What is already known on this topic

Exposure to the natural radioactive gas radon and its disintegration products can cause lung cancer

Exposure to radon gas in the home accounts for about half of all non-medical exposure to ionising radiation

High radon concentrations can be reduced in existing houses at moderate cost, and low concentrations can usually be ensured in new buildings at reasonable or low cost

What this study adds

After detailed stratification for smoking, there was strong evidence of an association between the radon concentration at home and lung cancer

The dose-response relation seemed to be linear, with no evidence of a threshold dose, and there was a significant dose-response relation even below currently recommended action levels

The absolute risk to smokers and recent ex-smokers was much greater than to lifelong non-smokers

Radon in the home accounts for about 9% of deaths from lung cancer and about 2% of all deaths from cancer in Europe

and hence 2% of all cancer deaths in Europe. In most countries radon concentrations vary widely, with levels in most homes below the national average but with levels in some homes several times above it. High radon concentrations can be reduced in existing houses at moderate cost, and low concentrations can usually be achieved at low cost in new buildings.

This paper is dedicated to the memory of Olav Axelson (1937-2004), who published the first study on radon in homes and lung cancer in the *Scandinavian Journal of Work, Environment and Health* in 1979. We thank the staff and participants in the collaborating studies. Richard Peto and Jon Miles provided helpful discussions during preparation of this paper, Gary Whitlock commented on a draft version, and Tom Fearn and David Cox provided helpful comments on the statistical methods.

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Science commentary: Radon blues

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The publication of a new collaborative study of the effect of domestic radon on the risk of lung cancer is a reminder that this is a hazard to be taken seriously.[1] Of course, health campaigners will rightly respond that radon gas, the cause of just under a tenth of deaths from lung cancer, is hardly in the same league as tobacco. That said, as a carcinogen worth tackling it does have one great "virtue." Unlike the perilous ingredients in materials that we choose to smoke, the threat posed by radon can be greatly reduced or even eliminated without a painful reliance on willpower or on the exercise of self denial. Unfortunately, the extent to which even the relatively pain-free remedies for dealing with it are actually applied is less then impressive.

The appropriate course of action will depend on the construction of the building and the level of radon

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to be dispersed. At the lower end of the scale, improving ventilation and sealing cracks in concrete floors may do the trick. With suspended timber floors the aim is to increase the flow of air beneath them—either passively through air bricks or by installing a fan. In houses with a concrete floor and higher radon levels it may be necessary to dig a sump—a small cavity beneath the floor—from which air is extracted, so removing any troublesome gas that might otherwise find its way into house.

Do these arrangements actually work? Passive systems are less effective and, although they have no moving parts to wear out, may still go wrong: airbricks blocked by vegetation, for example. Only a further radon test will reveal if there's been a failure. Active systems are better at removing the gas—but electric extractor fans don't last for ever. The National Radiological Protection Board (NRPB) has demonstrated their value[2] and also shown that fans reckoned to have a working life of no more five years may actually run for double that.[3] So even householders too negligent to examine their extractor fans more than once a year still have much to gain.

One form of negligence that's harder to overcome is a disinclination to do anything at all. A brief review of domestic radon published three years ago by the Parliamentary Office of Science and Technology made gloomy reading.[4] It reported estimates by NRPB that the gas significantly affects around 100 000 properties in Britain. Of householders whose radon was above the recommended action level (200 Bq/m^3), only about 10% were actually tackling the problem. NRPB says it has no reason to believe that the figure has subsequently improved.

Why the poor showing? The Parliamentary Office of Science and Technology identified four factors: a reluctance to do anything if the radon concentration is only slightly above the action level; a tolerance of "natural" radiation as opposed to its equivalent from the nuclear industry; inadequate access to reliable advice; and, of course, simple inertia.

Reflecting on his life's work, a distinguished radiation biologist once regretted that radioactivity was invisible. He'd always wished, he said, that he could paint it blue. Maybe our enthusiasm for home protection would get a boost if the gas percolating up through the floorboards had some equally eye catching colour.

Competing interests: None declared.

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A multiagency protocol for responding to sudden unexpected death in infancy: descriptive study

Anne Livesey

A working party set up by the Royal Colleges of Pathologists and of Paediatrics and Child Health has recommended introducing a national multiagency protocol for the management and investigation of sudden and unexpected deaths in infancy.[1]

In 1999, a protocol embodying many of the features now recommended for the national protocol was introduced in Sussex, England.[2]

This report on how such a protocol works in practice and its findings have implications for the implementation of a national protocol.

Participants, methods, and results

I collected anonymised data from coroners' records on postmortem investigations and cause of death of all infants who were reported to have died suddenly and unexpectedly in Sussex (total population 1 500 000, 150 000 aged under 15) in the three years 2000-2.

I used postal questionnaire and semistructured interview to get information about the working of the protocol from professionals in the seven relevant disciplines and from parents (subject to their general practitioners' consent).

I identified 29 infants, aged 3 days to 8 months; adequate records for analysis were available on all but one. Eight of the 29 deaths were attributed to a specific natural cause, 16 to sudden and unexpected death in infancy or to sudden infant death syndrome, one to unintentional overlay (suffocation), and two to unnatural causes; two were classified as unascertained (table).

Implementation of the protocol varied considerably. The ambulance service had not implemented it. In accordance with the protocol, coroners or their officers sometimes refused permission for pathology samples to be taken immediately but could not always readily be contacted out of hours. Interagency discussions were held in all cases, but relevant professionals were not always invited to contribute. Joint home visits by police and paediatricians were generally not initiated. Most paediatricians had concerns about being available at short notice, and some were unwilling to visit the home. Despite the guidelines, some also expressed uncertainty about their role. The number of police involved tended to be disproportionate and some parental feedback on police involvement was negative.

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