care/Home Help Clients	Local Authorities	National; Trends	comments as above
	Children on Child Protection Register	Local Authorities	National; Trends	comments as above
	Child Care Placements - children looked after	Local Authorities	National; Trends	comments as above
	Respite Care	Local Authorities	National; Trends	comments as above
Probation & Prison	Community Service Orders	Criminal Justice System/Social Work	National; Trends	Comprehensiveness of postcoding from Social Work systems nationally
	Social Enquiry Reports	Criminal Justice System/Social Work	National; Trends	ditto

Table 11 Well-being

Construct	Practical Indicator	Available Data	Strengths	Weaknesses
General Well-being	Psycho-social Well-being	Scottish Health Survey (GH12 Qns)	National; to be repeated	No detailed regional break-down
Satisfaction with Place of Living1	Satisfaction with Neighbourhood	SHCS; SHsS	National; To be repeated	SHCS: national, but regional breakdown limited; SHsS - This survey begins in the summer of 1999 and will take time to build up representative data from across Scotland;
Satisfaction with work and place of work	Satisfaction with Work	Employee Surveys?		no national source known
	Satisfaction with Place of Work	Employee Surveys?		no national source known
Optimism and hope for future	Needs developing	no national source known		
Suicide Rate	Suicides & Attempted Suicides - proxies sometimes used	Hospital Discharges; Death Registrations	national; trends available	difficult to differentiate deliberate self-harm from accidents

1. Links to Social Environment Constructs

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Table 12 Prosperity

Construct	Practical Indicator	Available Data	Strengths	Weaknesses
Levels and Patterns of Spending	Expenditure on: housing; fuel & power; leisure goods and services; alcohol; tobacco; motoring; travel; household goods and services; food and non-alcoholic drinks	Family Expenditure Survey	Trends from 1957; MDD1; Children's Expenditure from 1998/99	only 500/600 housholds in Scotland
	Housing Costs	SHsS; SHCS		SHsS -This survey begins in the summer of 1999 and will take build up representative data from across Scotland; SHCS - re comparisons only for Councils that boosted their sample
	Energy Expenditure	SHCS		SHCS - comments as above
	Housing Costs/Energy Expenditure wrt Household Income	SHsS; SHCS		SHsS & SHCS - comments as above
National and Regional GDP	GDP per head of Population	ONS		Only figures for Scotland as a whole
Levels and Patterns of Employment/Unemployment	Employment Status	Census; AES; SHsS; SNAP; SHCS	National; trends	Census - out of date; AES - excludes self-employed; SNAP - li 6 Health Boards; SHsS & SHCS - comments as above
	Economically Active	Labour Force Survey; SHsS	National; trends	LFS - Samples too small for within Scotland comparisons in so
	Unemployment	Claimant Count; LFS; SHsS; SNAP;SHCS	National; trends; Claimant Count - postcode detail; LFS - uses ILO definition	Claimant Count: only those on JSA incl.; changes in eligibili definitions over time; LFS, SHsS, SNAP & SHCS - comments
	Length of Unemployment	Claimant Count; SHsS	National; trends	only those on JSA incl.; changes in eligibility & definition
New Jobs Created	Vacancies	Job Centres	National; trends; by industry & occupation	Not easily aggregated to geographies based on place of resid
	New Deal	SEEdD from Department of Employment	National; within Scotland break-downs	New scheme which needs time to build up trends
Amenities	Basic Household Amenities e.g. toilet, bath, central heating	Census; SHCS		Census & SHCS - comments as above
	Consumer Durables eg. freezer, washing machine, telephone, computer	SHsS; FES;FRS;GHS		ONS surveys (FES,FRS & GHS) - Samples too small for wi Scotland comparisons
Health of Business	Business Start-ups	Scottish Enterprise	National; trends from 1997; Ind Class.	Limited geographic detail based on areas covered by Enterp Companies
	Business Closures	Scottish Enterprise	National; trends from 1997; Ind Class.	Limited geographic detail based on areas covered by Enterp Companies
	Businesses Registered for VAT	DTI , Small Firms Stats Unit	National; Trends	Excludes non-VAT registered business
Individual and Household Income	Household Income	SHsS; SHCS; PayCheck; GHS; NFS; FRS; FES	National; Trends	SHsS & SHCS - comments as above; ONS surveys - small Sc samples; Paycheck: cost & accuracy unknown:
	Gross Income for Individuals	New Earnings Survey; SHsS	National; Trends	Sample very small in some parts of Scotland; excludes self-emp those on v low pay , in armed forces; SHsS - comments as at
	Assets and Savings	SHsS; FRS	National	SHsS - comments as above
	Shares/Unit Trusts/ISAs/Other	FRS	National; Trends	Only 2500 in Scotland & excludes Islands and NW Highlan
Proportion defined as 'Poor'	*Requires work: depends on definition; various indicators exist in literature and could be applied*			
Benefits Uptake	Receipt of Benefits: Family Credit; Income Support; JSA; Council Tax Benefit; Housing Benefit	DSS; Councils; Surveys: SHsS, SHCS	National; trends	DSS: data available at different levels (e.g. postcode district, Authority) and often only a sample; SHsS& SHCS - commen above. For all sources problems in interpretation due to chang eligibility, under claiming and, conversely, benefit fraud.
Eligibility for Free School Meals, Clothing Allowance, etc.	In receipt of Free School Meals	Councils	National; trends	
	In receipt of Clothing Allowance	Councils	National; trends	Criteria for receipt may vary.
Housing Tenure	Housing Tenure	SHsS;SHCS; GHS; NFS; FRS; FES; SNAP; Census 2001	National; trends	Comments on all sources as above
Access to Financial Services	Current Account	SHsS; FRS	National	SHsS & FRS - comments as above
	Insurance Cover (by type)	SHsS; FRS	National	SHsS & FRS - comments as above
Car Ownership	Car registrations	DVLA;	Trends; Complete Count	Charge for access; only made available at postcode district le
	Car Registrations by Age of Car	DVLA	comments as above	comments as above
	New Car Registrations	DVLA	ditto	ditto
	Access/Ownership	Census; SHsS;ONS- FES, FRS, GHS; SNAP	Trends; SNAP - regional comparisons	Comments on all sources as above

