Are we really dying for a tan?

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BMJ 1999;319:114–6

Professionals in health care and health promotion have embraced the notion that sunlight (particularly in doses that lead to sunburn) is bad for health.[1–3] This was not always the case. In the early years of this century sunlight was regarded as an effective treatment for tuberculosis of the skin, and was also thought to be generally beneficial to health (box). Even today there are health resorts around the world offering heliotherapy—particularly for diseases of the skin such as psoriasis. The public have been slow to accept the message that exposure to sunlight is bad for health. Many people still sunbathe. In a survey carried out in England in 1995, 40% of those aged 16-24 reported being sunburnt in the preceding year, and just under 40% regarded a tan as being important to them.[4] Furthermore, qualitative research with people in Scotland aged 20-35 who regularly travelled abroad for pleasure, suggested that at least part of the attraction of a tan was the perceived feeling of healthiness.[5]

Summary points

- There is discordance between the health message to reduce exposure to sunlight and the health beliefs and behaviour of the public
- The health promotion message aims to reduce skin cancer incidence and mortality
- Increased exposure to sunlight may have beneficial effects on other diseases
- Health educators should weigh up explicitly the potential risks and benefits of reduced exposure to sunlight to ensure that the health education message is appropriate

Prevention paradox

The prevention paradox, as described by Rose, arises because many interventions that aim to improve health have relatively small influences on the health of most people. Thus, for one person to benefit, many people will have to change their behaviour and receive no benefit from these changes. Perhaps sensing that public awareness of this paradox might act as a disincentive to adopting behaviours that will protect health, the strength of the purported benefits of population programmes tends to have been exaggerated. For example, advocates of cervical screening have not made it clear how rare the disease is, nor have they advertised the disadvantages—the unnecessary anxiety and the cost of managing of false positive cases. It is evident, however, that people judge for themselves the plausibility of these official exhortations by comparing them with the evidence of their own experience.

In this system of lay epidemiology, people interpret health risks by integrating information from observation and discussion of cases of illness and death in personal networks and the public arena with formal and informal evidence provided by the media, health educational materials, and other relevant sources of information.[6] The evidence of people's attitudes and behaviour suggests that, on balance, lay epidemiology holds that exposure to sunlight is beneficial rather than harmful. This belief contrasts sharply with the current health education message. But before we dismiss this discordance between lay epidemiology and health education messages as ignorance on the part of the public, we should re-examine the scientific evidence on the overall balance of the benefits and harm of sun exposure.

Harm from sun exposure

Malignant melanoma

The main rationale for the health message—reduce exposure to sunlight, and, in particular, avoid sunburn—has been the belief that exposure contributes to the increasing incidence of malignant melanoma.[2] However, the exact nature of the association between malignant melanoma and exposure to sunlight has yet to be determined.[7] A recent systematic review of case-control studies confirmed that intermittent sun exposure (odds ratio 1.71; 95% confidence interval 1.54 to 1.90) and sunburn at all ages (1.91; 1.69 to 2.17) were associated with an increased risk of melanoma. It also showed, however, that people exposed to sun through their work were at a reduced risk (0.86; 0.76 to 0.96).[8] Even if reducing exposure to sunlight reduces the incidence of melanoma, its effect on overall mortality will be slight, as the number of deaths postponed will be small. In 1995, the deaths of 697 men and 698 women in England and Wales were attributed to malignant melanoma.[9] Even the most forceful campaign could be expected to prevent only a few of these deaths. There may also be effective options for reducing mortality from melanoma that do not require reducing exposure to sunlight—for example, by increasing awareness of the diagnosis and access to treatment.

Other adverse effects

Increased rates of other more benign forms of skin cancer (such as squamous cell carcinoma and basal cell carcinoma), cataracts, and skin ageing are associated with either intermittent or cumulative exposure to sunlight.[2 10] While these diseases are important causes of morbidity, they are usually amenable to treatment, and are not generally fatal. In 1995, the deaths of 264 men and 175 women in England and Wales were attributed to non-melanoma skin cancer.[9] More recently, it has been suggested that exposure to sunlight increases the incidence of non-Hodgkin's lymphoma.[11] This hypothesis is speculative; it has not yet been confirmed or refuted.[12]

Benefits of sun exposure

Coronary heart disease

There are seasonal patterns in cardiovascular mortality and in cardiovascular risk factors that may be partly explained by reduced exposure to sunlight in the winter months.[13–15] Some studies have reported a protective association for vitamin D (a marker of sunlight exposure).[16–18] For example, Scragg et al, in a case-control study of acute myocardial infarction, reported an odds ratio of 0.43 (95% CI 0.27 to 0.69) for subjects with 25-hydroxycholcalciferol concentrations equal to or above the median compared with subjects whose concentrations were below the median.[16] These findings are tentative, and might be explained by bias inherent in the case-control design or confounding by exposures such as physical activity. Nevertheless, as coronary disease is such an important cause of death (in 1995 the deaths of 73 129 men and 60 732 women in England and Wales were attributed to ischaemic heart disease[9]), even a modest protective effect of exposure to sunlight could result in a substantial reduction in mortality.

