

**THE DETERMINANTS OF
THE HEALTH OF THE PEOPLE**

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THE DETERMINATION OF HEALTH

As a first step towards improving health and reducing health inequalities, it is natural to ask what factors lead to our current pattern of ill health and health inequality.

Usually in this context, the medical concept of causation comes to mind as the required element. However, for these purposes the medical notion of a necessary and sufficient cause is too narrow, implying a direct “follow-on” relationship and originating from the doctrine of specific aetiology whereby each disease has a single cause.

This is commonly the position for infectious diseases, which are actually defined and classified according to their causative agent. But for the majority of health conditions, it has become clear that at best a complex web of causation involving many interacting factors is involved, and it is even debatable how useful the narrow concept of direct causation is over and above the concept of the wider determining factors.

Furthermore, in the circumstances of chronic disease and ill-health, “causative” and determining factors cannot logically be limited to biological, chemical and physical agents as various psychological and socio-economic factors are just as strongly related to these health states.

Why we are seeking to understand what influences health? Presumably, this is in order to suggest interventions that could be applied to improve human health. Even in the rare instances, such as infectious diseases, where we can describe a single causative factor, this in itself may not be enough to suggest a useful intervention.

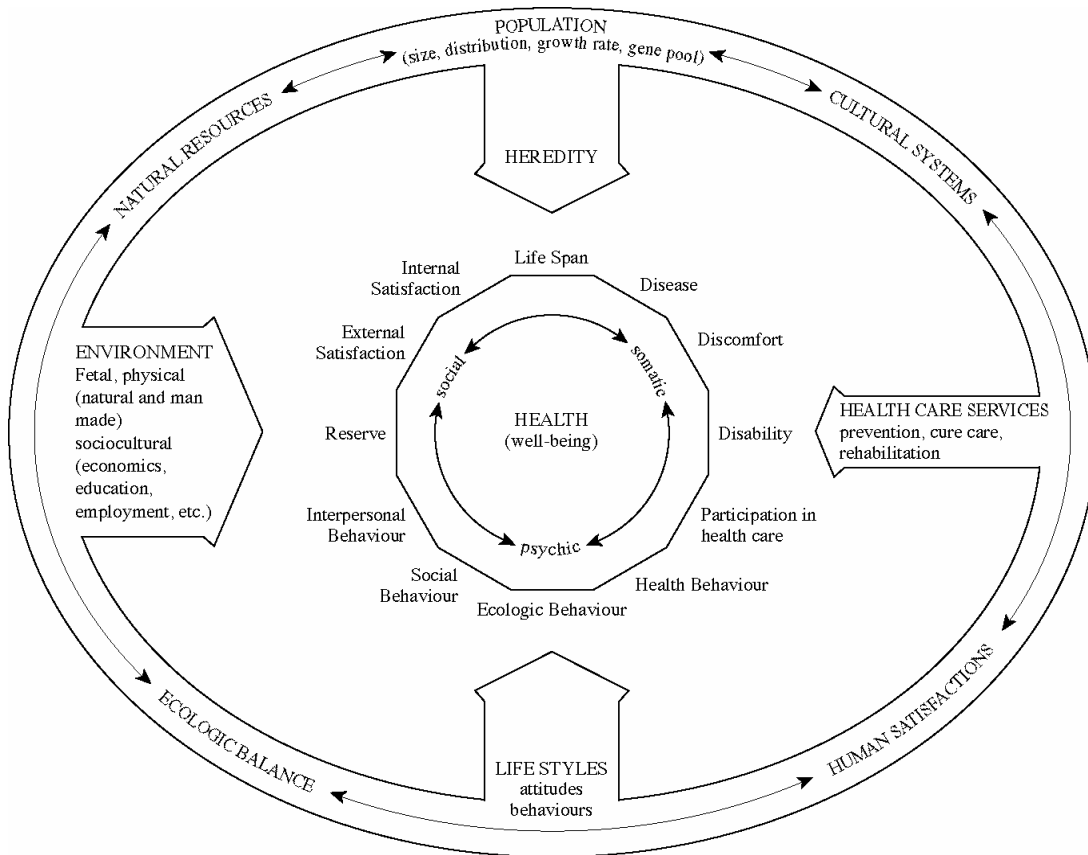
Rather, in order to effect a useful intervention, we may need to understand what influences the exposure of susceptible humans to this agent, which may be a “vehicle of transmission” - for example drinking water contaminated with sewage, or else some situational factor such as poverty or homelessness.

