Cancer Prevention in Primary Care

Diet and cancer

Joan Austoker

This is the fourth in a series of articles looking at how cancer can be prevented in general practice

Accumulating data indicate that modifications in diet may reduce the risk of cancer by as much as one third and possibly by as much as two thirds. On the basis of the existing evidence, however, it is not possible to be certain which cancers are causally related to diet and what proportion of them are due to specific components of the diet. Diet is currently thought to be a major factor in the aetiology of cancers of the large bowel and stomach, and it may also be important in the aetiology of several other cancers. With the exception of strong and consistent evidence of the protective effect of fruit and vegetables, practical dietary interventions that reduce the risk of cancer are difficult to formulate as, in general, the evidence is theoretical or contradictory and too weak to justify specific intervention. Authoritative guidelines on dietary management in primary care are conspicuously absent because of lack of research. The success of an individual based strategy will depend on adequate education, training, and support being made available to the relevant members of primary care teams.

Most of the evidence on diet and cancer is as yet inconclusive. There is, however, accumulating data indicating that modifications in diet may reduce the risk of cancer by as much as one third and possibly by as much as two thirds.

That diet can influence the incidence of cancer is abundantly clear from experimental studies in animals, which have shown that it can do so in many different ways, not only by introducing into the body carcinogens or substances from which carcinogens are formed in vivo but also by affecting the metabolism of carcinogens and the body's reaction to them.

International comparisons between patterns of food consumption in different populations and the incidence of cancers in these populations have enabled many hypotheses to be formulated. Such correlations are undermined by the fact that the human diet does not consist of isolated food components. On the basis of subsequent epidemiological studies to test these hypotheses, it is currently believed that diet is probably a major factor in the aetiology of cancers of the large bowel and stomach; it may possibly also be a major factor in the aetiology of cancers of the breast and prostate. Diet is probably also important in the aetiology of several other cancers.

Relation between diet and cancer: possibilities for prevention

On the basis of existing evidence, it is not possible to formulate, with any degree of certainty, a precise definition of which cancers are causally related to diet and what proportion of them are due to specific

Box 1—Current diet and cancer hypotheses

Possible protective factors

- Fruit
- Vegetables
- Fibre
- Antioxidant nutrients: β carotene, vitamins C and E
- Fish oils
- Plant derived oestrogenic compounds
- Calcium

Possible risk factors

- Meat
- Total fat
- Saturated or animal fat
- Preserved foods
- Alcohol (see previous article, 11 June)
- Salt

components of the diet. Box 1 shows current dietary hypotheses about the association of cancer risk with dietary factors. Table I shows some of the possible associations between diet and cancer.

FRUIT AND VEGETABLES

There is strong and consistent evidence that a high intake of fruit and vegetables protects against various cancers. The association is most marked for cancers of the respiratory and digestive tracts. A protective effect has not been found for hormone related cancers.

There is evidence of synergistic relations between smoking or alcohol consumption and malnutrition, particularly a low intake of fruit and vegetables. For oral, pharyngeal, and oesophageal cancers the highest risk is in heavy drinkers who also have a low fruit and vegetable intake. Evidence also suggests that smokers who have a high intake of vegetables sufficient to substantially increase their plasma concentration of β carotene have a 60% lower risk of developing lung cancer.

Overall, the protective effect of fruit and vegetables seems to be general and found consistently with many different groups of these foods. Although many bio-

TABLE I—Possible associations between selected dietary factors and risk of cancer (modified from WHO¹)

Site of cancer	Increased fat intake	Increased body weight	Increased fibre intake	Increased fruits and vegetable intake
Lung	Possibly increased			Decreased
Breast		Increased*		
Prostate	Possibly increased			
Endometrium		Increased		
Cervix				Decreased
Bladder				Decreased
Oral cavity				Decreased
Oesophagus				Decreased
Stomach				Decreased
Colon/rectum	Increased		Decreased	Decreased

*Postmenopausal women only.

