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## POLICIES ON PREVENTION: THE HAZARDS OF POLITICS\*

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The development of policies for the prevention of ill-health, and the inter-play of science and politics in this activity is a fascinating topic. In recent years, Yarrow<sup>1</sup> has described his experiences from his viewpoint as a medical officer in a ministry, while Mills<sup>2</sup> provides a scholarly review of the subject. This paper examines the epidemiological evidence in four areas, smoking, pollution, screening and iodine deficiency and tries to draw conclusions for improvement in the ways in which the findings from such studies are applied in the interest of public health.

## SMOKING

The most important health hazard in our country at this time is the smoking of cigarettes. The realisation of an increase in the incidence of chronic disease, e.g. cancer of the lung, coronary heart disease and chronic bronchitis, led to a variety of initiatives at the end of the Second World War. It is believed that the Medical Research Council (MRC) asked Pat Lawther to study air pollution and bronchitis, and Tony Bradford-Hill to study smoking—although initially it had been envisaged the other way round; only Lawther had an engineering degree and it was therefore considered more suitable that he should study the problem of air pollution.

Hill and Doll's studies are universally known<sup>3,4,5</sup> but their reception by the Imperial Tobacco Company probably less so. When the published results in the *British Medical Journal* were reported to the main board of the Imperial Tobacco Company according to a participant the chairman was so appalled by the findings that he turned to his board and said 'surely these results cannot be correct since we produce a clean, hygienic product!'

The general reaction to Hill and Doll's studies and similar investigations by Wynder,<sup>6</sup> Levin,<sup>7</sup> and Hammond<sup>8,9</sup> in the United States were muted, and little public notice was taken until the publication of the report of the Royal College of Physicians in 1962,<sup>10</sup> and the Surgeon General's report in the United States two years later.<sup>11</sup> As a result of these, governments and most members of the public began to take the problem of smoking more seriously. Tobacco companies reduced the amount of tobacco in cigarettes (from 1g/cigarette to 0.75g/cigarette) and introduced filters in most brands. They also became involved in a search for what they hoped would prove to be less harmful products; in particular tobacco substitute material. In the United Kingdom this search was led by Imperial Tobacco and ICI, and in the United States by Dupont.

The government in the UK reacted to these initiatives by setting up an Independent Scientific Committee under the chairmanship of Lord Hunter.<sup>12</sup>

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This was charged with assessing whether the tobacco substitute substances were themselves harmless. A variety of chemical, pharmacological, and toxicological tests were developed to determine the content of the new tobacco substitutes. However, the basic question as to whether smoking cigarettes 'laced' with tobacco substitute, or entirely made from the substitute, were truly less harmful than normal cigarettes remained unanswered. The committee envisaged undertaking large scale randomised controlled trials comparing the new cigarettes with the old as soon as the new cigarettes were established on the market rather than relying on short-term, acute pharmacological or chemical studies.

However, the possibility of testing the new cigarettes in a proper manner was never realised. This was principally for two reasons; the failure of tobacco companies to market and distribute the new cigarettes in line with their advertising and promotion, and the effectiveness of the Health Education Council's propaganda which suggested that smoking the new cigarettes was like falling from the 38th floor rather than from the 42nd floor. The new cigarettes sold disastrously and were taken off the market fairly rapidly.

Following this *débâcle*, the tobacco companies and governments began to be more concerned with reducing tar and nicotine content of cigarettes since it has always been assumed that the major harmful factors in cigarettes were their tar content. Through advances in technology and agricultural practice, it was possible for manufacturers to reduce the tar content of cigarettes considerably so that now there are few if any brands on the market with a tar content of more than 15 mg whereas before 1960 most brands had a tar content of more than 25 mg and only in airport duty-free shops can 'full strength' *Capstan* or *Player's Navycut* now be bought. The problem remained however, that the individual habit of smoking cigarettes is largely dependent on the nicotine content, which is perhaps that component of the cigarette which induces people to continue to smoke.<sup>13</sup>

Manufacturers developed two different ways to allow for this. The first was to add nicotine to the cigarette to produce a high nicotine-low tar cigarette. The second was to change the method of growing tobacco to ensure a tobacco which also had a high nicotine but lower tar content. The addition of nicotine to cigarettes was unacceptable since this would be a contamination of the cigarettes likely to increase the chance of addiction. The major research was for naturally occurring tobaccos which had a higher proportion of nicotine than tar. It has recently been debated in the US that if nicotine is added, cigarettes become classifiable as a drug, and therefore likely to encounter legal problems under the Food and Drug Administration regulations.

