Unless the practice of these committees is generally improved and made more uniform across districts it is likely that guidelines will be legally enforced for all committees, especially as public concern over ethics in research grows.

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Housing and Health

Noise, space, and light

Stella Lowry

Earlier in this series I discussed how hard it is to prove that any given aspect of housing is harmful to health. But often that is the wrong approach anyway. Houses should not be designed just to prevent harm to their occupants but also to promote health. In this article I will discuss three aspects of housing that affect wellbeing—noise, space, and light—but differ in the obviousness of their effects.

Noise

The structure of a building determines how well it transmits sound. Airpaths over or through party walls and unsealed pores in masonry transmit airborne sound. Ties in cavity walls can conduct sound, especially if mortar droppings are not cleaned off them during construction. Lightweight plastic ceilings on upper stories can cause reverberation in the roof space. Non-rigid layers attached to walls or floors can vibrate and reduce party wall insulation.

Though building regulations govern the transmission of sound between buildings, a recent study of newly completed but unoccupied houses gave poor results.[1] Over 1200 party walls and about 500 party floors were tested, and over half of the walls failed to meet the Building Research Establishment's recommended standard for the transmission of sound. The performance of a third of the floors was "very poor" for insulation of sounds caused by impact.

Noise is defined as unwanted sound. People are usually very tolerant of sounds they make themselves, but when they have no control over the source or if the sound is unwelcome it becomes noise. People vary in their ability to tolerate noise. Old people are often particularly sensitive, even at low intensities, probably because their reduced hearing acuity makes them less able to select out particular sounds from the background noise. This then interferes with their ability to communicate effectively.[2]

Different types of noise cause different responses. In a recent review Mant and Gray concluded that traffic noise and impersonal sounds such as machines are often tolerated well.[3] One of the most irritating noises is human voices, and surprisingly the intensity of a sound is of little importance in determining the annoyance it causes.

In contrast to industrial exposure the problem of domestic noise is not one of a risk to hearing—although

People living in tower blocks may be bombarded with noise from all directions

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people who live with teenagers might doubt this. Hearing may be permanently damaged by regular exposure to noise of 75 dB for eight hours a day. Domestic appliances can generate high levels of sound —in one study the intensity of sound in a living room rose from a background of 50 dB to 81 dB during vaccuuming[2]—but the exposure usually is so short that there is no risk to hearing.

The problem of domestic noise is one of annoyance. Most of us know the irritation of being woken up by a baby crying next door or the embarrassment of hearing neighbours rowing. For many people this is a constant problem and causes a great deal of stress. Apart from the effects of broken sleep and the sheer irritation of hearing other people's noise there is the strain of knowing that neighbours can hear your noise too. This lack of privacy is often emphasised when people are asked to describe how their housing affects their wellbeing.[4,5]

It is difficult to provide hard data to prove that domestic noise causes serious distress, because many confounding variables operate. Modern houses with thin walls or slab block construction often transmit noise better than older, traditionally built houses. People living in tower blocks may be bombarded with noise from all sides, above, and below whereas those in detached houses will hear noise produced only by their own family—usually much less stressful. People living in poorly constructed houses or high rise flats differ from those in detached, traditionally built homes by a multitude of factors other than exposure to noise. It is difficult to prove that noise is causing stress when people are also coping with low incomes, overcrowding, cold damp homes, lifts that don't work, and so on.

No studies have yet produced firm evidence that noise does serious harm,[3] but we should accept that it is a potential source of irritation and can act in combination with other facors to increase the stresses felt by many people living in modern housing.

JALAN CASH

In Hong Kong people live at densities of over 4000 per acre

Space

Descriptions of Victorian slums emphasise the overcrowding and poor sanitation as causes of death and disease. In his study of 11 560 families from the "wage earning classes" in York in 1899 Rowntree found that a tenth of them were living more than two to a room.[6] (He compared that favourably with Glasgow, where over half the population was overcrowded.)