Cancer Research
Campaign Primary Care
Education Research
Group, Department of
Public Health and Primary
Care, University of Oxford,
Oxford OX2 6PE
Joan Austoker, director

BMJ 1994;308:1610-4

logical mechanisms have been postulated, there is no real evidence that one particular component of the diet is responsible. A fairly consistent picture is emerging about some specific associations between nutrients in fruit and vegetables and specific cancer sites. A reduction in the risks of cancer of the mouth, pharynx, larynx, oesophagus, and stomach is related to the intake of vitamin C and carotenoids. This is consistent with a protective effect for antioxidant substances. Results from a recent study also suggest that dietary β carotene, raw fruits and vegetables, and vitamin E supplements reduce the risk of lung cancer in non-smoking men and women. Current evidence is not yet strong enough to recommend the specific supplementation of the diet with vitamins A, C, and E, β carotene, or selenium, despite the suggestive experimental evidence. Some supplements such as selenium can be toxic in large doses and are not advised. Any public health recommendation should therefore relate to vegetables and fruit as a whole rather than to specific food components.

A randomised intervention study in Linxian, China, showed a reduction in mortality from cancer, particularly from stomach cancer, among those receiving supplementation with β carotene, vitamin E, and selenium. This was the first time it has been shown that dietary supplementation can be used to reduce cancer rates in a study population. This was, however, a special population with high cancer rates and a long history of low dietary intakes of several important micronutrients. The results from this population at a dietary extreme cannot be directly applied to most Western populations, whose diet is generally much richer in essential micronutrients.

FAT AND ENERGY

The question of the possible effect of total energy intake compared with the contribution of each energy providing nutrient (protein, carbohydrates, fat, and alcohol) is unresolved. The balance between energy intake and physical activity is also uncertain. Excess energy intake is a risk factor only if it leads to obesity but not when it is associated with high energy expenditure. Obesity is an established risk factor for endometrial and postmenopausal breast cancers, but the association of these cancers with excessive energy intake is less well established. Increased physical activity and control of body weight should contribute to reducing the risk of ischaemic heart disease and strokes and may have an effect on reducing the risk of endometrial and postmenopausal breast cancers.

The association between dietary fat intake and breast cancer is particularly contentious and, at the present time, remains unresolved. There is slightly stronger evidence that high fat consumption may increase the risk of cancers of the prostate, colon, and rectum. It seems fair to conclude that diets high in saturated fats (or in meat, or both) increase the risk of colorectal cancer at least. But, taken overall, the evidence does not justify recommending specific measures to reduce the consumption of fat, whether saturated or not, just to reduce the risk of cancer (although the reduction of saturated fat is amply justified to reduce the risk of ischaemic heart disease).

There is some concern raised by studies showing an increased incidence of or mortality from cancer for some cancers associated with low serum cholesterol concentrations. These observations may, however, be explained by factors that cause these diseases or by the fact that early disease may lower serum cholesterol concentrations.

Fat currently forms about 40% of total energy in the British diet. Current recommendations for the prevention of ischaemic heart disease are that people should reduce their total and saturated fat intake to no

more than 35% and 11% of food energy respectively. On a population basis, a reduction in total dietary fat from 40% to 35% of total energy intake, or a reduction in saturated fat from 17% to 11%, would lead to a significant reduction in serum cholesterol concentrations. It has been estimated that a 10% reduction in the average serum cholesterol concentration of the population might in time result in a 20% to 30% reduction in mortality from ischaemic heart disease. Significant reductions in serum cholesterol concentrations have been achieved in entire Nordic and American communities through dietary change over a few years. The effect on the prevention of cancer—for example, colorectal cancer—of such reductions in total and saturated fat by dietary changes is a much more complex issue and must, at the present time, be based on probabilities rather than certainties. Whereas this benefit could be substantial for those people who would benefit, current knowledge is insufficient to identify such people.