Similarly, in the more common situation of chronic multi-factorial disease, we need to look much further than physical, chemical, biological or psychosocial agents to what influences exposure and / or susceptibility if we are to understand what leads to these conditions. Frequently we can usefully do this even where we do not know the identity of the agent(s) or even whether an environmental agent is involved at all.

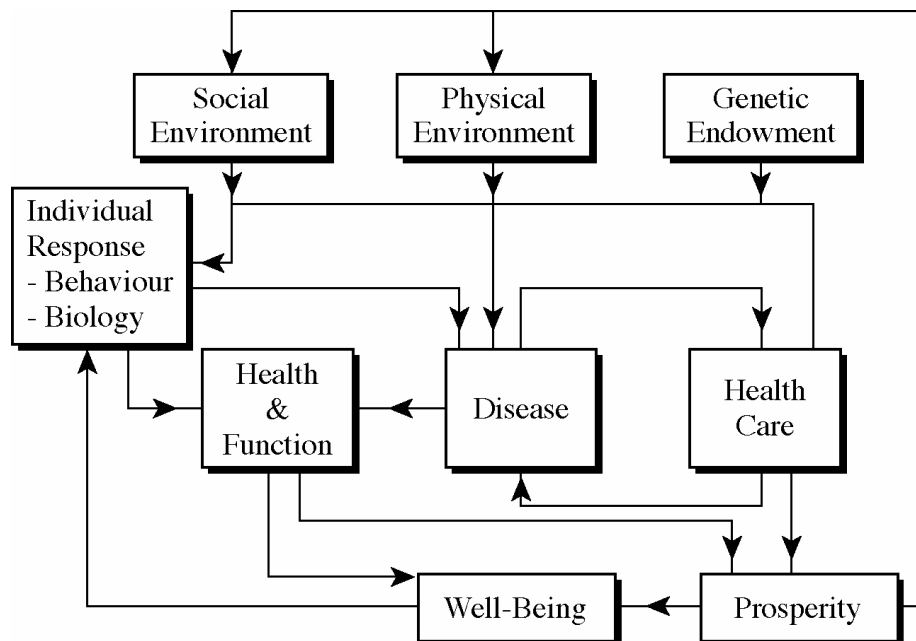
Broadly, there are two approaches to gaining this knowledge, basic laboratory science and human population research (epidemiology). Epidemiology is the study of the distribution and the determinants (of the distribution) of health related states in human populations. It is this epidemiological information on the determinants of health and disease in that population that we mainly require for public health policy.

WHAT DETERMINES HEALTH STATUS?

Blum (1974, 1981) has usefully grouped the determinants of health within a model which comprises the four fields of Environment, Lifestyle, Heredity (Genetics), and Health Care Services. Lalonde used a similar classification, the Health Field Concept (Laframboise 1973) in his famous public health strategy (Canadian Government 1974).



Building upon Blum's framework, Evans and Stoddart (1990 and 1994) developed a detailed model (below) suggesting interactive pathways in the production of health.



Considering the determinants of health in turn, within the original categories of Environment, Lifestyle, Heredity (Genetics), and Health Care Services as suggested by Blum (1974, 1981).

THE ENVIRONMENT

The environment can usefully be sub-divided into the pre-natal environment - before birth, within the womb; and the post-natal environment to which we are exposed following birth during childhood and adult life.

