INTRODUCTION

The history of medicine suggests that epidemiological observations have been more fruitful in detecting factors causative of disease than has any other approach. Such observations are often relatively inexpensive and have often constituted the stones with which hypotheses have been erected. These can then be tested experimentally and subsequently discarded, modified or confirmed.

The distribution of some potentially disease-causing factors in an environment may be shown to be related to the distribution pattern of one or more diseases. It must, however, be recognised that not only can several factors contribute to the cause of a single disease, but one factor may play a role in the causation of several diseases. Personal susceptibility in addition to tobacco smoke or other environmental factors can contribute to the risk of lung cancer developing in an individual, and, on the other hand, cigarette smoking can be a factor contributing to the causation of many different diseases, both benign and malignant.

When considering the etiology of disease it is essential to emphasise that both causative and protective factors must be taken into account, and either of these may show a distribution pattern corresponding to that is the disease being investigated.

In view of these observations it is clear that when two or more diseases share the same distribution patterns, whether geographical, socio-economic, or with change of the environment some common factor may contribute to the cause of each or help to confer protection against each. Consequently it must be viewed as the height of folly to search for the cause of any one disease without at the same time considering what other disorders might have a similar distribution pattern and might consequently throw light on the disease under investigation.

THE SIGNIFICANCE OF RELATIONSHIPS

All the results of any cause will be maximum whenever the cause operates maximally and minimum where it operates minimally. As a consequence they will all be associated with one another in the former but not in the latter situation. As a corollary to this, an observed association between results suggests that they share a common cause. Different species of flowers dependent on a warm climate are found associated with one another in the tropics and various kinds resistant to cold grow together on mountains, the climate being the factor common to each group of plants. The same principle applies in the case of disease in consequence of which it is of the greatest possible importance to use disease associations as a potent tool to reveal etiological factors (4).

Associations may be of various kinds. They may be revealed in geographical or socio-economic distribution, in changes occurring following emigration from one environment to another, or in the historical emergence of different diseases as cultural or other changes alter the environment. The rapid advance in scientific knowledge over recent decades has led to the limitations implicit in specialization in one subject to the exclusion of others. I once prefaced a talk to members of the National Cancer Institute by remarking that one of the major defects in cancer research was specialization in cancer. Such specialization is of course essential in many aspects of cancer research but can be severely limiting in epidemiological studies. An obvious example is the fact that very few cancer registries ever record the prevalence of polyps of the large bowel. As a result little is known of the geographical distribution of these tumours beyond the fact that they are very common in Western countries and extremely rare in Third World communities amongst whom bowel cancer rates are invariably low (5). Yet it is generally accepted that large-bowel cancer in the West commonly if not almost invariably arises in pre-existing polyps (15). The cause of polyps must consequently be assumed to be the cause of cancer, and if research attention was focused on the former rather than on the latter there would be several hundred times as many patients to consider in any study. Regrettably this approach seems seldom to have been considered until intervention studies were planned to ascertain whether changes in diet might reduce the development of polyps, and therefore presumably over longer periods of time the development of cancer (3).

If two diseases tend to occur together it would seem reasonable to suspect some common etiological factors and therefore to study the one most amenable to investigation. If two things are associated the search is facilitated by looking for the one which is easiest to find. Dead animals in Africa are associated with vultures flying overhead. When looking for the body of a dead animal, it is best to locate the vultures flying overhead and then look down and find the carcass. Don’t conduct your search from the outset with your eyes on the ground.

The search for environmental factors possibly causative of Burkitt’s Lymphoma might never had proceeded far had not the observed geographical distribution of the tumour been compared with that of several nonmalignant con-
tions. It was the shared distribution pattern that suggested some vector agent, and this led initially to the search for a virus and subsequently to the implication of malaria in the pathogenesis of the disease (13).

WESTERN DISEASES

One of the major advances in the understanding of illness that has occurred in recent years must be the recognition that a formidable proportion of the common diseases observed in economically more developed countries, are in fact characteristic of modern Western culture (6, 19).

The list of these diseases is indeed formidable and includes the following:

Coronary heart disease: The commonest cause of death in many Western countries.
Appendicitis: The most frequent indication for emergency abdominal surgery.
Gall-stones: One of the commonest indications for abdominal surgery.
Diverticular disease of the colon: One of the commonest disorders of the large bowel affecting an estimated one-third of elderly people.
Hiatus Hernia: Detectable in some 20% of adults in the U.S.A.
Diabetes: The commonest endocrine disorder.
Obesity: The commonest nutritional disorder.
Dental caries: The commonest of all disorders.

The following neoplasms are also observed most frequently in economically more developed communities and have a similar distribution to the diseases enumerated above.

1. Both cancer and polyps of the large bowel.
2. Breast cancer.
3. Endometrial cancer.

The above diseases are grouped together because there is good evidence that dietary factors play either a causative or protective role. There are other diseases characteristic of modern Western culture and aetiology of which remains obscure. These include multiple sclerosis, Crohn’s disease, ulcerative colitis, thyrotoxicosis and pernicious anaemia.

4. Lung cancer has in the past been observed most frequently in affluent societies but this tumour relates not to diet but to cigarette smoking.

Incrimination of Diet

All of these diseases can be shown to be related either directly or indirectly to the alimentary tract. Even those least obviously related like breast and endometrial cancer are dependent on hormones known to be influenced by bacteriological and other activity occurring in the gut.

Since diet is the major determinant of the environment of the gut it would seem more logical to consider the effect of diets on bowel content and behaviour and consequently on disease patterns than to consider changes related to such factors as improved technology, better housing or more efficient transport. It has in fact been shown that the changes that occur in dietary patterns throughout the world, following impact with Western culture have been closely comparable, and these changes have been observed in all five continents to precede the emergence or increased frequency of Western diseases (20). Dietary changes that occurred in North America and Western Europe over the past 150 years are similar in kind though less in extent that those which contrast Third World and Western diets, and can be summarised as follows.

Protein intake as a proportion of energy is comparable in both affluent and in poorer societies, though it is mainly of animal origin in the former and vegetable derived in the latter.

Not only does total carbohydrate consumption become markedly reduced following impact with Western culture, but sugar is increased at the expense of starch the intake of which falls dramatically. Starch is the main staple of all Third World diets.

Fat is increased to compensate reduction in starch, and provides over three times the proportion of energy in affluent compared to poorer populations.

The greatest dietary change is however in fibre intake. This varies between 80–140 g/d in most of the Third World yet is often under 20 g/d in Western countries. Salt intake is also much higher in economically more developed countries.

RELATING DIETARY CHANGE TO DISEASE EMERGENCE

When considering the effect of diet on disease its possible protective as well as causative effects must ever be borne in mind. It is a reduction in the fibre and starch content of food and an increase in the fat, sugar and salt that have been observed to precede increases of all Western diseases.