FIBRE

In the case of fibre, the evidence has been confused by uncertainty about which compounds exert the beneficial effect. There is some evidence, as yet inconclusive, that dietary fibre protects against large bowel cancer. The term fibre encompasses many components, each of which has specific physiological functions. Most studies of colorectal cancer have found no protective effect of fibre from cereals but have found a protective effect of fibre from vegetables and, perhaps, fruit. This could conceivably reflect an association with other components of fruit and vegetables, with fibre intake acting merely as an indicator of consumption. Classic fibre, however, is an important component of the undigested carbohydrate that reaches the large bowel, and from the point of view of public education it is still appropriate to recommend an increased consumption of unrefined cereals and green vegetables, in which it principally occurs.

SUMMARY OF THE EVIDENCE

Although several lines of evidence indicate that dietary modifications may reduce the risk of cancer, the contribution of diet to the total incidence of and mortality from cancer cannot be measured on the basis of present knowledge. Practical dietary interventions that reduce the risk of cancer are difficult to formulate as, in general, the evidence is theoretical or contradictory and too weak to justify specific intervention. Any recommendations relating to alterations in diet will need to be integrated with more general advice about diet and preventing chronic disease (particularly heart disease) rather than focusing specifically on the possible effects in reducing the risk of cancer.

Overall, the accumulating evidence is sufficiently strong to justify public education about the importance of increasing the consumption of fruit and vegetables, especially raw and lightly cooked vegetables and salads (box 2). Reductions in the intake of total and unsaturated fat should relate to prevention of coronary heart disease and not specifically to cancer, although a reduction in the intake of fat could conceivably lead to a reduction in the incidence of colorectal cancer.

The evidence for the importance of starchy, fibre rich foods in limiting the risk of large bowel cancer is increasing. There is insufficient evidence to support a recommendation to increase wholegrain cereal on the grounds of exerting a protective effect against cancer, but an increase in these products may be desirable to compensate for the reduction in dietary fat.

There is no conclusive evidence that vitamin or mineral supplements protect against cancer. Moreover, their use may occasionally result in overdosage or false reassurance resulting in a tendency to ignore the

Box 2—Diet and cancer: summary of the evidence

- Frequent consumption of fruit and vegetables is consistently associated with a lower risk of cancers of the digestive and respiratory tracts
- Reductions in levels of total and unsaturated fat should relate to reducing the risk of cardiovascular disease, not specifically to cancer
- Avoid obesity
- The evidence that dietary fibre protects against large bowel cancer is inconclusive. Substituting fibre rich carbohydrates to compensate for reducing dietary fat may be desirable
- Vitamin and mineral supplements are not needed for people eating good balanced diets, and there is no conclusive evidence that they prevent cancer
- There is no evidence that artificial sweeteners or other food additives cause cancer in humans
- Consumption of smoked, cured, pickled, and barbecued foods is unlikely to be a hazard in the United Kingdom but should not be increased above current levels
- Avoid mouldy foods

wider recommendations about fruit and vegetables.

There is no evidence that food additives such as preservatives, flavourings, colouring, or artificial sweeteners cause cancer in humans.

It has been suggested for a long time that salt might be a risk factor for gastric cancer and that its consumption should therefore be reduced. There are other reasons why reducing salt intake may also be beneficial—for example, lowering blood pressure.

Other recommendations, based on existing evidence, suggest that the consumption of smoked, cured, and pickled foods should not be increased above current levels and that food which has become mouldy should be avoided. All the adverse evidence is from developing countries where there is heavy dependence on such foods. The extent to which the above items are consumed in the United Kingdom does not constitute a hazard.

Other food substances currently being studied for their potential protective effect are fish oils (ω -3 fatty acids), plant derived oestrogenic compounds (phyto-oestrogens), and calcium.

Need for further research about diet and cancer

A sound prevention policy depends on an understanding of the true relation between diet and cancer. Apart from the reasonably consistent data on the protective effect of fruit and vegetables, good epidemiological data on diet and cancer are scarce and inconsistent. A major problem in conducting dietary studies has been the difficulty in assessing the content of any diet (current or past). The results provided by retrospective case-control studies remain controversial on many important issues. These studies rely on self reporting of past dietary habits, which can be notoriously inaccurate. There may be a bias between cases and controls. Patients with cancer may recall diet in a different way from healthy controls. Randomised intervention studies are the ideal means of providing sound conclusions but are difficult to implement as human nature and appetite are hard to control. Long term prospective cohort studies are not an ideal solution because the time at which carcinogenesis begins cannot be determined. They do, however, offer the advantage that data on current diet can be collected well before the onset of disease and there is no case-control bias.