THE PRE-NATAL ENVIRONMENT

A growing body of evidence supports recognition of the central importance of the pre-natal environment within the womb as a central determinant of subsequent adult health and mortality (Barker and Robinson 1992) and of health inequalities (Barker and Osmond 1987a, Osmond 1987, Barker et al 1989a, Barker et al 1989c, Osmond et al 1990).

Adverse maternal factors compromise the intrauterine environment; maternal illness, smoking or high blood pressure result in low birthweight babies, whereas uncontrolled maternal gestational diabetes results in overweight babies.

There is also a huge literature on the sensitivity of the foetus to intrauterine environmental agents. These range from ionising radiation to maternal medication and nutrition (eg a diet lacking in folic acid), resulting most graphically in congenital malformations while also having other less obvious implications for lifetime health.

The adult mortality rate from stroke and ischaemic heart disease appears to be powerfully determined by adverse maternal factors acting before and during pregnancy. The same factors cause neonatal mortality, and in a given geographical area, the adult mortality rate from stroke and ischaemic heart disease is closely correlated with the neonatal mortality rate which applied some sixty years earlier (Barker and Osmond 1986 and 1987b) (Barker, et al 1989a and 1989c). These intrauterine factors may be linked with stroke and ischaemic heart disease though the mediator of high blood pressure (Barker et al 1990b and 1992) (Law et al 1992) or maternal anaemia or iron deficiency (Godfrey et al 1991). Impaired intrauterine growth is also strongly predictive of non-insulin dependent diabetes in late adulthood (Hales et al 1991) and impaired glucose tolerance in early adulthood (Robinson et al 1992).

THE POST-NATAL ENVIRONMENT

Research evidence has shown beyond reasonable doubt that the dramatic improvements in the health experienced by all societies as they develop can be attributed less to improvements in medicine and surgery and more to improvements in wider environmental conditions (McKeown 1979). These include access to sufficient nutritious food, the provision of pure drinking water and separate disposal of sewerage, improvements in working conditions and in housing, and a voluntary reduction in birth rate. The environment can be usefully sub-categorised into the

physical, chemical and biological environment and the social, psychological and economic environment.

The social, psychological and economic environment

Social inequalities in population health have in the past been principally environmentally determined, with the most important component probably being the socio-economic environment (McKeown 1979). Evidence suggests that the socio-economic environment remains the primary determinant of current social inequalities in health status seen between populations and between areas (Townsend et al 1992, Whitehead 1995, Davey-Smith et al 1997).

Social factors powerfully determine health and ill-health, and this is clearly exemplified by the very strong association between health and socio-economic status as measured according to the Registrar General's Social Class Classification. Within this schema individuals are allocated to social classes depending on occupation with high prestige professionals (doctors and lawyers) placed in social class I, managers and other professionals (teacher and nurses) in social class II, skilled non-manual and skilled manual workers in social class III, semi-skilled manual in social class IV and unskilled manual in social class V.

In the UK there is a 5 year difference in life expectancy between males in social class I and in social classes IV and V. The corresponding figure for females is 3 years (Davey-Smith et al 1997, Hattersley 1997). Both of these differentials are wider than they were 15 years ago (Harding et al 1997) with the gap for young males opening most markedly (Drever and Bunting 1997). Long standing limiting illness is 40 percent more common in social class V than social class I in the UK, while no such differential exists in acute sickness (Bunting 1997).

Socio-economic status throughout adulthood is the more important socio-economic indicator over a life time for differentiating groups with differing risks of mortality from cancer and non-cardiovascular non-cancer causes, whereas socio-economic status in childhood is particularly important in determining lifetime risk of death from cardiovascular disease (Davey-Smith 1997) which like most other diseases is much more common in poorer socio-economic groups (Morrison et al 1997).