Table 13 - UK surveys

Survey	Source	First Recorded	Frequency of updates	Survey Sample	Data Recorded	Revisions - dates	Comparability Geographically	Further Detail
Census of Employment/Annual Employment Survey	ONS	1980	Annually	125,000 enterprises covering 15 million employees (1996)	Industrial Classification (1992 Standard); Sex; Full Time/Part Time; Postcode	1995	Scotland <--> Health Board/Local Authority <--> Postcode Sector/Ward	The AES is a sample survey sent to employers which ran for the first time in 1995 and replaced the Census of Employment which ran until 1993. The self-employed are excluded and workplaces with less than 25 employees, although a small sample of smaller firms is carried out. Concerns about sampling errors for small areas -- wards and postcode sectors. Prior to 1995 large companies were surveyed and smaller ones sampled, biennially. Information is available at ward and postcode sectors, but level of accuracy is poor at this level.
New Earnings Survey	ONS	1970	Annually	1% sample from PAYE	Includes: Age; Sex; Full Time/Part Time; Industry; Occupation; Manual/Non-manual, Hours of Work; Gross Earnings (incl. components); Pension Arrangements		Scotland <--> Local Authority	Questionnaire sent to 1% sample of employees on PAYE Income Tax scheme. The smallest areas for which estimates are available are Local Authorities and there are large sample errors in small Local Authority areas. Also does not cover: people earning below income tax threshold, mainly women in part time work and a small proportion of young adults; and, some categories of employment e.g. Armed Forces, employed in Enterprise zones, in private domestic service, occupational pensioners and a few other small categories.
Labour Force Survey	ONS	1984	Quarterly	Rolling sample of 60,000 households across UK	Economic Activity; Unemployment(ILO definition); Occupation; Age; Sex; Full Time/Part Time; Hours Worked; Employees/Self-employed; Gross Earnings; Industrial Sector1		Scotland <--> Health Board/Local Authority	The Labour Force Survey is a quarterly sample survey, involving a rolling sample of 60,000 households across the UK. This survey froms part of a harmonised set of comparable surveys carried out in each country in the EU. The smallest areas in the UK for which estimates are available are Local Authorities but some of these are suppressed due to sampling errors. Uses the ILO definition of unemployment, the main official measure of unemployment, since April 1998.
General Household Survey	ONS	1971	Annual	10,000 households in GB; ~ 830 in Scotland	Includes: household detail; housing and consumer durables; burglaries; employment; occupation; personal pension scheme; education; general health (including self-reported sickness, long standing complaints; health related quality of life; for elderly (mobility & self care); mobility & mobility aids; drinking; smoking; sports and leisure participation; self rated health using Visual Analogue Scale.1	1996	GB<-->Scotland	A continuous survey running since 1971 based on samples from general population using computer assisted personal interviewing (CAPI). Normally annual, however there were no surveys in 1997 and 1999. Reverting to annual frequency from 2000. Harmonisation of questions and outputs with other national surveys initiated in 1996. Sample in Scotland includes the Scottish mainland, but excludes the islands.