A major randomised controlled trial tested if these new cigarettes were truly less harmful than standard brands,<sup>14,15</sup> but no difference was shown in symptoms or ventilatory function of individuals smoking the new cigarettes and those smoking the old ones; whether they were medium tar-medium nicotine, low tar-low nicotine or low tar-medium nicotine cigarettes. It is probable that this was due to the fact that individual smokers adapted their smoking (as assessed by assay of urinary cotinine) so that they would absorb their own 'fix' of nicotine and thus remain addicted while the tar intake would reflect the number of cigarettes smoked.

Thus the strategy of lowering the tar content of each cigarette was unlikely to produce any health benefit. Nonetheless, governments continued to negotiate with cigarette companies to promote the sale of low tar cigarettes.

The alternative strategies in reducing the harm from cigarettes are either to stop people from smoking or, better still, to stop them from taking it up. The attempt to stop people from smoking through providing an alternative source of nicotine such as nicotine containing skin patches or nicotine chewing gum, medicalises the problem of tobacco addiction. It does lead to some benefit and governments and others have supported such efforts. Other approaches, e.g. the use of counselling, have had some success—but none are effective in more than a small proportion of individuals.<sup>16,17</sup>

Discouraging children from taking up smoking is perhaps even more important, but this must involve teachers and people other than health personnel. Several studies endeavoured to determine the major factors that induce children to take up cigarette smoking.<sup>18,19</sup> The results show that 30 per cent of smoking can be attributed to the child's response to peer pressure, and to exposure to parental smoking at 11–12 years of age. More than 70 per cent of children will try smoking before 16 years irrespective of their attitudes and circumstances, but only about 3.5 per cent try for the first time after this age. About 45 per cent of those who were occasional smokers but become regular smokers before reaching 16 years old, reflected attitudes of the family environment, but only about 4.6 per cent become regular smokers after 16. There is a maximum incidence of regular smoking of about 20 per cent per annum as children move into the third year of secondary school, and a pattern of attitudes tolerant to smoking experienced at home, and observed in places of work and recreation before the children take up smoking.

Susceptibility to peer pressure, a dismissive attitude to the hazards of smoking, and having smoking parents at the age of 11–12 years, are significantly associated with later smoking. There was not much chance of stopping a child experimenting with cigarettes since about 80 per cent do so irrespective of attitudes and circumstances, but it may be possible to deter children from smoking regularly. If this can be achieved before age 15–16, they are unlikely to do so subsequently. This is particularly important before age 14 when the maximum incidence of regular smoking occurs. Thus the timing of health education programmes must reflect this and should begin long before age 14.

These longitudinal investigations raised major concerns about the objectives of health education programmes and ways in which their effectiveness is evaluated. While many programmes of health education discourage children from experimenting during adolescence quite effectively, the means that they use may increase the likelihood that they will smoke when they become adults. This is clearly undesirable.

Whether a programme achieves the aim of preventing adult smoking is extremely difficult to assess and most evaluations use the prevalence of smoking in the children at one point in time as a yardstick. Even this causes difficulties because the effects are small and prevalence at one time is an insensitive measure of a dynamic process where only small changes may be observed. As a result, it is common for such evaluations to assess effects by measuring the understanding and knowledge which the programme was designed to increase rather than measuring the smoking behaviour. The increase in knowledge is assumed to decrease the risk of the child starting to smoke at school or later and thus decrease the risk that he or she would become an adult smoker.<sup>20</sup>

Teachers see their role as providing knowledge, improving self-esteem and

decision-making skills rather than directly effecting behavioural change. A useful programme is designed to convince teachers that it is based on sound principles so that they are happy and able to incorporate it into their curriculum. School circumstances are also important; for instance, it has been shown that there is an association between single sex education and the smoking habits of boys.<sup>21</sup> One step which might help to reduce smoking in adolescence, would be a ban on teachers smoking since it has been shown that this is seen as permissive.<sup>18,22</sup>

The evidence from the longitudinal study shows that susceptibility to peer pressure tends to develop before a child takes to smoking regularly, suggesting that health educationists should make every effort to utilise such methods as social modelling concerned with equipping to resist social pressures to smoke.<sup>23</sup> The finding that children, before smoking regularly, tend to become dismissive of the hazards suggests that programmes should aim to create and maintain an awareness in the children of how relevant the hazards are to them. Worthwhile effects on health can be achieved and evidence of this may make it easier to enrol parents in a more constructive way than has been possible in the past.