Infant mortality in the UK is 70 percent higher in social class V than in social class I (Botting 1997), and again this is a differential that has widened in the last decade and a half. Children in the manual social classes are more likely to suffer from chronic sickness and tooth decay than those in non-manual classes (Botting and Bunting 1997).

A real association or an artefact?

Clearly the socio-economic environment is strongly associated with health. However, the next consideration is whether this association is real or whether it is due to some artefact or bias or confounding factor. The evidence suggests that these associations are unlikely to be explained by artefact or by the social drift hypothesis (whereby health determines social class) or by genetics determining both health and social class (Marmot et al 1995). Historically, neither social class nor health status have been

primarily genetically determined. Similarly, health status has not been the main determinant of social class, though it does have some effect (Fox and Benzeval 1995).

Given that artefact is not the explanation, and that the association is therefore real, it is natural to enquire into the possible mechanisms linking the socio-economic environment and health, and also into the particular aspects of the socio-economic environment which are responsible for determining health. These issues are now considered in turn, beginning with a discussion of the possible mediating pathways between the socio-economic environment and health, before moving on to a discussion of the important (general and later specific) socio-economic environmental factors which determine health.

Mediators between the socio-economic environment and health

The main mediators acting between the socio-economic environment and ill health are likely to be psychosocial stress (Patrick et al 1995) and other psychological states including self-esteem, identity, and personality, which also influence personal and social expectations. Some of the translation from socio-economic environment to biological health state probably occurs through endocrine hormone release and other biological signals (Tarlov 1996). The psyche (the mind) and the soma (the body) are likely to be much more closely linked than the philosopher Descartes implied when he separated them within his model of “Cartesian Dualism”, a conceptual separation which unhelpfully persists to this day.

The socio-economic environment in turn considerably determines the level of exposure to physical environmental hazards - wealthier people have more choices, being able to buy their way out of unhealthy environments, and also appears to produce the lifestyles and behaviour that lead on to ill-health, probably as a result of stress and peer pressure (Brenner 1995, Davey-Smith et al 1997).

General socio-economic environmental determinANTS

The general factors within the socio-economic environment which act to determine health status can be summarised by the “3 Rs” of “relational position” (social integration and cohesion), “resource position” (wealth, poverty and deprivation), and “relative position” (social stratification, inclusion and exclusion) (Miller 1995). These will be taken in turn:

Relational Position (Social Integration and Cohesion)

The relational position of a society or group refers to how closely individuals relate to each other. Research dating back as far as the great 19th century French sociologist Emile Durkheim (1897) has suggested that the closeness of a society in terms of a sense of belonging (anomie as opposed to atomie) and community is a strong determinant of mental health particularly of suicide. Similarly, more recent work shows clear links between social networks, confiding relationships and depression (Brown 1978). Community cohesion, including family structures, is also related to physical health indices (Patrick et al 1995).

Resource Position (Wealth, poverty, and deprivation)

Wealth, income, poverty and deprivation are strongly related to social class and a very close correlation between the pattern of deprivation and the pattern of ill-health and disease is evident.

The level of material well being experienced by an individual is largely determined by their social class, which is therefore also a key indicator of poverty and deprivation; and almost every health state and every disease is strongly social class related, being more common among poorer people (Hart, N 1997). The health differentials seen by social class probably result partly from absolute resource poverty but also from the social barriers created by relative lack of resources.

Relative Position (relative poverty and social exclusion)

There is considerable evidence suggesting that once one gets above a basic third world developmental level, then it is relative rather than absolute deprivation and poverty which is the more important determinant of health. Countries with lower levels of inequality in wealth (relative poverty) have lower levels of health inequality (Wilkinson 1996, 1997, Marmot et al 1995).

If relative poverty is more important than absolute poverty (at least in a country with a welfare state) this may suggest that health disadvantage may be more a result of psychological mediators (Brunner 1997) related to relative social position than to differential exposure to hazardous material physical agents.