Mental health

People find lying or sitting in the sun enjoyable and relaxing.[3] This subjective sense of wellbeing may be important in itself in improving the quality of a person's life. Seasonal variations in sunlight exposure may underlie a proportion of episodes of depression—those attributed to seasonal affective disorder.[19] Furthermore, the well documented increases in suicidal behaviour in early spring may also be related to patterns of day length and sun exposure, although other explanations for this phenomenon exist.[20] Psychiatric illness is an important factor in population health, and any beneficial effect of increased exposure to sunlight might reduce appreciably the population burden of disease.

Other diseases

Exposure to sunlight increases vitamin D production and reduces the risk of rickets in childhood and of osteomalacia and fractures in adulthood.[21] In addition, ultraviolet light (both from natural and medical sources) is used to treat some skin conditions such as psoriasis, which affects 2% of people of European ancestry. It has also been suggested on the basis of the ecological association with latitude, that exposure to sunlight reduces the incidence of multiple sclerosis.[22]

The solarium at Jamnagar

The widespread belief that sunlight was beneficial to health was shared by physicians working in many areas of medicine. Sunlight exposure was recommended for several disorders, and ways of increasing exposure were contrived. The solarium at Jamnagar, Gujarat, India (figure), is an impressive example of this. The solarium was built on the initiative of the ruler of Nawanagar state, the cricketer Ranjitsinghi. It was designed by a French engineer, Dr Jean Saidman (who built three of these solariums), and was operational from 1934. The Jamnagar solarium is 40 feet tall and the treatment rooms are located in the rotating top section, which is 114 feet long and takes an hour to rotate fully. Maximal light exposure can be ensured by rotation. Some treatment rooms are equipped with filters which allow through only rays of wavelengths considered suitable for the various diseases treated in the solarium, and lenses concentrate the light to two and a half times its natural intensity. The solarium no longer works because most of the lenses and concentrators were broken during a cyclone and replacements cannot be found. A detailed photographic library provides before and after views of people treated for various conditions, including lymphoid hyperplasias, tuberculosis, and several skin conditions.

The solarium at Jamnagar, India (above). Lenses and concentrators increase the efficiency of the solarium (below)

Conclusions

There is evidence that the potential benefits of exposure to sunlight may outweigh the widely publicised adverse effects on the incidence of skin cancer. Advice aimed at reducing the frequency of episodes of sunburn may have the net effect of reducing the population's mean exposure to sunlight. For example, in one study the use of sunscreens was shown to reduced vitamin D concentrations.[23] No population

data are available on long term trends in exposure to sunlight in Britain to confirm that such a reduction has taken place. Reduced exposure to sunlight could have adverse effects, but we believe that any advice to increase exposure to sunlight is premature given the tentative nature of our review and concerns about the changing nature of sunlight exposure with the thinning of the ozone layer.[24] However, we suggest that the basis for current advice to reduce exposure to sunlight should be reviewed in a formal and quantitative manner so that the potential benefits and harm from exposure to sunlight can be conveyed to the public. The risk:benefit ratio will differ between individuals; for many people the small absolute increase in risk of melanoma could easily be outweighed by the effect of reduced sunlight on mood. A recent article in *Vogue* suggests that lay understanding is, perhaps again, ahead of medical thinking in attempting to weigh up factors for and against exposure to sunlight.[25] Perhaps, while we await the conclusions of such formal analyses, those of us who enjoy spending time in the sun can rest (on our deck chair, sun lounger … or whatever) assured that the chance that we will be one of the people dying from our tan is small.

We thank Mr Sunil Thakar of the M P Shah Hospital, Jamnagar, for arranging a visit to the solarium and providing details of its history.

Competing interests: None declared.