It is important to appreciate the limited effectiveness of reduction in smoking prevalence in adulthood that even the best school health educational programmes, based on these principles, are likely to achieve. Mathematical modelling, by Swan and his colleagues, showed that the maximum effect is only likely to be a reduction in smoking prevalence of about 30–40 per cent. Though these studies were commissioned by the MRC and the government and published between 1972 and 1991, it is of interest to consider what, if any, notice has been taken of them. Changes in school curricula, and changes in teachers' attitudes have not been as positive as one might have hoped. Thus few schools have been able to undertake the proposals put forward. Concern in this variety of education has been side-tracked by other initiatives, and health education in childhood has been manipulated by the media and by politicians to such an extent that the simple messages have been lost.

Smoking has become far less acceptable in society now than it was 20 or more years ago. The suppression of smoking on transport, in offices and in restaurants has had a profound influence. However, there have been counter-pressures. Although governments appreciate the effect a ban on cigarette advertising may have on smoking, there has been a consistent lack of willingness to suppress the promotion of this massive health hazard. One such example of the UK government's attitude towards tobacco advertising occurred when it considered its objectives for the development of the Health of the Nation, which included targets for the reduction of cancer and coronary heart disease incidence. The Advisory Committee to the Secretary of State unanimously urged the abolition of cigarette advertising and emphasised if advertising was to continue, the government's belief in the Health of the Nation targets was not credible. When this was discussed by the Secretary of State's Working Party, all members, not just doctors (who were in a minority), unanimously called for the suppression of cigarette advertising.

The Health of the Nation method of expression of targets<sup>24</sup> is also an example of the ways in which politics can influence prevention. These targets are expressed in terms of disease or outcome, such as with the reduction of heart disease and of cancer. An alternative way to express targets for improvement of health is in terms of risks or process, e.g. the reduction of smoking, the

improvement of nutrition. Although most of the advisers to the UK government emphasised the need to start off by putting the message across in terms of risks (process) rather than disease (outcome), this was rejected (although it must be emphasised that these risks are well described in the documents). This is partly a matter of political philosophy. Stating it in disease (outcome) terms suggests that the major actors and players are in the Department of Health and that it involves doctors and the health care professionals. Stating it in risk (process) terms places a greater emphasis on the other actors in the process such as the teachers, the Department of Education, the Ministry of Agriculture, and the Department of the Environment.

A united approach towards prevention between different disciplines, agencies, and departments would surely be extremely useful in improving health. The government needs to recognise this. It is clear that to improve the national health we are not only concerned with the health service. Unfortunately, in spite of protestations to the contrary, and although all departments of state pay lip service to the promotion of health, it cannot yet be said that they place any great priority on activities that are concerned with the preservation of health as compared, for example, with their concern for the economy.

The problem of stating targets in terms of disease have also been underestimated since we need to evaluate what we are achieving and we have to be concerned with methods of measurement. Diseases change at a slow rate and there are large variations from year to year. It is much easier to measure changes in, for example, smoking habits or the sales of cigarettes which might reveal more rapidly whether a programme is effective.

Nevertheless much has been achieved in the field of smoking prevention, both in this and most Western countries. The tobacco manufacturers are now on the defensive and prevalence of smoking has become less. Yet from a geo-political stance there is still much to be done. The manufacturers now promote their products in the Third World countries. As most of these are exports from the US and UK a crucial public health issue remains.

