Abstract. In trying to demonstrate the importance of preventive medicine in health care promotion, previous studies involving prevention and control of diseases have been discussed. Preventive medicine is also urged as the best method to help promoting health especially in the developing countries. Developed countries are urged to support developing countries, materially and financially in promoting their health. In terms of cost analysis prevention is an investment in health that produce a reduced probability of mortality and/or morbidity, therefore, we, investors in the developing countries, have to sacrifice something today in order to gain a benefit at a later point in time. (Keio J Med 39 (4): 265–269, December 1990)

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Introduction

In the words of the noted medical historian, Henry Sigerist: Medicine, by promoting health and preventing illness, endeavors to keep individuals adjusted to their environment as useful and contented members of society, or by restoring health and rehabilitating the former patient it endeavors to readjust individuals to their environment. This idea conforms very well with the present concepts of preventive medicine (preventing illness and promoting health).

In preventive medicine the community replaces the individual patient, as the primary focus of concern. In preventive medicine the objective is to evaluate the health of a defined community, including those members who would benefit but do not seek medical care. In this article, we intend to discuss the most important applications and cost effectiveness of preventive medicine in health promotion especially for the interest of developing countries. Health problems in the developing countries are caused by many factors. That is, the majority of the people in these countries have low incomes, insufficient food, poor sanitation, poor access to safe water (treated tap water) and high population growth rate. We therefore strongly believe that the only way in which developing countries can effectively solve health problems facing them is through preventive medicine practice (application).

Preventive medicine necessitates a systematic way of studying both the patterns of occurrence of disease in a community and the patterns of delivery of medical care, since offered services influence and also are influenced by the nature of disease and by the changes in modes of therapy. This systematic approach is provided by epidemiology, which forms the basic science of preventive medicine. It is understood that preventing illness and promoting health are functions of all medicine, therefore, preventive medicine represents a composite rather than a unitary body of knowledge. While in practice specific measures continue to occupy a central part in preventive medicine, general preventive measures have long been known to be very important. The successful application of both specific and general measures requires the effort of health education in order to achieve the cooperation of those people who comprise the community.

There are two important objectives of preventive medicine; to prolong life, and to reduce disability. In the developed countries progress in achieving the first objective has been enormous due to social and economic changes that have resulted in better nutrition, smaller families, better education, and the increase in medical knowledge that has enabled many diseases to be cured and prevented. It is at this point that we think developed countries, because of previous experience in solving...
their health problems, can help a lot in improving health situations in the developing countries.

The Importance of Preventive Medicine in Disease Prevention

Economic aspect

The main objective of economic analysis is not only to estimate the economic consequences of preventive programmes (their costs and benefits) but also to contribute to an understanding of individual and collective choice in allocating resources to prevention. As a discipline economics deals with choices between alternative ways of allocating resources. It is the characterization of the situation in which the decision has to be made that is most important, and the distinction between economic and non-economic factors is secondary. The basic distinction between prevention and other health measures in terms of economic analysis is the timing of costs and benefits. From an economic point of view prevention is an investment that produces a reduced probability of mortality and or morbidity. The economic concept of investment, means that the investor has to sacrifice something today in order to gain a benefit at a later point in time. Therefore for investment cost will always come before benefit in time. Costs are not only more immediate than benefits, but they are also more certain. It is always true that with investment we do not usually with certainty know what the benefit will be later in time. We can only receive the benefit with a certain probability. Now, when in practice can we apply the economic theory of investment in preventive medicine? The economic theory of investment is obviously relevant for the analysis of choices between alternative preventive programmes, between alternative designs of preventive programmes and between the prevention and treatment of a particular disease. This simply means that prevention and the economic concept of investment has to be developed with care. The aim of prevention is not primarily the monetary returns on invested capital and that the resources spent on prevention are not only financial. The economic analysis of preventive measure as investments therefore must include a careful assessment of costs and benefits from a wider social perspective. Having this in mind we can use most of concepts, theories and methods developed for the economic analysis of investment decisions for studies of the value of preventive medicine. Preventive measures not only affect a person’s health in the future (as understood generally) but could also affect his or her future health care expenditure and future income in terms of production. The possibility of prevention as a measure for containing health expenditure has been discussed in many previous studies. What are the reasons why some people especially the third parties (administrators) who provide the investment capital are being sceptical of the idea of prevention as an investment for health care cost containment? There are several reasons. First, prevention is an investment which first increases costs. Second, preventive measures usually cannot prevent morbidity and mortality from occurring, but what they can do is to postpone both morbidity and mortality. For example the studies of the consequences of reduced smoking by Leu and Schaub show that life time health care expenditure of non-smokers are not less than those of smokers. However what we should all remember is the general lack of data about health care expenditure over the life-time and we have also to remind ourselves, as Warner emphasizes, that postponing costs is also a means of containing costs. Third, and perhaps most important, international and inter-regional comparison shows that the level of health-care expenditure is not at all related to the health of the population. In the developing countries for example, health of the people is still not satisfactory, but at the same time they are the people getting the least in terms of health-care expenditure. It is at this point that we feel that the developed countries through WHO or otherwise are to assist the developing countries in promoting their health status in terms of financial, material and manpower support.