National Food Survey	ONS/MAFF	early 1940s	Annual (continuous through year)	6,000 households in GB; 500/600 in Scotland	Includes (over a 7 day period) expenditure and consumption of all food and drink by type brought home; ditto for eaten out; school food; quantity of food; type of meals; nutrient intake.1	1996	GB<-->Scotland	Random sample of private households in which an initial interview is followed by completion of a diary for the household over a 7 day period. Harmonisation of questions has had little effect. N.Ireland added 3 years ago. 1997 most recent publication.
Family Resources Survey	DSS	1994/95 (1st avail. Data)	Annual	25,000 households in GB;~2000 households in Scotland	Includes: households with sick/disabled member; access to consumer durables; income from benefits, employment and savings; insurance cover by type; Financial details (Current Acc, Building Soc, Share, Bonds, etc); Carers (age, sex, hours relationship to person cared for); Person cared for (type of care frequency; age; length of time cared for); Travel to work (distance and mode of transport).1	1996/97 (ext to N. Ireland)	GB<-->Scotland	Stratified, clustered probability sampling. 5 regions in Scotland - Highlands, Grampian & Tayside; Fife, Central & Lothian; Glasgow; Strathclyde (excl Glasgow); Borders & Dumfries and Galloway. Areas excluded: N of Caledonian Canal, W. Isles, Orkney and Shetland (3% of Scot. Pop). Household interview. Harmonisation of questions and input in 1996/97 and also further changes in 1997/98.
Family Expenditure Survey	ONS	1957	Annual	6,409 households in GB in 1997/98; 584 in Scotland	Includes: Expenditure by Gross Income on housing, fuel, power, motoring, leisure goods and services, alcohol, tobacco, travel, food and non-alcoholic drinks; wages; self-employment; investments; annuities, pensions, social security benefits.1	1997/98 and other years	GB<-->Scotland	Carried out by interview via random sample. Main harmonisation in 1997/98. In 1998/99 weighting to be used for first time and children's (7-15 years of age) expenditure to be added. Many discontinuities in questions over the years. On a calendar year basis until 1993.
International Passenger Survey	ONS	1960s (but not available for analysis until late 1980s)	Annual (continuous through year)	~260,000 interviews in UK, representing 0.2% of travellers	Includes: Age, Sex, Length of Visit, Spending per visit, Mode of Travel, Purpose of visit, Countries visited(for UK residents), Region of UK visited or from.		UK <--> Scotland <--> Region	Collects information on travel to and from UK. Based on face to face interview with a sample of passengers as they enter or leave the UK by principle air, sex and tunnel routes
National Travel Survey	DETR	July 1988 (first available data)	Annual (continuous through year)	1996-1998: (GB) 9284 households & 21980 individuals; (Scotland) 834 households & 1903 individuals	Detail includes: purpose of journey; mode of travel (car, rail, cycle, other); cost; type of houshold; work status; socio-economic group; housing tenure; total gross household income; frequency of cycling; difficulties with travel mobility (e.g. use of buses); access to cars; type of car (size); Individuals - age,sex working status driving license, travel in last 7 days.1 (Excludes ethnic group from harmonised questions listed in note 1)		GB <--> Scotland	First report published in Sep 1993, covering period 1989-91. Carried out by interview. Covers personal travel for private purposes, work or education and only journeys within GB. Excludes large parts of Highlands & Islands including: Bute, Cumbrae, Argyll & its islands, Skye and Lochalsh, Mallaig, Inverie, most of Mull, and all of the islands of Orkney, Shetland and the Western Isles.