#### AIR POLLUTION

In complete contrast to the story of smoking prevention is that concerned with air pollution.<sup>25,26,27</sup> The effects of air pollution on health have caused concern for many centuries wherever coal has been widely used. As long ago as 1257 Queen Eleanor was apparently unable to remain in Nottingham because of the smoke, and in 1307 a commission was appointed:

'To enquire of all who burn sea coal in the City (of London) or part adjoining and to punish them for the first offence with great fines and upon the second offence to demolish their furnaces'.<sup>7</sup>

Despite these threats, the use of coal for crude industrial purposes continued, and by the 17th century it was also used for domestic heating in place of wood. Evelyn<sup>29</sup> in his famous discourse *Fumifugium* described the effects of London smoke and wrote.

'(The) inhabitants breathe nothing but an impure mist, accompanied with a fuliginous and filthy vapour, which renders them obnoxious to a thousand inconveniences, corrupting the lungs, and disordering the entire habit of their bodies; so that catarrhs, phythisicks, coughs and consumptions, rage more in this one City than in the whole Earth besides'.

London was indeed an unhealthy city at that time, but the physicians do not appear to have singled out pollution. The causes of death recorded in early bills of mortality<sup>30</sup> were many, but pollution as a cause was rarely mentioned.

The problem of pollution in London worsened, largely because of the increase in population and the accompanying increase in coal consumption. The effect on mortality was, however, not generally acknowledged in the death certificates which were introduced in 1838.

During the nineteenth century episodes of dense fog did not excite much interest although their possible harmful effects were recognised. In December 1873 there were 650 excess deaths, in January 1880, 1,200. The situation was, in general, worse than in other cities of Europe or in the United States, since much of the coal was burned in grossly inefficient open grates, discharging smoke from small chimneys close to ground level. In other countries more efficient closed stoves or central heating was used in homes.

Public interest into the problems of air pollution gradually developed towards the end of the 19th century and regular measurements of smoke were started.<sup>31</sup> The unique feature of the London 'pea-soupers' of the late 19th and early 20th centuries was their high tar content. These fogs had a yellowish appearance and contained large quantities of tar in droplet form in addition to carbon particles. The tar came from the distillation of coal on open fires, which, until about 1930, were used not only in the kitchens, but also in the living rooms and bedrooms of the majority of London houses. Even in the 1950s, when all but the living room fires had disappeared, there were occasions when the soluble benzene fraction of the smoke exceeded 40 per cent.

There have been several recorded major episodes of air pollution in this country since the middle of the 19th century. However, the 1952 smog episode, perhaps was the turning point when more than 3,000 people died in London over a period of two weeks as a result of an episode lasting five days. It was this episode which impelled the UK government to act, and the control of air pollution is now widely effected not only in this country, but also in others.

In the UK the Clean Air Acts were introduced, so that since the mid 1970s it has been difficult, if not impossible, to identify the health effects of reduced air pollution in our population. Part of the difference between the success of the action in air pollution, in contrast to the lack of it with cigarette smoking—a much more hazardous factor is perhaps two-fold. Firstly changes in levels of pollution could be introduced by legislation stating the levels of pollution which were acceptable, and that methods of heating and energy generation would have to be introduced into industry and homes which did not produce the hazardous components of air pollution; smoke and sulphur dioxide. Thus it was a measure that could be introduced relatively easily through legislation as compared with the difficulty of achieving changes in individual behaviour.

Secondly, since many homes were being rebuilt following the end of the Second World War, newer methods of heating, which did not use open coal fires, could be introduced relatively easily and cheaply. Thus, success in obtaining clean air can be attributed to a major catastrophe, to the ability to induce change relatively easily, and to the 'sensitization' of the population to the problem of air pollution.

It is now difficult to identify the effects of air pollution on health in spite of the considerable media attention on present pollution in our cities, particularly

that from motor cars. It is possible that the effect of this is very small compared to the levels of pollution we had in the past.