Absolute poverty can be prevented by benefits, and some argue that absolute poverty barely exists in the UK, at least in the way that it did 50 years ago. However, benefits may also create dependence resulting from a poverty trap caused by the perverse incentives built into the benefit system.

Relative deprivation can be tackled by social engineering to flatten out differentials through re-distributive policies (which are far more politically controversial) or alternatively if the mediators are psychosocial then perhaps the effects of relative deprivation can be ameliorated through psychosocial support mechanisms or policies to reduce psychosocial stress (Wilkinson 1997a).

Specific socio-economic environmental determinants

Unemployment, economic inactivity and economic dependency

Unemployment is a key determinant of health (Brenner 1995) with a close correlation, even after correction for social class, with various measures of health status including premature mortality, suggesting that it is an independent determinant of health (Bethune 1997). This relationship is not explained by pre-existing ill health leading to unemployment. Unemployment and economic inactivity also appear to have an effect on self-esteem and mental health, over and above the health effects of unemployment mediated through poverty.

Employment and the Occupational Environment

On the whole, employment is healthier than unemployment. However, there is a long legacy of occupationally caused ill health in post-(heavy)industrial parts of the UK in particular. Although much of the hazardous heavy industry has now disappeared, while that which remains is probably more closely regulated than previously in health and safety terms, nevertheless most exposure to health damaging agents probably still occurs in the occupational setting. Psychosocial stress in the workplace (Everson et al 1997), particularly that related to low autonomy at work, and “high effort - low reward” work has been implicated as an occupational determinant of ill health, with those of lower employment status within organisations being most disadvantaged (Marmot and Feeney 1996, Marmot et al 1997, Bosma et al 1997, Johnson and Hall 1995).

Education

After age, the largest determinant of differential health status is probably social class. However, social class and education are strongly correlated in both directions in a virtuous cyclical relationship (Blane et al 1996). The absence of wealth and education acts in a vicious cycle potentially spiralling towards a socially excluded position associated with ill health (Wadsworth 1996).

The main determinant of adult social class is the social class into which one was born. However, general education appears to offer the greatest potential for social class mobility and is probably the key intervention available to prevent poverty, deprivation or exclusion and thereby to reduce health inequalities and to promote public health (Wadsworth 1996, Blane et al 1996).

Maternal education level is a particularly strong predictor of various parenting skills and behaviours beneficial to foetal and infant health including duration of breast feeding (Wadsworth 1996).

Economic Growth and Recession

There is a relationship between economic growth and health (Brenner 1995). Population health status decreases in recessions mediated through social mechanisms such as poverty, unemployment and loss of social position (Brenner 1995).

Culture and Social Norms

Cultural factors and social and group norms (peer pressure) are powerful health determinants (Patrick et al 1995) through their effect on behaviour. Social norms condition (normative) behaviour patterns that are socially acceptable but not necessarily healthy. Traversing social norms can also lead to felt stigma or enacted stigma (labelling) resulting in secondary deviant health related behaviour.

Lifestyle (which is covered separately later) represents a predictable combination of several specific behaviours, ranging across different aspects of life experience. Lifestyle is a strong determinant of health, and obviously is partially subject to “free will”. However, research suggests that lifestyle is actually largely determined by these social processes involving culture and social norms (Patrick et al 1995).

Crime and Violence

If the social environment becomes unsafe this can influence the mental health status of an individual. A safe environment free of crime (or fear of crime) is an important factor and contributes significantly to individuals' sense of well being (Patrick et al 1995). Violent crime directed at the person is of particular importance as a health determinant. However, crime against property is also relevant. The challenge is not just to be "tough on crime" for health as well as other reasons, but also to be "tough on the causes of crime", which are largely the same socio-economic factors which determine health.

The physical, chemical and biological environment

Physical, chemical and biological environmental influences are highly important determinants of health (Last 1998). Exposure to hazards in these environmental categories is strongly correlated with social class and determined by socio-economic status, acting largely through occupation and precise geographical area of residence.