The European prospective investigation of cancer

(EPIC) is the largest detailed study of diet and cancer yet undertaken. It has been designed to test the dietary hypotheses outlined in box 1. More than 400 000 healthy middle aged men and women from seven European countries will be asked to provide a blood sample to obtain objective measurements of their nutritional status, together with comprehensive dietary, medical, and lifestyle information. All seven European countries in the study will be using the same standardised core protocol so that the results can be pooled, thereby greatly increasing the power of the study. The collaboration also enables the study to investigate the effects of a wide range of foods, as eating habits are quite different in the southern and northern European countries. Follow up for incidence of and mortality from cancer will be for at least 10 years.

In Britain 75 000 patients are being recruited for the study through general practices throughout the country.

Strategies for prevention

POPULATION VERSUS INDIVIDUAL BASED APPROACH

Box 3 shows some of the problems in implementing a prevention policy in relation to diet and cancer. A population approach carries with it the potential for major reductions in cancer incidence and mortality. On the basis of the present evidence, with the exception of advice on fruit and vegetable consumption, such an approach cannot be advocated for cancer alone. An additional but important consideration is that measures that are beneficial to the population as a whole are not necessarily beneficial to each individual. Moreover, it is not possible to predict with any degree of certainty which people will benefit. The probabilities of benefit to people from recommendations relating to dietary change are much higher for preventing cardiovascular disease than for preventing cancer. It is important, therefore, that any dietary guidelines relating to cancer prevention should provide sufficient evidence to the public of the benefits and disadvantages (or risks) to enable them to make informed decisions about dietary changes. This includes the need for a presentation of the current limits of knowledge about diet and cancer.

An individual based approach would result in a small reduction in overall cancer risk in the population. None the less, dietary interventions demand to some

Box 3—Strategies for prevention: some of the problems

- The total impact of dietary factors on incidence of and mortality from cancer is difficult to determine
- Insufficient knowledge is available on the best means to affect dietary change
- The precise effect of implementing dietary changes on the risk of cancer is difficult to quantify
- Any recommendation should reflect the relative importance of a risk factor in terms of the proportion of cancer that might be prevented by its modification
- Evidence of a beneficial effect of a dietary change should outweigh any potential harmful effects
- A population approach has the potential for major reductions in incidence of and mortality from cancer
- The effect of any intervention may be delayed for many years, possibly a whole generation
- Measures that are beneficial to the population as a whole are not necessarily beneficial to each person
- An individual based approach would result in a very small reduction in overall risk of cancer in the population
- It is not possible at present to predict which individuals will benefit—the evidence is based on probabilities rather than certainties

Box 4—Health of the Nation targets²

Diet and nutrition

- To reduce the average percentage of food energy derived by the population from saturated fatty acids by at least 35% by 2005 (from 17% in 1990 to no more than 11%)
- To reduce the average percentage of food energy derived by the population from total fat by at least 12% by 2005 (from about 40% in 1990 to no more than 35%)

Obesity

- To reduce the percentages of men and women aged 16-64 who are obese by at least 25% for men and at least 33% for women by 2005 (from 8% for men and 12% for women in 1986-7 to no more than 6% and 8% respectively)

TABLE II—Agricultural grants and subsidies in United Kingdom, 1990^a

Agricultural produce	Subsidy (%)
Beef and veal	26.5
Cereals	17.9
Milk products	15.6
Sheep meat	14.7
Oil seeds	12.7
Sugar	6.5
Other, including pig meat	3.4
Processed goods	2.7

extent a strategy focused on individual people. Such a strategy could promote individual health education in primary care and would be complementary to a population strategy. The success of an individual based strategy will depend to a considerable extent on the provision of adequate support and training for the relevant members of the primary care team. A high risk approach specifically related to preventing cancer is not currently possible, with the exception of appropriate dietary advice offered to obese patients.