The scientific assessment of the health hazards of air pollution presents difficulties. Seven main reasons for this complexity have been put forward.<sup>32</sup>

1. There are two major forms of community air pollution—(a) a 'reducing' form which consists, largely of sulphur dioxide (SO<sub>2</sub>) and is the feature of London smog, and (b) an 'oxidising' form which consist of carbon monoxide (CO), hydrocarbons, and photo-chemical decomposition products and is the feature of Los Angeles smog. Although they share a common name, these are two different types of air pollution and it would be misleading to assume that they have the same effects on health.
2. Meteorological variables affect the interpretation of air pollution data and the validity of monitoring, and can increase the duration of exposure to pollutants by preventing their natural dispersion.
3. There is a lack of consensus about which pollutants in the air damage health and which therefore need to be monitored.
4. The areas of a city in which high levels of air pollution occur usually contain the industries in which the residents work. It is therefore hard to assess the health effects of air pollution alone since there will be many other influences on the health of a working population.
5. Areas of high pollution also tend to be areas with blight, poor housing, overcrowding and other deprivation.
6. When people become ill with respiratory disease they may move away from areas of high air pollution. This makes it dangerous to examine a relationship between air pollution and health without also investigating the patterns of, and reasons for, migration, in some circumstances, for example, it may be the healthier and wealthier who move away.
7. The effect of personal air pollution in the form of cigarette smoking is considerably stronger than that of community air pollution in the development of lung cancer and chronic respiratory disease. The importance of the indoor environment in exposure to air pollution must also be considered.

There is still no clear understanding of the exact nature of the particulates which damage health. However, it is possible to distinguish between three main types of reaction to pollutants:

1. Acute effects in healthy subjects, illustrated by the reactions to acute episodes of smog or to the acute increases in pollution levels that can occur, particularly in industrial environments but also under experimental conditions.
2. Exacerbations in pre-existing disease in vulnerable individuals with cardiac or respiratory disease, who when exposed to air pollution may suffer an increase in symptoms or even die.
3. Hypersensitivity phenomena; (a) immunological; (b) non-specific bronchial hyper-reactivity whether partially or wholly reversible and possibly leading to chronic effects.

It is important in considering pollution to separate the aesthetic aspects from the effects on health. Pollution abatement costs money whether the cost of reducing pollution levels to abate the unpleasant aesthetic effects will be acceptable to society is uncertain. The cost of control of industrial pollution is high. Recently in Japan major modifications to industrial processes have been made through change in production methods, and using different methods of

environmental control. The largest steel factory in Japan, Nippon Steel, spends approximately 20 per cent of its production costs on environmental pollution control. Industry in the United States faces similar problems and, having less modern plants, may need to spend an even greater proportion to reduce the present level of pollution.

The resistance of industry to prevention of pollution and the politics concerned are quite different from those relating to cigarette smoking. With the latter the individual has to be influenced and the counter-argument rests on the principles of individual choice and liberty. Smoking in the main harms the individual who smokes while air pollution may affect the whole community. The tobacco manufacturer is thus concerned with evidence that 'passive' smoking may cause cancer and respiratory disease. To control air pollution, industrial practices have to change, methods of emission control introduced and methods of manufacturing altered. This requires legislation which is politically much easier and more readily accepted in most countries than the measures which restrict the rights of the individual.

Scientific studies on the health effects of air pollution, for the purpose of determining acceptable levels of pollution are few. Most studies have investigated the general effect of air pollution on health, and have not sought to determine specific levels above which air pollution becomes harmful.

The difficulty of calculating risk and benefit in pollution control relates to that of separating the acute and chronic effects and the devising of experiments to assess both of these.

Extrapolation from animal experiments is not appropriate as the effects are dissimilar to those in humans. We are thus dependent on epidemiological investigation of the effects of actual exposure. These have conclusively demonstrated the hazards at relatively high levels<sup>26</sup> but recent observations of the Royal Commission on the Environment indicate that people are also concerned with the risks from low levels of air pollution; whether the government will respond with further abatement measures remains to be seen.

#### SCREENING

The concept of screening for the presence of disease in individuals who presume themselves to be healthy, is one that now has wide acceptance. Pressures for the development of screening services is very great. Screening is an attractive concept—disease is diagnosed early and therefore more easily mitigated. It stands apart from traditional medicine in seeking to detect disease before symptoms present and before the individual seeks medical advice. It carries considerable ethical responsibilities since it contains the potential to move an individual from the state of apparent health to one of disorder. Complete freedom from disease is almost incompatible with the process of living.<sup>33</sup> But screening should not be used to identify conditions that are either untreatable or insignificant since in either of these circumstances lies distress and anxiety. Screening is unlike other health care services where the contact is initiated by the patient. In screening the invitation to be examined is initiated by the practitioner who thus has the responsibility of ensuring that an effective form of treatment is available if an abnormality is detected. This has been the case with tuberculosis detection by mass screening by X-ray.