Shelter and housing (and the domestic environment)

After food and water, shelter from the extremes of the natural environment is probably the other important physical environmental pre-requisite for health. Homelessness, which has been seen with increasing frequency in recent years, is therefore a fundamental threat to health. Alongside the availability of shelter, the quality of housing has also been a crucial factor related to health. The links between housing conditions and health have long been recognised. Generally, those living in good housing are in better physical and mental health than those who are not.

These links were most prominent in Victorian Britain, which established the connection between overcrowded and insanitary housing, high death rates and high rates of disease. The link was probably mainly between overcrowding and poor ventilation and respiratory infections such as TB. Massive slum clearance and significant investment in private sector and social housing improved these conditions but often broke up community psychosocial support. Even though the condition of housing has now improved, it is still likely that many of the inequalities in health which we see in today's adults and elderly are related to the poor housing conditions they experienced many years ago when they were children (Barker and Osmond 1987a). Poor adult respiratory health status and adult death from chronic obstructive airways disease are both determined by childhood respiratory infection, which is partly related to overcrowded living conditions (Barker et al 1991).

The indoor environment is believed to influence allergic respiratory disorders, some of which may be related to dampness, central heating and wall to wall carpeting (Best 1995). These environmental conditions have particular impact on children (Barker and Osmond 1987a). Fuel poverty is also an issue that is under increasing examination and especially its impact on the poorest and oldest in whom it causes hypothermia.

Pollution of the general environment

Pollution, whether generalised, as in air quality in urban areas, or localised, as in incidents such as oil spills, is often believed, and may sometimes be proved, to be the cause of ill health and may therefore account for health inequalities. A lot is known about the health damaging effects of exposure to high doses of myriad different chemicals in the occupational setting. Much less is known about low dose exposure in the general community (Last 1998). However, a large evidence base now exists on the health effects of urban pollution principally emanating from motor vehicle emissions. These are principally the provocation of asthma attacks in the susceptible (Last 1998).

Water and sanitation

Historically, following the industrial revolution, domestic water polluted with sewage was probably the greatest single threat to health. The efficient separation of drinking water from effluent achieved by the sewer system in cities was probably the greatest achievement of the public health movement. The maintenance of this system remains crucial today, and drinking water providers have to consider new microbiological threats such as *Cryptosporidium* which are particularly difficult to deal with. The main chemical hazard in drinking water is lead from piping which can cause lead poisoning and mental retardation. Fluoride in drinking water at appropriate naturally occurring (or artificially created) levels substantially reduces the incidence of dental decay across all classes and age groups. This benefit is not enjoyed in large parts of the UK.

Food and agriculture

Availability of sufficient quantities of safe nutritious food is a fundamental determinant of health and its lack is a form of absolute deprivation.

LIFESTYLE

Another important factor which influences health is the lifestyle of each individual; whether a person chooses to smoke, exercise frequently, or limit intake of fatty foods.

At first sight lifestyle may be thought to be a matter of free choice. However, evidence suggests that in addition to being influenced by educational level and personal skills, it is also strongly determined by wider factors related to local and personal situation. These include peer pressure, social norms, socio-economic factors (including poverty and deprivation) social class, and also by product marketing and advertising and local availability (Abel-Smith 1994).

DIET AND NUTRITION

A healthy or unhealthy diet, is a key determinant of health (Last 1998).

Evidence suggests that poor nutrition in early childhood related to family poverty some sixty to seventy years ago increased subsequent susceptibility to death from ischaemic heart disease and stroke in adulthood (Barker and Osmond 1986, Barker and Osmond 1987a, Barker et al 1989b, Barker et al 1990a). Several of these papers

suggest hypertension as the mediator within this relationship, though evidence also implicates high serum cholesterol concentration again resulting from poor nutrition in childhood earlier this century (Fall et al 1992).