In Victorian slums the number of people sleeping in a room was a useful indicator of overcrowding. Today, when conditions are so much better, it is harder to decide what to measure. Should we look at floor area or room volume per person, or the number of people per available living room (excluding bathrooms and kitchens), or the number of bedrooms as a function of the number of adults of each sex in the household? The 1957 Housing Act contained a formula for calculating maximum acceptable occupancy of a dwelling based on the number of bedrooms and living rooms ("habitable rooms"). Children were allowed a half allowance, with no provision for infants. In the annual reports of the registrar general overcrowding is defined as more than two people in each habitable room.

Given the emphasis on overcrowding in the past, there is surprisingly little evidence that it is still a major risk to health. If the number of people using a dwelling is separated from other variables such as poverty and social class it has very little influence on health. This reflects the high quality of sanitation of most homes. The 1986 English house condition survey found that 139 000 homes still had no inside toilet and 151 000 had no hot water, but many of these properties were vacant and under repair.[7] Less than 1% of the population lives in such conditions, and even for most of them life is far removed from the shared privies, open sewers, and communal pumps of former slums.

But overcrowding still has a serious potential risk to health. We should not be too smug about our progress from the slums. "Houses in multiple occupation" cover a multitude of sins, including houses converted into flats, student lodgings, hostels, and the notorious bed and breakfast hotels for homeless families. The conditions in some of these are little better than in Victorian slums: many families have to share washing, toilet, food storage, and cooking facilities. In these properties infectious diseases, especially childhood diarrhoeas, are common.[8]

These very overcrowded conditions, with people living on top of each other and belongings stacked everywhere, also put inhabitants at risk of accidents, especially fire; and when accidents happen the escape routes are often inadequate to deal with the large number of people to be evacuated. In 1844 Engels could see the association between overcrowding and a high incidence of burns and scalds in children[9]—yet another lesson that we are now having to relearn. The Institution of Environmental Health Officers wants the law to be tightened to introduce national codes of practice and mandatory inspection and licensing of houses in multiple occupation to try to reduce these risks to health and safety.[10]

Nowadays overcrowding is usually seen more as a threat to mental than to physical health. One of the extreme examples of modern overcrowding is Hong Kong, where population densities can exceed 4000 per acre. A study of people living in Hong Kong found that the median allocation of space was as little as 43 square feet (4 m^2) per person, with over a quarter of people sleeping more than three to a bed and almost two fifths sharing their home with non-related people.[11,12] After controlling for poverty, however, the study showed few major ill effects of this high density. Parents tended to allow their children to play outside unsupervised and people were unwilling to entertain at home, but mental health, family relationships, and

performance at work did not seem to suffer. The only factor that was consistently associated with stress was the number of non-related households in each dwelling.

Mitchell has emphasised the difference between density (the number of people per unit space) and congestion (the number of simultaneous demands for the use of the available space).[13] Mental health seems to be affected by overcrowding, but it is the lack of personal control over the available space rather than the small space available that seems to be important. This fits in with Newman's theories of the importance of "defensible space" (space under the resident's personal control).[14] Personal control over space, such as that gained from having a private front door approached through a defined garden, Newman says, engenders pride and security. Conversely, lack of control, as found in impersonal tower blocks with a single entry point set in communal grounds, creates hostility and promotes vandalism. Simplistic and idealistic as some of Newman's claims may be, personal control over one's home environment does seem to be important.

Light

The health effects of domestic lighting are not immediately obvious. The latest review of the building regulations removed the requirement for window areas to be a set percentage of floor surface area, and there is now nothing in the regulations to prevent someone from building a house without windows.

When discussing the health effects of domestic lighting few think beyond photoepilepsy and the possibility that fluorescent lights can cause skin cancer. Some people certainly are sensitive to flicker from fluorescent tubes and television sets, but so few people are affected and the problem is so easily spotted and remedied that this is not a major risk to health.