1 Secretary of State for Health. *The health of the nation*. London: Department of Health, 1992.
2 Melia J. Skin cancer. *Health Hyg* 1995;16:153-8.
3 Arthey S, Clarke VA. Suntanning and sun protection: a review of the psychological literature. *Soc Sci Med* 1995;40:265-74.
4 Bridgwood A, Malbon G, Lader D, Matheson J. *Health in England 1995. What people know, what people think, what people do. A survey of adults aged 16-74 in England carried out by Social Survey Division of ONS on behalf of the Health Education Authority*. London: HMSO, 1996.
5 Carter S. Who wants to be a "peelie wally"? Glaswegian tourists' attitudes to sun tans and sun exposures. In: Clift S, Grabowski P, eds. *Tourism and health*. London: Pinter, 1997.
6 Frankel SJ, Davison C, Davey Smith G. Lay epidemiology and the rationality of responses to health educators. *Br J Gen Pract* 1991;41:428-30.
7 Finkel E. Sorting the hype from the facts in melanoma. *Lancet* 1998;351:1866.
8 Elwood JM, Jopson J. Melanoma and sun exposure: an overview of published studies. *Int J Cancer* 1997;73:198-203.
9 Office for National Statistics. *1995 Mortality statistics. Cause. England and Wales*. London: Stationery Office, 1997.
10 West SK, Duncan DD, Munoz B, Rubin GS, Fried LP, Bandeen-Roche K, et al. Sunlight exposure and risk of lens opacities in a population-based study. The Salisbury eye evaluation project. *JAMA* 1998;280:714-8.
11 Adami J, Frisch M, Yuen J, Glimelius B, Melbye M. Evidence of an association between non-Hodgkin's lymphoma and skin cancer. *BMJ* 1995;310:1491-5.
12 Freedman DM, Zahm SH, Dosemeci M. Residential and occupational exposure to sunlight and mortality from non-Hodgkin's lymphoma: composite (threefold) case-control study. *BMJ* 1997;314:1451-5.
13 Grimes DS, Hindle E, Dyer T. Sunlight, cholesterol and coronary heart disease. *Q J Med* 1996;89:579-89.
14 Brennan PJ, Greenberg G, Miall WE, Thompson SG. Seasonal variation in arterial blood pressure. *BMJ* 1982;285:919-23.
15 Khaw KT. Temperature and cardiovascular mortality. *Lancet* 1995;345:337-8.
16 Scragg R, Jackson R, Holdaway IM, Lim T, Beaglehole R. Myocardial infarction is inversely associated with plasma 25-hydroxyvitamin D_3 levels: a community-based study. *Int J Epidemiol* 1990;19:559-63.
17 Vik T, Try K, Thelle DS, Forde OH. Tromsø heart study: vitamin D metabolism and myocardial infarction. *BMJ* 1979;ii:176.
18 Lund B, Badskjaer J, Soerensen OH. Vitamin D and ischaemic heart disease. *Horm Metab Res* 1978;10:553-6.
19 Wehr TA, Rosenthal NE. Seasonality and affective illness. *Am J Psychiatry* 1989;146:829-39.
20 Chew KSY, McCleary R. The spring peak in suicides: a cross-national analysis. *Soc Sci Med* 1995;40:223-30.
21 Utiger RD. The need for more vitamin D. *N Engl J Med* 1998;338:828-9.
22 McMichael AJ, Hall AJ. Does immunosuppressive ultraviolet radiation explain the latitude gradient for multiple sclerosis? *Epidemiology* 1997;8:642-5.
23 Marks R, Foley PA, Jolley D, Knight KR, Harrison J, Thompson SC. The effect of regular sunscreen use on vitamin D levels in an Australian population. *Arch Dermatol* 1995;131:415-21.
24 McMichael AJ, Haines A. Climate change and health: implications for research, monitoring and policy. *BMJ* 1997;315:870-4.
25 Hutton D. Health news. *Vogue* 1998 May:114.

(Accepted 19 April 1999)

The private finance initiative

PFI in the NHS—is there an economic case?

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This is the second of four articles on Britain's public-private partnership in health care

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continued over

BMJ 1999;319:116–9

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The private finance initiative substantially increases the cost of hospital building. Total costs (construction costs plus financing costs) in a sample of hospitals built under the private finance initiative are 18-60% higher than construction costs alone (table 1). Shareholders in private finance initiative schemes can expect real returns of 15-25% a year.[1] The consortiums involved in these schemes charge the NHS fees equivalent to 11.2-18.5% of construction costs (table 2). If the Treasury were to finance new hospitals directly out of its own borrowing it would pay a real rate of annual interest of 3.0-3.5%. It has been estimated that the £2.7 billion Scottish private finance initiative programme will cost, at a conservative estimate, "£2 billion more than if the Treasury had acquired the assets directly."[2] The higher costs will be met locally through cuts in clinical spending and nationally through subsidies from NHS capital budgets.

Medical staff are deeply implicated in hospital private finance initiative schemes. Clinical directors approve and medical directors sign off the full business

Summary points

Investment under the private finance initiative costs more than public sector procurement. The annual charge for the use of privately financed facilities is between 9.1% and 18% of the original construction cost, whereas government can borrow at interest rates of 3.0% to 3.5%

The extra cost of private finance is disguised by the Treasury's insistence that NHS trusts discount costs at 6% per annum when comparing the costs of the private finance option with public sector investment

The amount of risk transferred to the private sector under privately financed deals has been exaggerated, leading to spurious attributions of additional value to private sector options