"HEALTH OF THE NATION"

The targets in the government's health strategy *Health of the Nation* for diet and nutrition relate specifically to cardiovascular risk prevention (box 4). There is clearly a conflict between government health and agricultural policies. Current government agricultural grants and subsidies are heavily weighted towards a range of meat as well as milk products and to crops grown largely for feeding farm animals (table II). When the high fat content of these products is taken into account the *Health of the Nation* targets seem less likely to be achieved. It should be a priority, therefore, to implement national (and international) policies on food subsidies that are linked to health priorities.

The *Health of the Nation* strategy emphasises the importance of public health information that encourages healthy eating, and it emphasises the need for public education resources, as well as adequate education and training of all appropriate health professionals. It also advocates the provision of "plenty and accessible supplies of starchy staples, vegetables, and fruit." While the importance of education and accessibility cannot be denied, other factors such as culture and economic considerations may also be significant. Figure 1 shows the consumption of fruit and vegetables in the seven European countries participating in the European prospective investigation of cancer study. Although some social and cultural factors influence this distribution, economic factors related to the cost of fruit and vegetables may also play a part. There is evidence indicating that households with lower incomes are more likely to consume foods of a lower nutritional quality than those with higher incomes. Figure 2 shows the relation between family income and fruit consumption in the United Kingdom. If an increasing quantity of fruit and vegetables is to be a realistic option in the nation's diet consideration needs to be given to ways of making them more affordable.

How effective are dietary interventions in primary care?

The requirements of bands 2 and 3 of the new general practitioner health promotion programme include the need for dietary management for a number of conditions and the need to monitor diet and offer

interventions when appropriate for all patients aged 15 to 74.

Authoritative guidelines on dietary management in primary care are conspicuously absent because of lack of research. When data are available they show that giving dietary advice in primary care does not seem to produce long lasting dietary changes.

There are many barriers to providing effective nutritional interventions in primary care. Several studies have shown that the dietary knowledge of general practitioners and practice nurses is incomplete and occasionally inaccurate. Appreciable deficiencies in their ability to give practical and appropriate dietary advice have also been identified. These studies point to the need for improved nutritional education and training for members of primary care teams.

Lack of incentive to carry out nutritional interventions may also be a factor, particularly if the success rate of such interventions is low. A randomised study in primary care found that knowledge of cholesterol level had little effect in motivating patients to comply with advice to reduce fat in their diet. Another study found that one third of a group of men who had recently had a myocardial infarction were unable or unwilling to follow dietary advice. Thus, even in those at established high risk the endeavours of primary care teams to offer dietary advice may often be met with resistance, if not active resentment. Motivation will be affected by such encounters.

Little information is available on the best methods of making dietary assessments and implementing nutritional interventions in primary care. A randomised study is currently under way in patients with moderately raised cholesterol concentrations to compare the effectiveness of nutritional advice provided by nurses in achieving lowered blood cholesterol concentrations with the effectiveness of advice provided by a dietitian. In other areas of health promotion in primary care, studies have shown that using a nurse without the involvement of a general practitioner is not effective. For both smoking cessation and reducing alcohol consumption brief advice from a general practitioner is an essential component of the intervention. Follow up can be provided by practice nurses, who may give greater priority than do general practitioners to offering dietary advice. Training for practice nurses has been shown to enhance both their knowledge and their perception of the effectiveness of dietary interventions. Although the one to one approach is time consuming, it has been shown to be effective in other interventions to change lifestyle. There is little evidence supporting the long term efficacy of group approaches.

The effectiveness of much of the wide range of nutritional health education materials currently available to primary care teams needs to be evaluated. Current evidence on their use is contradictory. Whereas one study found that the use of health education leaflets in primary care was effective, by reinforcing the message, another found little evidence to support the use of nutrition leaflets to effect change.

Despite the scarcity of published work showing the efficacy of nutritional interventions in primary care, the demands of the general practitioner contract mean that a range of dietary interventions are currently being used. Box 5 shows the key issues for primary care teams. Further research is needed to determine the best methods of implementing dietary advice in primary care.