1. In common with other government surveys collects standard information on the following: Household Composition - age; sex; marital status (legal/de facto); householder status; ethnic origin; Tenure; Industry/Occupation/Employment Status/Socio-economic Class; Full-time/Part-time; Income Classification

Table 14 - Scottish Surveys

Survey	Source	First Recorded	Frequency of updates	Survey Sample	Data Recorded	Revisions - dates	Comparability Geographically	Further Detail
Scottish Crime Survey	S.O. Cental Research Office	1993; 1996; next survey in 2000	~ every 5 years	adults over 16 (5045 sample in 1996) & a small sample of children 12 -15	Includes: socio-demographic data; fear of crime and general social issues; victimisation experience; adult self-completion questionnaire (confessions to petty crimes, exposure and use of illegal drugs, domestic violence and sexual assault); Young Person's (12-15 year olds) Self-Completion questionnaire (victimisation out of the home; contacts with police, 'confessions' of petty crime and exposure to and use of drugs).		Scotland	Two surveys sampling from the whole of Scotland have been carried out in 1993 and 1996. Survey is a questionnaire based household survey of adults over 16 (5045 sample in 1996), although a limited sample of children between 12 and 15 was included in 1996. Persons who were homeless, in prison, hospital or other institutions were not included in the survey.
Scottish House Conditions Survey	Scottish Homes	1991	1996 is most recent survey	19,900 interviews in 1996 and 17,900 inspections in 1996	(Dwellings): vacant properties; second homes; type & age of housing; location; amenities; condition; dampness & condensation; energy efficiency; heating; adaptations & access. (Household): household composition; employment and income levels; tenure; income & benefit payments; housing costs; energy expenditure; health of households (longterm limiting illness, impaired mobility; community care grouping). (Neighbourhoods and local environment): neighbourhood satisfaction by housing type, household type and housing tenure.		Local Authority (if expanded sample)	The survey is carried out in two parts, one on socio-economic factors (19,900 interviews in 1996) and the other on physical dwellings (17,900 inspections in 1996). Boosted samples were taken in Glasgow, Edinburgh, Angus, Fife, Highland, S. Lanarkshire, N Lanarkshire, East Lothian and Argyll & Bute. Next survey is planned for 2002.
Scottish Household Survey	Scottish Office	Starts summer 1999	To be reported on quarterly	Samples of ~3900 quarterly, building up to over 60,000 over 4 years	(HIGHEST INCOME HOUSEHOLDER OR HIS/HER SPOUSE/PARTNER) - Household composition; Property;Amenities; Transport; Children in household; Health, disabilities and care; Working status of highest income householder; Household income; Assets and savings; Housing costs; Credit and debt. (RANDOMLY SELECTED ADULT) - Housing; Local area/community safety; Education; Transport; Services and local government; Health;Economic activity; Income		Scotland <--> Local Authority	Aims to collect good quality information, principally in the areas of Local Government, Social Inclusion and Transport as well as a wide range of other areas.The survey uses, where appropriate, the harmonised concepts and questions for government social surveys which have been developed by the Office for National Statistics (ONS), and takes account, where possible, of some of the definitions and questions which are expected to be used in the forthcoming 2001 Census of Population.