Screening for cancer of the cervix was introduced in the late 1950s and early

1960s in British Columbia<sup>34</sup> and in California. This was considered of enormous importance and benefit to the health of women and was seized upon by many feminist organisations. A variety of pressure groups induced the UK government to introduce screening for cancer of the cervix in the 1960s without yet any clear evidence of its benefit. This programme rapidly overwhelmed pathology laboratories, since there were inadequate numbers of cytologists to read the smears, and partly as a result of this the frequency of post-mortems and other routine pathological investigations diminished. It became clear that for screening to be effective a series of criteria had to be satisfied. Most credit has to be given to Max Wilson,<sup>35</sup> a medical officer in the Department of Health, who together with Jungner<sup>36</sup> laid down a series of criteria and principles for introducing screening services in practice. The Nuffield Provincial Hospitals Trust<sup>37</sup> also produced a noteworthy publication on screening which laid down certain rules.

A major randomised control trial by the South East London Screening Study Group,<sup>38</sup> of multiphasic screening in general practice was unable to show that this had any benefit in terms of mortality, morbidity or levels of function. The government decided to be more cautious before advocating and funding other screening programmes and requires appropriate experiments to be undertaken before their introduction.

Yet by the late 1980s, the UK government introduced in the new GP contract, multiphasic screening of the type which had been shown to be ineffective ten years before. This was largely because of the mistaken belief of many politicians that providing such a service would reduce the cost of the NHS. This evoked concerted opposition and resistance from individual general practitioners as well as from their representative bodies. Several evaluations of these services were published.<sup>39</sup> The Department of Health retreated and more sensible conditions have now been incorporated into the GP contract. It is difficult to determine what factors influenced this change at either ministerial, administrative, or medical advisory levels.

Other potential screening procedures such as for cancer of the colon and prostate have not been introduced since every study undertaken so far has failed to show benefit in reducing mortality or morbidity despite clamour from members of the medical profession, as well as from lay people, to introduce them. There has however been a rapid growth of private screening clinics which advertise general health screening programs for men and women. Particular pressure and lay groups, supported by the media, may excite public demand for screening for specific conditions often on the anecdotal basis of personal experience and unsupported by scientific appraisal. The preface to the Nuffield Provincial Hospitals Trust book<sup>37</sup> raises the possibility of well-intentioned doctors, patients and pressure groups leading a crusade against a particular disease to persuade the government to provide a screening service before a comprehensive and scientifically respectable assessment of its benefit is available. In these circumstances the act of screening acquires respectability almost by virtue of its existence. Opponents of screening cite the harm that it can do in terms of misuse of limited resources, over or misdiagnosis, over-treatment and the provocation of fear and anxiety. Skrabanek has stated that 'screening healthy people without informing them about the magnitude of inherent risks of screening is ethically unjustifiable'.<sup>40</sup> A significant increase in psychological distress in healthy adults who have been screened for coronary heart disease risk factors has been shown



and it was emphasised that advocates of screening tend to assume that the process has only two possible outcomes—benefit or no effect.<sup>41</sup> The possibility that it may actually cause harm is largely ignored. The balance seems to lie somewhere between the extremes of enthusiasm and doubt in a cautious and rigorous approach to screening practices and proposals.

The disadvantages of screening are more complex. They include longer periods of morbidity for patients whose prognosis is unaltered in spite of diagnosis, and over-treatment of insignificant abnormalities that are identified. For example, the period of absenteeism from work may be increased after individuals are informed of being hypertensive.<sup>42</sup> This increase appears to be related to awareness of diagnosis and is unaffected by therapy.

There are other resource costs in finding more disorder: to that of the screening tests themselves are added those of the manpower and the subsequent management of whatever is found. There is the certainty that some individuals with false negative results may be given unfounded reassurance. Conversely those with false positive results may be subjected to needless anxiety and at the most to unnecessary and possible disfiguring surgery. Finally there is the question of the possible hazard of the screening test itself.