Conclusion

A sound prevention policy depends on a better understanding of the relation between diet and cancer. With the exception of the protective effect of fruit and

FIG 1—Consumption of fruit and vegetables (excluding potatoes) in seven European countries^a

FIG 2—Consumption of fruit by family income in United Kingdom, 1952 and 1990.^a A is high income families and D low income families; 1 ounce=28g

Box 5—Key issues for primary care teams in diet and cancer

- With the exception of the protective effect of fruit and vegetables, the evidence linking diet and cancer is inconclusive
- Consistent, accurate messages are needed
- Dietary interventions must be relevant for all lifestyle issues (healthy eating)—that is, part of a more general prevention of chronic disease and not specific to cancer
- Brief validated assessment questionnaires need to be developed
- People who are most likely to benefit should be targeted
- Incorporating the principles of the “process of change” model and the techniques of “motivational interviewing” may lead to improved outcomes
- Advice from the general practitioner should be tailored to the needs of the individual patient as much as is possible
- Simple information, advice, and support may be more useful than more detailed and sophisticated approaches
- Advice should be practical, positive, and relevant
- Practice nurses may have an important role in providing follow up to advice from the general practitioner
- Dietitians have a part to play, but more in educating doctors and nurses than in advising individual patients
- Oral advice could be supplemented with simple leaflets emphasizing basic dietary issues and with good illustrations

vegetables, the evidence linking diet and cancer is inconclusive and contradictory on many issues. The precise mechanism of action of the many dietary factors that may increase or reduce the risk of cancer remains unclear.

Research is difficult to undertake because the human diet does not consist of isolated food components. Furthermore, dietary patterns strongly correlate with other factors such as smoking and drinking, which independently affect the risk of cancer. Therefore, any attempt to isolate one single factor in carcinogenesis may be futile. Despite this, it is important to follow up promising leads concerning diet and cancer by undertaking prospective cohort and intervention studies.

Knowledge is required of the best methods of implementing dietary recommendations if they are to achieve their full impact. A population approach has a much greater potential for achieving major reductions in the incidence of and mortality from cancer than has an individual based approach. However, on the basis of the present evidence, with the exception of advice on fruit and vegetables, a popular approach cannot be advocated for cancer alone. Dietary intervention in primary care requires advice for individual people. The success of an individual based strategy will depend

on adequate education, training, and support being made available for the relevant members of primary care teams. Further research is required on means of implementing dietary changes in primary care.

I thank Dr David Forman, Dr Tim Key, and Ms Jean King for constructive suggestions on drafts of this article.

- 1 World Health Organisation. Diet, nutrition and the prevention of chronic diseases. *WHO Tech Rep Ser* 1990;797.
- 2 Secretary of the State for Health. *The health of the nation*. London: HMSO, 1992.
- 3 Ministry of Agriculture, Fisheries and Food. *Agriculture in the United Kingdom: 1990*. London: HMSO, 1991.
- 4 Commission of the European Communities. *The agricultural situation in the Community: 1991 report*. Brussels: CEC, 1992.
- 5 Ministry of Agriculture, Fisheries and Food. *Report of the national food survey, 1991*. London: HMSO, 1992.