In more modern times, deficient maternal and early childhood diets may be less common. However, the important recent discoveries of the nutritional value of maternal folic acid for the prevention of neural tube defects and of breast feeding for the promotion of general health and the prevention of disease makes it clear that this issue remains relevant. Furthermore breast feeding has actually been declining, particularly in poorer groups (James et al 1997). Diet in adulthood may be less important in explaining inequalities in health than diet in childhood (Cade et al 1988), though there is also a wealth of evidence of a relationship.

Green vegetables, salads and fruit provide antioxidant vitamins and fibre and are thought to be protective against bowel diseases and cancers in general (James et al 1997). Current health promotion campaigns advise five helpings of fruit or vegetables daily. Diets high in saturated fatty acid cause heart disease and strokes and high salt intake causes high blood pressure and heart disease and strokes (James et al 1997). Similarly, it is well known that foods high in refined sugar cause obesity and dental caries.

For each component of a healthy diet a consistent picture relating poor diet, poverty and low social class is seen throughout the UK (James 1997).

SUBSTANCE MISUSE

The misuse of nicotine, alcohol and drugs has major implications for health.

SMOKING

Smoking increases the risk of having a small baby, and of suffering heart disease, lung cancer, bronchitis and emphysema, limb amputation and various other problems. A major concern is the continued high number of teenage girls who smoke.

ALCOHOL

In excess, alcohol causes cirrhosis of the liver and high blood pressure in addition to social problems. In moderation, alcohol is probably beneficial to health.

EXERCISE AND OBESITY

Both exercise and obesity are strong risk factors for coronary heart disease, which is the biggest killer in the UK.

OVERWEIGHT / OBESITY

Obesity increases risk of heart disease and stroke, among other problems. The UK has some of the worst rates of obesity in the world – and rising.

EXERCISE

Regular strenuous exercise has a protective effect for heart disease and stroke, builds bone mass, improves posture and helps control body weight.

HEREDITY (GENETICS) AND OTHER INTRINSIC FACTORS

These factors include genetic endowment (including sex) and biological age. The genetic constitution of individuals and populations is the key intrinsic determinant of health. All human diseases have a genetic component, including those due to infectious diseases or toxic agents, where the host response, in terms of the extent and severity of the effect, is at least in part a function of genetic susceptibility. Some diseases, which are due to single gene or chromosomal deficits, appear to be completely genetically determined.

Genetics is also potentially the most powerful arena for medical intervention to improve the health of individuals and could therefore also be a key focus for public policy in facilitating the treatment of those who could benefit. Thus far, medical intervention cannot change the genetic constitution of individuals to improve their health, but the power of the genetic revolution is to enable greater understanding of the interaction between genetic and environmental factors. This will allow conventional public health interventions to be focused on genetically susceptible sub-populations, and health promotional messages to be targeted at individuals at specific risk of disease.

Genetic testing and screening for diseases can at this stage only identify those at greater or lesser risk, with little prospect for direct curative intervention. Nevertheless, in some cases useful medical or personal action can be taken to reduce that risk, while in others the information may lead to benefit for other family members. The extent to which such knowledge may give rise to unnecessary anxiety is unclear but the whole question of genetic testing and screening raises significant ethical questions.

In the area of pre-conceptual counselling and foetal screening, recourse is available to more definitive intervention, though in the latter case, this means termination of pregnancy, a course of action few find easy. Furthermore, again there are ethical questions about falsely alarming those who are not affected.

In summary, at the moment there is only limited scope for clinical or public health intervention, but a number of policy issues can reasonably be set out at this time. This provides a window of opportunity to debate the ethical and financial implications of genetic science, yet however these resolve, there can be little doubt that the greater understanding of disease mechanisms brought about by the genetic revolution will have significant benefits for the public health (see also Zimmern and Cook 2000).