There are wide differences in access to screening facilities in different parts of the country and, indeed, between different hospitals and general practices within the same area. While it is always going to be difficult to achieve a uniform standard of health care and competence, availability of screening for a particular condition should not depend on where a patient happens to live.<sup>43</sup>

There appears to be a serious lack of co-ordination. In many areas there is no one responsible for screening activities and it is therefore easy for follow-up to fail. Various types of health professional may be involved with one case or screening programme but no one has overall responsibility and there may be inadequate communication between them. This is highlighted by the situation in screening for the risk of coronary heart disease. There is a danger in shifting the emphasis in this type of screening to primary care, which will shift the responsibility for this major cause of death and illness from national to local level, and the efficiency of the screening will depend on individual practices and practitioners rather than on national policies in relation to cigarette smoking, diet and exercise.<sup>44</sup>

There is also little in the way of systematic scientific evaluation of existing screening programmes without which it is impossible to judge their value. Evaluation should be built into the foundations of any screening programme. The lack of quality control in many screening programmes is of concern. There are guide-lines, for example in the field of cervical cancer screening, but there is no compulsion for any laboratory to adopt them.

Finally there is a lack of quality control of health education and promotion linked to screening, despite that many of the conditions we wish to influence need behavioural change. This must be of concern at a time of increasing public awareness of health as a positive and desirable goal and the overlap between changing lifestyles and national policies of prevention.

#### IODINE DEFICIENCY

Perhaps the best example of the effectiveness of prevention policies and the way in which they can be introduced is the reduction of iodine deficiency and goitre.

That success has been achieved may reflect the commitment and sensitivity of the researchers, the lack of financial consequences and the individuals alone cannot provide protection.<sup>45</sup> The loss of iodine from soil, due to glaciation, snow, and high rainfall, leads to low iodine content of all food grown in it. Inadequate dietary iodine leads to reduced synthesis of thyroid hormones. It is worth emphasising, that the circumstances are still found in Europe,<sup>46</sup> South America, Africa, Asia and Oceania and that large numbers of individuals continue to be affected by it.

To prevent and control goitre, iodine intake has to be supplemented. This can be done through the use of iodization of salt, oil, bread or water. The main global sources of iodine are in the USA, Japan and Chile. There are two forms of iodine which can be used to iodize salt—iodide, and iodate. Iodate is less soluble and more stable than iodide and is therefore preferred for tropical, moist conditions. Both are generally referred to as iodized salt. The advantage of supplementing salt is that it is used by all sections of the community irrespective of social and economic status. Its production is often confined to a few centres which means that processing can occur on a large scale and with better controlled conditions. The mixing of the iodine compound with salt is simple. However, packaging of the iodized salt is important. Jute bags absorb moisture and so the iodate dissolves and will drip out of the bag and thus much of the added iodide is lost. To avoid this waterproofing is required. This may be achieved by either a polythene lining inside the jute bag or a plastic bag. The additional cost of plastic bags is justified by reduced losses and by their resale value.

The cost of iodization of salt is made up of the components of the chemicals, processing, packaging and the running of the plant. It averages US \$4.00 per ton without packaging and US \$8.00 per ton with packaging. The cost per 1,000 population is in the range of US \$20–40/year or 2–4 US cents per person per year.

The preparation of the iodized salt is only the first stage of the social political process by which it eventually reaches the consumer. The likelihood of an effective salt iodization programme in a particular country depends on the salt production and distribution process which needs to be analysed carefully prior to the initiation of a programme, as this will enable the incorporation of the iodization process into the existing system with minimum disruption. Monitoring of the iodine content at the origin, the final distribution point, and in the kitchen of the consumer is necessary to ensure quality control. Delays in transit and exposure to heat and moisture, will cause variation in the concentration of iodine available for consumption. A single method for checking the iodine content of salt is used in China and should be used more widely elsewhere.

An effective programme requires legislation and enforcement measures in addition to quality control and substantial financial resources. However, public awareness and publicity is also necessary so that there is a demand for the iodized salt. This can be avoided if the iodization of salt for human consumption is made compulsory. This is the case in China but not yet in India. Where there is no compulsion to iodize salt major media campaigns should be mounted to inform the public of the concept of iodine deficiency and the social and economic benefits of a control programme.