Selected additional references

- American Cancer Society. Guidelines on diet, nutrition and cancer. *CA* 1991;41:334-8.
- Baron JA, Gleason R, Crowe B, Mann JJ. Preliminary trial of the effects of general practice based nutritional advice. *Br J Gen Pract* 1990;42:137-41.
- Block G, Patterson B, Subar A. Fruit, vegetables, and cancer prevention: a review of the epidemiological evidence. *Nutr Cancer* 1992;18:1-29.
- Boyle P. Nutritional factors and cancer. In: Garrow JS, James WPT, eds. *Bassmore's textbook of nutrition*. 9th ed. Human nutrition and dietetics. Edinburgh: Churchill Livingstone, 1993:701-13.
- Boyle P. Dietary factors in the aetiology of cancer. *Oncology and Haematology* 1994;2:7-8. (Literature service 1.)
- Boyd NF, Martin LJ, Noffel M, Lockwood GA, Tritcher DL. A meta-analysis of studies of dietary fat and breast cancer risk. *Br J Cancer* 1993;68:627-36.
- Doll R. The prevention of cancer: opportunities and challenges. In: Heller T, Davey B, Bailey L, eds. *Reducing the risk of cancer*. London: Hodder and Stoughton, 1989:14-25.
- Doll R. The lesson of life: keynote address to the nutrition and cancer conference. *Cancer Res* 1992;52:2024-9s.
- Francis J, Roche M, Mant D, Jones L, Fullard E. Would primary health care workers give appropriate dietary advice after cholesterol screening? *BMJ* 1989;298:1620-2.
- Health Education Authority. *Diet and cancer*. London: HEA, 1990.
- Health Education Authority. *Nutrition interventions in primary health care: a literature review*. London: HEA, 1993.
- Law MR, Wald NJ, Thompson SG. By how much and how quickly does reduction in serum cholesterol concentration lower risk of ischaemic heart disease? *BMJ* 1994;308:367-73.
- Mann JJ, Morgan B, Ball M, Mant D, Jones L, Robertson I. Hyperlipidaemia in general practice: three year follow up of an opportunistic screening project. *Br J Gen Pract* 1990;40:418-22.
- Modan B. Diet and cancer: causal relationship or wishing thinking? *Lancet* 1992;340:162-4.
- Riboli E. Nutrition and cancer: background and rationale for the European Prospective Investigation into Cancer and Nutrition (EPIC). *Annals of Oncology* 1992;3:783-91.
- Riboli E, Cummings JH. Ole Moller Jensen memorial symposium on nutrition and cancer. *Int J Cancer* 1993;55:531-7.
- Robertson I, Phillips A, Mant D, Thorogood M, Fowler G, Fuller A, et al. Motivational effect of cholesterol measurement in general practice health checks. *Br J Gen Pract* 1992;42:469-72.
- Steinmetz KA, Potter JD. Vegetables, fruit, and cancer. I. Epidemiology. *Cancer Causes and Control* 1991;2:325-57.
- Tomatis L, ed. *Cancer: causes, occurrence and control*. Lyons: International Agency for Research on Cancer, 1990.

A complete list of references can be obtained from the author.

SOUND BITES

Widdicombe Fair

Among my family possessions is a china musical jug, which plays the tune of “Widdicombe Fair” when it is lifted up. Its body, featuring Tom Pearce’s auld mare and the words of the folk song, is not in good condition. It has been painstakingly reassembled by gluing together broken fragments. It has a dramatic history.

I was a toddler at this time in the second world war and my family lived in Southampton. During air raids everybody got under the Morrison shelter, a steel kitchen table. This included our lodger, a research chemist, who was very frightened. One night a bomb came screaming down very close. At impact everything shook and there was then whiteness and silence, eventually broken by the tune of “Widdicombe Fair” coming out of nothingness. The bomb had brought the ceiling plaster down and shaken the jug off the mantelpiece on to the floor, where it shattered. The lodger panicked and rushed out shouting that he was going somewhere safe and that no two bombs could fall in the same place. Despite the night’s darkness and the blackout he managed to find a sub-

stantial bomb crater in the potato patch and climbed in.

What he had shouted as he left was wrong on two counts. Firstly, his statistics were faulty, as successive bombs falling at random take no account of previous points of impact. Secondly, and rather more important, the bomb whose deep crater he was sitting in had not yet gone off. He was found some time later by an air raid warden with a torch, sleeping in his crater up against the tail fin of a bomb of unprecedented size, which exploded spontaneously 30 hours later.

The chemist’s behaviour is reminiscent of that of some politicians and other experts who assure us with statistical arguments (perhaps concealing their internal panic) that where they are leading us is the safest, indeed the only possible, place. Afterwards it becomes clear that the unstated but implicit assumptions were wrong and the statistics fallacious, but there may not always be someone with a torch to point this out before the explosion.—HUGH TUNSTALL-PEDOE is director of the cardiovascular epidemiology unit at the University of Dundee