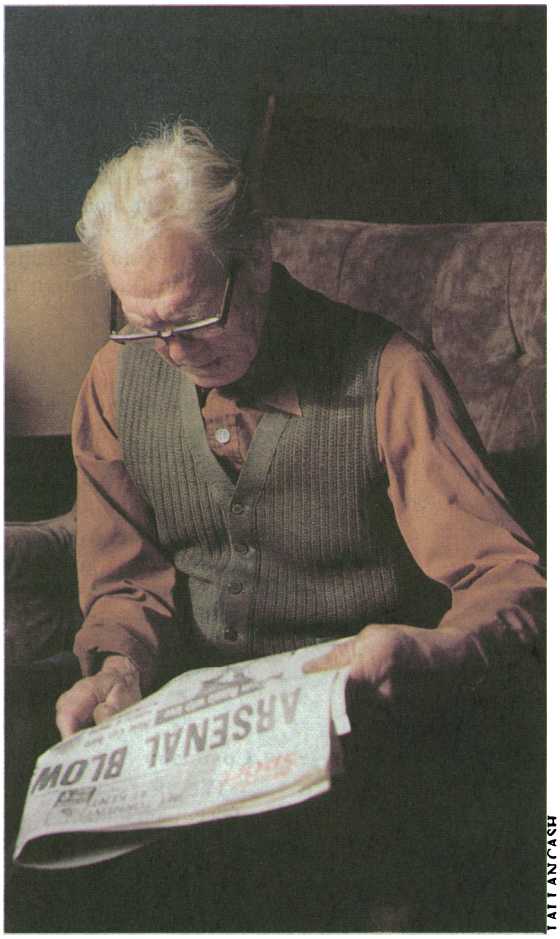
Scare stories about the possibility that artificial light can induce skin cancer surface from time to time. In 1982 a study from Australia suggested that occupational exposure to fluorescent light was a risk factor for malignant melanoma.[15] But the lesions were distributed mainly on the trunk and this theory did not fit in well with other evidence about the carcinogenic effects of ultraviolet light. Dr Allister McKinlay from the National Radiological Protection Board emphasises that domestic exposure to fluorescent light is only intermittent, but in any case his studies of the emission spectra of commonly used domestic fluorescent tubes after 0, 100, and 2000 hours of use have not found any evidence that they are harmful.[16]

Dr McKinlay is much more concerned about the ultraviolet emission from tungsten halogen spotlights —now becoming fashionable as desk lamps. After they are used for a few hours the exposed skin on hands and forearms develops erythema. The amount of blue light emitted by the lamps is enough to cause retinal damage, but fortunately the lamps are so bright that most people cannot look at them for long. Perhaps the most worrying feature of these lamps is their operating temperature, about 300°C—a real hazard to users and inquisitive children.[17]

A new health effect of domestic light has emerged recently with descriptions of the seasonal affective disorder,[18] in which some people develop cyclical depression in the winter months with a return to normal in the spring. The mechanism is unknown, but day length is thought to be important. There is some evidence that exposure to bright light for at least three hours a day during winter will prevent this. No particular wavelength seems to be needed so long as the light is bright.

But the most important health problem here arises from the fact that nearly two thirds of British homes are inadequately lit. People struggling to do close work such as reading or sewing may suffer tension headaches and tire easily, but more worrying is the risk of accidents in badly lit kitchens or dim stairways. One survey in 1979-80 found that three quarters of homes had a single ceiling light, usually fitted with a 100 W bulb, as the only source of light in the kitchen.[19] There was a positive correlation between higher social class and more than one light source in the kitchen. None of the homes met the standard of an illumination level of 100 lux at the bottom of a flight of stairs recommended by the Chartered Institution of Building Services and the Illuminating Engineering Society. And the standards suggested in their code are about 60% of the equivalent levels of light recommended in industry.

At least a quarter of a million people in Britain, most of them elderly, have substantially limited sight. The Partially Sighted Society is concerned that health workers rarely appreciate the benefits of good lighting, yet many doctors will have come across patients who complain of poor vision but perform well when tested in clinic. It is worth checking that the lighting in these people's homes is adequate.