We think that it is hardly meaningful to try to generalize about empirical cost benefit, cost effectiveness and cost containment studies of preventive measures. For example, if we take immunization programmes, you will find those which produce benefit in excess of costs as well as those where the opposite is true. You will find screening projects which are cost effective if they are applied to one part of the population but not if they are extended to other groups. Some programmes are cost effective at one point in time but not at later one. Mass screening for tuberculosis might serve as the best example. Also there will be some programmes for life style changes that reduce health care expenditures and others that increase them. An important point is to try to do the right thing at the right time and place. It is our personal believes that if this is done correctly in the long run everybody will eventually benefit from a sound economic appraisal in health care.

Screening for genetic disease

Genetic diseases and congenital malformations are important causes of neonatal and childhood diseases in the developed countries. In many developing countries where single gene disorders occur at a particular high frequency as a result of natural selection, an even greater health burden will be caused by genetic diseases once the high mortality rates in early life due to malnutrition and infection are reduced. The prevention of genetic dis-
cases prospectively (genetic counselling) entails screening large population for genetic diseases and then offering appropriate advice about marriage. Retrospectively, genetic counselling after the birth of an affected child has only a limited effect on the incidence of a genetic disease. Generally, programmes for preventing genetic diseases involve antenatal or neonatal screening for common diseases. For instance antenatal screening is reserved for conditions which are either preventable, such as rhesus haemolytic disease, or are of such severity that there is an indication for termination of pregnancy, such as Down syndrome, neural tube defects, certain haemolytic disorders and variety of rare metabolic disorders. Neonatal screening on the other hand is restricted to conditions for which there are useful treatments, such as hypothyroidism, phenylketonuria and sickle cell anaemia. Genetic screening is relatively expensive. However, it is very effective in reducing morbidity and mortality in the communities. Unless the gene probe technology is considerably simplified and its cost reduced, this approach will not be widely applicable in rural population in the developing countries where rural infrastructures are still very poor. This is the major challenge for the control of genetic diseases in the developing countries into which the developed countries must give a hand to its solution.

Screening for cancer and coronary heart diseases

The ability to identify carcinoma in situ by cytological methods led to the plausible suggestion that early detection and treatment of this condition might prevent invasive cancer. The purpose of cancer screening is to find cancers in an earlier stage than if the patient waited for overt signs or symptoms, and the assumption being that finding cancers earlier in their natural history makes them more amenable to treatment giving the patient a higher probability of survival and greater chance of a cure. Shapiro and co-authors noticed that breast physical examination and mammography delivered annually to women under the age of 50 years reduce mortality from breast cancer. The effectiveness of mammography in women under the age of 50 years was also suggested by Baker. One randomized control trial involving digital examination and rigid sigmoidoscopy suggested a statistically significant reduction in cancer of the colon mortality. Randomized control trial involving screening for lung cancer indicates that screening for lung cancer is not effective using chest x-ray and sputum cytology. It has also been shown that endometrial cancer and its precursors can be detected in asymptomatic women enabling high rate of cure of this particular cancer. Screening asymptomatic adults for cancer therefore seems to be a very valuable health activity which should also be encouraged in the developing countries, given necessary support and assistance.