Iodized salt was first used in Europe and the United States; New Zealand followed. It is much used in South American countries. It has also been used in

many parts of Asia but there are problems in the production and distribution of iodized salt in many countries, partly due to unwillingness of politicians to take effective action, as well as political and social factors which lead to a lack of quality control, erratic and unknown distribution processes, inadequate programme management and ignorance, as well as difficulties in distributing the substance over wide areas. Other methods need to be considered. An alternative is the injection of iodized oil which is particularly applicable in remote or isolated situations, such as a mountain area like Papua New Guinea. Such situations pose obstruction to the distribution of any food items, including salt. Although the addition of iodine to bread has been used in some countries including Holland and Australia, it is now not often used. Iodized water has been used in Thailand—but once again governments need to be motivated into developing and maintaining prevention programmes.

In view of the potential effectiveness of the various methods for correction of iodine deficiency, it might be anticipated that most programmes would be successful. This is not so. Success depends on much more than effective technology. The first problem is the assessment of a population or group living in an area that is suspected of being iodine deficient. The data required include—the total population, including the number of children under 15 years of age; the goitre rate; the rates of cretinism; the level of urinary iodine excretion; the level of iodine in the drinking water; and the level of serum thyroxine ( $T_4$ ) in various age groups.

Basic population data are usually available and make a reference point of obvious importance in developing a comprehensive iodization programme. There are difficulties in reaching the whole iodine deficient population, especially because of the remoteness of many communities. Various methods of definition and diagnosis of iodine deficiency, cretinism and goitre have been promulgated and described.<sup>46</sup>

Having assessed the size of the problem it is important to transmit the message of iodine deficiency and how it can be prevented to the health professionals both within and outside the public sector, to politicians, to the general public and also to the salt technologists and to administrators in the salt industry.

The politicians and policy decision makers are of crucial importance. They have no interest in the physiology or diagnosis but are concerned with the operation and benefits of iodine deficiency control, with improvement in perinatal mortality, improved school performance, improved health and well-being, increased work output and productivity, as well as to quality of life. The ability to read is not necessarily present in all communities, particularly those at greatest risk. Thus pragmatic messages have to be developed for radio and television. Social marketing is crucial.

Planning a control programme is clearly a concern of the department of health. But, as with most public health activities an intersectorial approach is essential, including education, information, industry, commerce, transport and agriculture. Even within a health department all sections must be involved including those relating to maternity, child health and mental health.

All these considerations are met best by the establishment of a control commission which is responsible for bringing these facets together. This commission will need to set specific objectives and targets, with options and priorities and appropriate methods of monitoring and surveillance.

Political decisions are crucial to the authority of any commission and to the allocation of sufficient resources. These often depend on a degree of 'groundswell' in the community, or at least a perception by politicians that the issue is a significant one to the community. Aid agencies can allocate resources only if governments give priority to such programmes.

#### CONCLUSION

These examples, demonstrate the influence of civil and political activity in the development and application of preventive policies. There are clear lessons to be learnt. Individuals and the media propagate scare stories on preventive activity. Pressure groups, including those representing individuals at risk and those representing particular philosophies exert political pressure to introduce screening services or to stop preventive services such as whooping cough vaccination. Governments and political parties propagate particular preventive policies often in the belief that they will improve health and thus demonstrate their concern for the people. Governments and industry may oppose preventive measures because of the costs involved or the effects on the economy or taxation.

We have to be concerned with the effectiveness of the measures that we advocate. In secondary prevention and screening there is little point for a condition for which we have no treatment. For immunizing agents we have to be straightforward about recognizing that such agents may have side or adverse effects and we must make people aware of these. We should be clear about the costs of preventive policies. The policies may reduce job availability; this may influence the economy of the country which may in turn bring about more disease or a decline in quality of life.

In prevention, as opposed to individual treatments, we are concerned with mass effects. Hence prevention is placed in a political context. Decisions on prevention policies evoke radical views from advocating groups, such as doctors advocating particular treatments which they believe to be beneficial, or calls from the tobacco lobby for the continuation of cigarette advertising. Propaganda contests of opposing groups opinions or interests will continue in which the media will be a large player.

It is crucial that the adoption of preventive policies by government should involve negotiation with all views and a balance be reached. While a government is rightfully concerned with the financial and social well-being of its citizens the health of those it serves must be a fundamental part of this concern.

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