Lifestyle Surveys

Survey	Source	First Recorded	Frequency of updates	Survey Sample	Data Recorded	Revisions - dates	Comparability Geographically	Further Detail
Local Lifestyle Surveys	SNAP	1996 onwards	variable	Health Boards & sub-localities	Questions on the following topics: General Health, Health Services, Women's Health, Food, Smoking, Alcohol, Physical Activity, Drugs, Sexual Health and Personal and Social Information (including Age, Sex, Social Class, Ethnic Origin)		between Health Boards (core questions only)	Six Health Boards carried out postal surveys in 1996, using at least some of the core questions.
Scottish Health Survey	Dept of Health, S.O.	1995	every 3 years	Regions (not Health Boards)	The main topics covered were: General Health, Use of Health Services, Eating Habits, Smoking, Drinking, Physical Activity, Blood Pressure, Obesity, Respiratory Symptoms, Blood Analytes, Cardiovascular Disease, Psychosocial Well-being, Accidents, Economic Activity, Educational Attainment, Parental History and Household and Personal details (including Age, Sex, Social Class, Occupation, Size of Household, Marital Status)		Scotland vs England; Scottish Heart Health Study	Survey carried out over a year of adults (16-64 years) taken from random sample of addresses (private households only). Initial interview, followed by optional anthropometric measurements (BP, Lung Function & BMI) and a blood sample taken by a nurse.
Smoking among Secondary School Children	ONS	1982	every 2 years (but no survey in 1988 in Scotland)	150 Scottish Schools ~ 3,500 pupils	Despite the title of this survey questions on alcohol use (from 1990) and drugs (only in 1998) are covered, as well as smoking prevalence. Topics include:(Smoking) smoking status, source of cigarettes, age when started, smoker's in household; (Money) average money to spend in a week; (Alcohol) drinking status, when started, frequency, where, quantity and type of drink in last 7 days; (Drugs) knowledge & use of a range of drugs, when started.		Scotland vs England within Scotland: Strathclyde vs rest of Scotland	A survey carried out by the ONS for the Scottish Office. The most recent survey was in 1998 and the report for this will be available in October. The survey samples from schools across the whole of Scotland, including the islands, but the size of the sample limits the regional comparsions that can be made. It is uncertain whether the 4 drugs related questions included in 1998 will be repeated in 2000.
RUHBC - Health Behaviour in Scottish Schoolchildren	RUHBC	1990	every four years?	Region; final sample in 1994 was 4079 pupils	The main topics covered in 1994 survey were: Nutrition and Eating Habits; Physical Activity; Smoking; Alcohol; Dental Health; Back Seat Belt Use; Symptoms and Use of Medicine; Illegal Drug use. Also recorded personal details including Age, Sex, Parental Occupation, Place of Living.	See notes	International <--> Scotland <--> Regions	Two surveys (1990,1994) have been reported on. Each survey had a set of core questions and additionally a series of special focus questions. Surveys administered via questionnaire completed anonymously by schoolchildren from P7, S2 & S4.

Table 15 Geographical levels at which a range of data relevant to the model are made available.

Data	Source	Minimum Level of Aggregation (at which available)
Reported Crime	Police Forces	Police Force Area/Local Authority
Tap Water Quality	Scottish Regional Water Boards	Population Zones (100 – 50,000 people)
Car Registrations	DVLA (via their agents)	Postcode District
Hospital Discharges	ISD	Postcode (subject to confidentiality rules and local guidelines on access)
Income Support Premiums	DSS	Postcode District
Disability Living Allowance	DSS	Postcode Sector/Ward
New Deal Entrants	DoE	Employment Service districts and Job Centre areas
Air Quality	AEA Technology	Site specific
Satisfaction with Neighbourhood	Scottish House Condition Survey	Local Authority
Road Traffic Accidents	SO Transport Statistics	Grid Reference of Accident Site

Table 16 – Selection of published indicators reviewed during the project

- Targets from Scottish Office's White paper on health - 'Towards a healthier Scotland', (1999) Edinburgh: The Stationery Office or available from http://www.scotland.gov.uk/library/documents-w7/tahs-00.htm

- Poverty and Social Exclusion Indicators, New Policy Institute from report by Joseph Rowantree Foundation (Dec 1998).

- Quality of Life Dimensions, Rogerson et al (1988). Scottish Geographical Magazine, 104, pp 130-137

- WHO Baseline Indicators for Cities, Glasgow Healthy City Partnership (July 1988).

- Intermediate Indicators for Healthy Alliances, Short life Working Group reporting to Board General Manager's Group (1997)

- Deprivation Indicators from S.O. CRU commissioned report *Revising the Scottish Area Deprivation Index* (report by Gibb K, Kearns A, Keoghan M, Mackay D and Turok I of Dept of urban Studies, University of Glasgow) Edinburgh: The Stationery Office

- Headline Indicators from *South Lanarkshire Community Plan*, Dec 1998. Lanarkshire Health Board.