There is no dispute about the importance of hypertension and ischaemic heart disease in the developed communities. Early attempts to study the impact of lowering diastolic pressure in the ranges of 90–114 mmHg and 115–129 mmHg were done by two Veterans Administration (VA) Cooperative Study Groups. In these two studies the benefits were due to reduction in the frequency of stroke, heart failure, and renal failure. The results of the VA studies, coupled with those of other studies led to the more or less mandatory treatment of those with sustained diastolic pressure of 115 mmHg or more. The main predictors of IHD (ischaemic heart disease) other than sex, and increase in age are hypertension, hypercholesterolaemia and cigarette smoking. One view emphasizes the need for a downward shift in the blood cholesterol level for the community as a whole. This shift of course will depend on successful health education and dietary changes and not a question of screening. The other view is that evidence in favour of the community approach to the prevention of IHD by dietary means is not sufficiently strong and that intervention should be confined to those at a particular high risk. The Oslo trial showed a significant reduction in IHD events in the group encouraged to adopt diet rich in polyunsaturated fat and to stop smoking. The study by Berwick and co-authors showed good cost-effectiveness in the questions of methods of preventing IHD by modifying cholesterol levels in children. Screening for cigarette smoking is very discouraging. The effects of increase in price and in detailed informations may not have been well emphasized. At the moment, although cigarette consumption is going down in some countries, worldwide consumption of cigarette is going up. Switching to pipe and cigars smoking, nasal snuffing, chewing and dipping tabacco is not a solution. For instance chewing and dipping of tabacco might cause more cases of oral cancer. Alcohol consumption is known to be increasing world-wide. At the same time it was noted earlier that alcohol related disabilities were increasing. Therefore alcohol related diseases seem imperative to be included in the spectrum of conditions over which prevention is to be vigorously attempted. Many measures have been suggested for screening for alcoholism. However, questionnaires have been reported to be better than biochemical tests at eliciting a true picture of alcohol consumption. The results of the controlled intervention trial (alcohol study) showed good results especially in the intervention group. Mortality was reduced by almost a half in the intervention group. There was also significantly fewer sick leave days and days in the hospital in the intervention than the control group (most important aspect of prevention in the control of alcoholism and alcohol related diseases).
Immunization and infectious diseases control

Prevention of infectious diseases by vaccination has been one of the major triumphs of medicine (one of the major role played and still being played by preventive aspect of medicine). There have been many previous studies done on different vaccine: for poliomyelitis vaccine,\(^9\) for pertussis vaccine,\(^40\) for measles vaccine,\(^41,42\) for rubella vaccine,\(^32,43\) for mumps vaccine,\(^44\) and for influenza vaccine.\(^45\) These studies consider vaccines' benefits, risks and costs and conclude that these vaccines result in a net savings of morbidity, mortality and cost (money). Studies of the benefits, risks and cost aid in altering or setting health policy. The benefits of smallpox vaccine which helped to eradicate this serious disease with rarity of serious adverse reactions to vaccination,\(^46\) caused this procedure of immunization to be considered of unquestioned value.\(^47\) The point of importance to note here is that almost all studies on immunization demonstrated that the benefits outweigh the risks and costs for many vaccines (eg polio, pertussis, measles, mumps, rubella), and their use provides a net saving to society. In order to promote health status in the developing countries where infectious diseases are still the major causes of morbidity and mortality, preventive programmes should be the priorities in health services. Problems facing developing countries also include malnutrition, infectious diseases and poor sanitation.\(^2\)

References