Nearly two thirds of British homes are inadequately lit

A useful leaflet for people with visual impairment (and for the health workers who advise them) is produced by the Partially Sighted Society. It contains tips such as using strong contrasting colours to enhance visual clues, choosing wide lightshades that reflect as much light as possible, and carefully shielding lamps to avoid glare—particularly disabling for people with cataracts—while not reducing too much the amount of light transmitted.[21]

Often the amount of illumination can be increased very easily at little expense to the patient. A fluorescent tube gives better illumination at lower cost than an ordinary light bulb but may not be so aesthetically pleasing. A dirty net curtain may block up to 85% of daylight entering a room, though a clean one will allow up to 70% of the light through. As much as half of the illumination from a single ceiling light is obtained after reflection from the walls, ceiling, and floor, so the choice of colour schemes for internal decorations can affect the illumination in a room greatly.[20]

Conclusions

Domestic noise poses no great risk to physical health but may be an important source of irritation and stress. Overcrowding can endanger physical health if the demands on the sanitary services to a property are high or if there are inadequate means of detecting and escaping from a fire. Domestic lighting has a surprisingly large effect on physical health because so few homes are adequately lit to ensure the safety of occupants, especially the elderly. Poor domestic lighting may also influence mental health, although this is an unresearched subject.

Comment

The effects of noise, space, and light on the wellbeing of occupants illustrate how complicated the analysis of housing and health can be. In industry noise intensity has a clear association with physical health, but industrial standards are not always applicable to domestic settings.

History has taught us that overcrowding can endanger health, but recent studies have found only subtle effects of congestion on mental health, and overcrowding has been rather played down. In many hostels and hotels we are now having to relearn the lessons of the Victorian slums. The basic principles of housing and health do not change much, and we ignore them at our peril.

Domestic lighting might not at first be expected to have much effect on physical health, but its potential to contribute to accidents, especially in elderly people, is shocking and underestimated. Housing often influences health indirectly, but we seldom look carefully enough for the association.

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MATERIA PARAMEDICA

How phosphine strengthened my character

No, Phosphine is not a Victorian girls' name; there are no romantic associations. Phosphine is a poisonous gas; it smells of rotten fish, and it ignites spontaneously on contact with air. When discharged slowly from an underwater tube, bubbles of phosphine ignite with a bright flash on reaching the surface and yield a white vortex ring of smoke consisting of phosphorus pentoxide. A most spectacular demonstration, best reserved for end of term celebrations.

My preparatory school was Warwick House in Swiss Cottage, northwest London. It yielded some eminent alumni; the only one with whom I have maintained contact is Edward Lowbury, microbiologist and poet. It was geared to getting its boys entrance scholarships to St Paul's School; in fact, it was a crammer's academically and spatially, being contained in one small private house, which was also the headmaster's residence. A small room at the rear served as chemistry laboratory. A large room adjacent was the headmaster's sitting room with French doors to the garden. Chemistry, as a school subject, was nicknamed "stinks" with good reason. Fritsch, the headmaster, must have suffered dreadfully from its proximity. The chemistry teacher visited on Fridays; an easygoing man called Slocombe, he kept order by maintaining our interest. Mr Fritsch tolerated his experiments with good grace.

One Friday all was different. Fritsch told the class that in no circumstances were we to participate in any practical chemistry. When Slocombe arrived he wore an unusually determined expression.

"Come downstairs," he said, "we shall perform an experiment."

Our small class followed him down, and, as we passed Mr Fritsch's room, I asked permission to get his consent, but Mr Slocombe hurried us on. The experiment was set up using white phosphorus and caustic soda. (*Don't* try it at home!) Master and boys went into the garden and watched the blazing flashes of phosphine through the laboratory window. A wonderful sight it was. The ground floor was uninhabitable from the stench of poisonous fumes. Fritsch was purple with rage. It was Slocombe's last lesson; I suspect he was under notice to leave and wanted his revenge. But he went with a bang: the whimper was ours. All boys in the class were punished with 100 lines for disobeying Fritsch's prohibition. Seemed rather unfair.

So what has this to do with character formation? Well, it taught me two things. In a situation of divided loyalties, make up your mind quickly to which side you will give priority. And, secondly, don't be surprised if you are the victim of an illogical or unjust decision. It happens to most of us.

I nearly forgot: the formula for phosphine is PH_3.

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