- Pollution Targets and Indicators from *UK Climate Change Programme – a consultation paper*, Dept of Environment, Transport and Regions (1998). HMSO or available from http://www.environment.detr.gov.uk/consult/climatechange/index.htm

- Proposed Indicators from *Sustainability Counts: a consultation paper on a set of headline indicators of sustainable development*. Dept of Environment, Transport and Regions (1998). HMSO or available from: http://www.environment.detr.gov.uk/sustainable/consult/

- Standardised Participation Ratios by postcode sector, reported Raab G M (Oct 1998) *Participation in higher education in Scotland (*Report commissioned by the Scottish Higher Education Funding Council). Available from: http://www.maths.napier.ac.uk/~gillianr/shefc/intro.html

- Relevant Performance Targets from *Comprehensive Spending Review, Public Service Agreements 1999-2002*. (1998) Edinburgh: The Stationery Office. Cm 4181.

Appendix I – Discussion of models of health

A reasonable starting point for an assessment of strategic proposals to achieve better health and well-being for the population of Scotland (such as those put forward in 'Towards a Healthier Scotland' [SODoH 1999]) is the validity and usefulness of the model of health which provides the analytical framework. One of the strengths of the White Paper is the attempt to provide such a model. In Chapter 2 the government makes a commitment to take or facilitate action at three 'levels': life circumstances (e.g. unemployment, housing conditions, multiple deprivation); (health) lifestyles (especially, smoking, diet, physical activity and drug misuse); and health topics (e.g. CHD and stroke, cancer and accidents).

It is clear that health topics are the outcomes, while life circumstances and lifestyles are antecedent, input or causal factors. Whether or not there is a more sophisticated understanding of the pathways and relationships between these three levels which guides health policy development is, however, almost impossible to glean from the document itself. It would appear that life circumstances are believed to impact directly on population health, as well as indirectly via lifestyles; little more can be stated or deduced with any certainty. The consensus among those who responded to the Green Paper ('Working Together for a Healthier Scotland' [SODoH 1998]) consultation exercise was that action across all levels is required and endorsed, but that there is a need for greater clarity about the model which underpins the approach. The White Paper does not, however, appear to have taken these comments on board.

The failure to spell out the model in more detail is surprising in view of the many candidates on offer in the academic and practitioner literature. Any selection is likely to reflect personal prejudices and preferences, but three models are presented below on the basis of their citation and reproduction in theoretical and policy discussions about health promotion and disease prevention.

Dahlgren and Whitehead (Whitehead 1995) propose a model (see Figure 1) built around "layers of influence, one on top of the other…" Whereas the inner core consists of factors which are "fixed" and therefore not modifiable (age, sex and hereditary factors), the surrounding layers could theoretically be modified. "Individual lifestyle factors" are the adopted behaviours and way of life that can have health-enhancing or health-

damaging effects. Since, however, individuals interact with family, friends and others around them, their behaviour and way of life is influenced by wider social and community influences (next layer). Wider influences on an individual's health is constituted by the living and working conditions, including access to essential services and facilities. Overarching all these layers is the set of economic, cultural and environmental conditions, many of which "have a bearing on every other layer." Whitehead notes:

"It is the range and inter-relationship of all the different determinants of health that [the] Figure … seeks to stress. If one health hazard or risk factor is focused upon, it is important to examine how it fits in with the other layers of influence, and whether it could be considered a primary cause or merely a symptom of a larger problem represented in some other layer. [...] In thinking about a policy response, questions need to be asked about the size of the contribution each of the four layers and their constituent factors make to the health divide [between socio-economic groups]; the feasibility of changing specific factors; and the complementary action that would be required to influence linked factors in other layers" (p24)