HEALTH CARE SERVICES

A person's health can also be influenced by access to good quality (effective) services (Bunker et al 1995). However, contrary to popular opinion, the evidence from

historical studies (McKeown 1979), between countries comparisons (Cochrane 1978), and other studies (Marmot et al 1995) suggests that this influence of medical and health care upon the health of the population has been and remains smaller than each of the three other fields of environment, lifestyle and genetics. It follows therefore that inequalities in access to effective medical and health care services are not likely to be the main explanation for inequalities in health status.

It should be noted that these conclusions are based largely on mortality based evidence and it is possible that health care may well play a larger part in improving quality of life rather than increasing length of life.

Nevertheless, the evidence which does exist is sufficiently convincing to be able to conclude that prevention through social and environmental policy and public health action is more effective than medical and healthcare services, in achieving population health gain (Hobbs and Jamrozik 1997). This has been the position across the sweep of history though the contribution of clinical medicine has been increasing in the late twentieth century. Nonetheless, in simple terms, and perhaps unsurprisingly, it appears that it is easier to prevent health from being forfeited in the first place than it is to restore health after it has been lost.

Within the domain of clinical medical and health care services, it is preventive medicine in the form of immunisation and preventive maternal and child health, rather than “curative” services that have historically been of greatest value in advancing population health and also in reducing health inequalities (Bunker et al 1995, Hobbs and Jamrozik 1997). Large though this contribution has been, it should not distract from the fact that overall, prevention has most effectively and efficiently been achieved by social and environmental policy than by public health or preventive medical services.

Therapeutic medicine has benefited the health of the population most through the antibiotic treatment of sexually transmitted diseases and of some other infectious diseases, particularly Tuberculosis (Hobbs and Jamrozik 1997). However, in the latter case, the role of improving social and environmental conditions (including provision of clean water and better housing leading to reduction in overcrowding) and better nutrition was much more important in the decline of this disease than the advent of effective treatment.

There have been some notable medical successes in the treatment of cancer in younger patients particularly in the case of childhood leukaemia, and of testicular cancer in young men, both of which are now almost invariably curable, however the population health impact of successful treatment of these rare diseases is small.

Outside medical drug therapy, orthopaedic and accident surgeons have a claim to be among the doctors achieving greatest population health gain particularly as a result of treating fractures due to trauma in younger patients (Hobbs and Jamrozik 1997). Ophthalmic surgeons can rival these claims as a result of the great benefits to be derived from cataract surgery (Hobbs and Jamrozik 1997).

In recent times there have been considerable advances through medical innovation and it is often assumed that this must therefore translate into a greater benefit to the health of the population. It is reasonable to assume that there has been benefit at the

population as well as the individual level. However, there is little convincing evidence to suggest that the the relative contribution made by medical and health care to the health of the population has increased markedly compared to wider social, environmental and public health policy and action.

Following the success of the latter interventions in combating infectious diseases, the current picture of population ill-health is different from that in the past, comprising largely chronic degenerative diseases in older people. These patients are in health terms on a downward trajectory and their diseases being degenerative in nature, are more refractory to medical intervention. Hence there is also a law of diminishing returns, whereby progressively larger increments of expenditure on medical care for these groups achieves progressively smaller incremental health improvement. Health maintenance may be a more realistic goal than health improvement for these groups.

Ironically therefore, just as medicine appears to have become more potent, the prevalent degenerative health conditions make it more difficult for it to demonstrate unequivocally that it is making a larger contribution to the health of the population. These degenerative diseases are usually amenable more to delay than prevention, and to quality of life improvement rather than cure. Because medical treatment benefits might therefore be more evident in quality of life improvement rather than mortality rates or longevity, they may also be more difficult to demonstrate unequivocally.

CONCLUSION

Although absence of evidence of benefit is not synonymous with failure, rational public policy should as far as possible be made according to the evidence which does exist. This favours social, environmental and public health policy over clinical medicine and healthcare.

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