Figure 1 Dahlgren and Whitehead model (Whitehead 1995, p23)
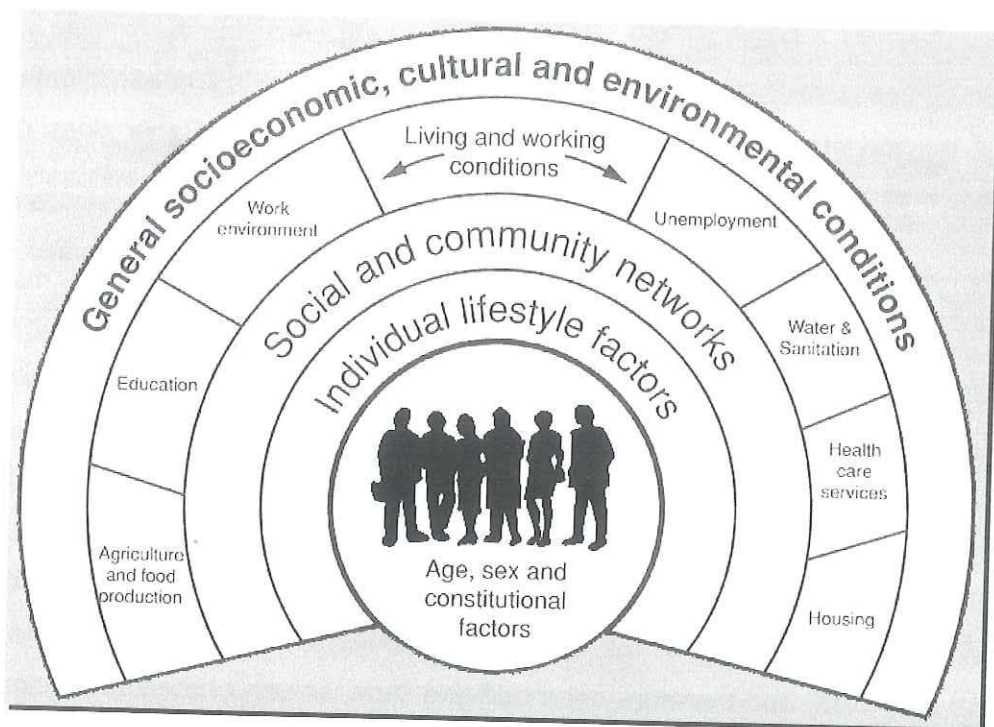
A more complex 'population health' model has been proposed by the Canadian Institute for Advanced Research (Evans and Stoddart 1994). As Figure 1 in the main report shows, this is a very different model to that proposed by Whitehead and Dahlgren: instead of 'layers' it consists of several interactive or feedback loops; in place of an undifferentiated concept of 'health' (which, anyway, is implicit, rather than explicit, in the Whitehead and Dahlgren model) a distinction is drawn between 'health and function' (i.e. the subjective experience of the individual), 'disease' (a category used by the health care system) and 'well-being', the individual's sense of life satisfaction "which is or should be (we postulate) the ultimate objective of health policy" (Evans and Stoddart 1994, p47); and the health care system itself is included in the model.

The three main input variables are the social environment (e.g. social support, emotional deprivation), the physical environment (e.g. exposure to harmful substances) and genetic endowment. These environments interact to influence health and function via individual responses, under the headings of 'behaviour' and 'biology'. Evans and Stoddart (1994) refer to 'behaviour' rather than 'lifestyle' because they wish to draw attention to the evidence that, while smoking (to take a key example) "is obviously an individual action, ...it may not be an individual choice....[T]he well-defined clustering of smoking and non-smoking behaviour within the population suggests that such behaviour is ... a form of 'host' (the smoker) response to a social environment that does or does not promote smoking" (p50).

Evans and Stoddart recognise that the test of their proposed framework is "the extent to which others find it useful as a set of categories for portraying complex causal patterns" (p59) and for guiding effective and efficient health policy-making. They are particularly mindful of the need to avoid ambiguity about the relative weighting to be given to individual responsibility, on the one hand, and structural or environmental influences, on the other, when devising appropriate policy responses. They were critical of the famous 1974 Canadian White Paper *A New Perspective on the Health of Canadians* (also known as the Lalonde Report) (Canada 1974) because it could be 'read' in mutually incompatible ways:

> "At one end of the ideological spectrum, it was seen as a call for a much more interventionist set of social policies, going well beyond the public provision of health care per se in the effort to improve the health of the Canadian population

and relieve the burden of morbidity and mortality. At the other end, however, the assumption that life-styles and to a lesser extent living environments are chosen [emphasis in original] by the persons concerned could be combined with the white Paper framework to argue that people are largely responsible for their own health status—have in fact chosen it. If so, then the justification for collective intervention, even in the provision of health care, becomes less clear" (Evans and Stoddart 1994, p42).

A final example is the socio-ecological model of health, developed for the Federal Canadian Heart Health Initiative and the Toronto (Canada) Health Department, and championed by the World Health Organisation (European Region, in particular). Figure 2 presents the most recent version of this model, as presented in a publication commissioned by the Health Education Board for Scotland and the Research Unit in Health and Behavioural Change (Labonte 1998). The key set of health determinants

Figure 2 Socio-ecological model (Labonte, 1998 p7)

Determinants of Health:
Socio-ecological Model
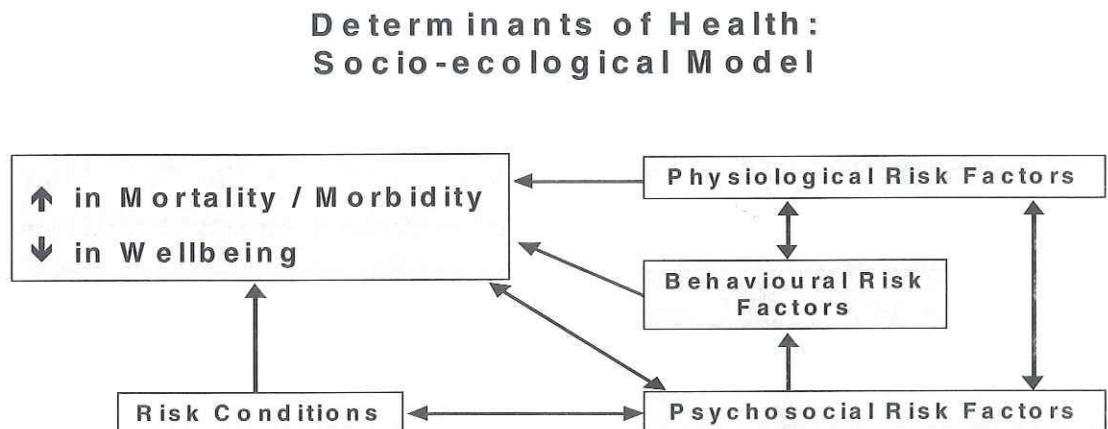
comes under the heading 'risk conditions', defined as living and working conditions that are conditioned and constrained by economic and political processes (practices and policies). These conditions "are unequally distributed by virtue of being conditions of

comparative inequality" (p7).   Risk conditions increase the relative risk of morbidity and mortality directly and also through psychosocial risk factors, individual cognitive or emotional states which reflect the subjective experience of social inequalities.   The internalisation of low status and (relative) powerlessness as evidence of personal 'failure' increases the likelihood of bodily breakdown (what the model calls physiological risk factors) and more unhealthy lifestyles (behavioural risk factors), particularly smoking and consumption of higher fat foods.

> "… [B]ecause people caught in this 'web' of risk conditions and risk factors experience less social support and greater isolation, they are often less likely to be active in community groups or processes concerned with improving risk conditions in the first place.   This 'feedback loop' reinforces isolation and self-blame, reinforcing the experience of disease/dis-ease" (Labonte 1998, p8).

It is important to consider the implications for both strategic and operational aspects of health policy-making of assigning a primary role in promoting/damaging population health to socio-economic and environmental determinants (i.e. risk conditions).   As Labonte notes:

> "… [T]he amount of health resources and program [sic] attention that presently go to the 'boxes' of medically or physiologically defined risks, or to behaviourally defined lifestyles, needs some redirection. The health promotion task is to locate these diseases and behavioural tasks in their psychosocial and socio-environmental contexts, to recognize these contexts as independent health risks in their own right; and to recognize the importance of acting around all of the problems in the 'web'" (Labonte 1998, p8).

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