

Discounted knowledge

Local experience, environmental pollution and health

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In Popay, J. & Williams, G. (Eds.) (1994) *Researching the people's health*, London: Routledge

INTRODUCTION

The last decade has seen a resurgence of public concern about the physical environment, which has taken two main forms. Most publicized has been concern with the global consequences of our collective use of the planet. But comparable concern has been aroused, on a quite different geographical scale, about particular sources of pollution and the local populations living nearby. This chapter is about the latter, and about the social and political context in which such concerns are expressed and contested. We shall draw on two case studies from major urban centres in north-east England to explore some of the methodological issues which arise from trying to take local understandings seriously in research of an epidemiological nature.

Where people have voiced anxieties about the effects upon their health of pollution from an individual factory or industrial process, a common official response in the initial stages of what often turns out to be a long-running issue has been to dismiss public fears as unnecessary and exaggerated. In our experience, this is often accompanied by the rider that concern about personal smoking habits would be more rational and effective – an interesting juxtaposition of air-pollution concerns about which we shall have more to say later. Another dismissive response is to minimize public concerns by suggesting that only a minority worry about pollution. With an implied claim to be portraying the views of the majority, the argument goes that employment security and local crime are greater local preoccupations than pollution. These official responses have the effect of foreclosing debate: local voices may not be stifled but they are largely ignored. Since these voices are more often than not those of working-class people living in neighbourhoods

where economic hardship is common, questions of power and inequality are necessarily involved.

Nevertheless, over the last few years a gradual reassessment of the possible impact of air pollution on health has been occurring. This comes after a long period of dormancy, in the wake of the large reductions in smoke and sulphur dioxide levels achieved through progressive implementation of the Clean Air Act and the introduction of smokeless zones in most cities. A recent editorial in *The Lancet*, under the title 'Environmental pollution: it kills trees, but does it kill people?' (1992: 821), is one indication of this shift. The issues here are not only epidemiological or toxicological. The way that concerns about health and environmental pollution take shape in the public arena – the timing, the interests and coalitions involved, the problems identified – reflects processes of interest to sociologists and anthropologists. One recurrent topic in local environmental controversies is the weight that should be given to the knowledge and experience of those who either claim that their health has been affected or are worried about a possible effect. How seriously are such claims and concerns to be taken? And what are the implications for methodology of taking these claims seriously?

Let us suppose that people in a community express unease about the effects on their health of environmental pollution from a nearby industry, and a subsequent health survey shows raised levels of self-reported respiratory symptoms. On what grounds do we conclude either that the evidence confirms local public unease, or alternatively that the population concerned is so predisposed towards the possibility of a health effect that the apparent evidence must be discounted as 'reporting bias'? The question is far from academic, for a common undercurrent when a local issue emerges is that people living close to the pollution source in question face an uphill struggle to have their concerns taken seriously. Around the Monkton coking works, in Hebburn on the south side of the River Tyne, these concerns were often expressed in remarks like the following by a 52-year-old woman living in the vicinity of the works. The comment is of interest precisely because of the way in which it echoes the question posed by *The Lancet*: 'I am a keen gardener. In the last 20 years, 3 apple trees have died . . . apples were black, sticky and attracted flies. You couldn't open your windows for the sulphur smells in summer. If the plants and trees were dying, the air pollution couldn't have done me much good.'

This chapter is primarily about the role of local knowledge and belief in guiding epidemiological attempts to explore links between industrial

air pollution and the health of people living nearby. In other words, it is about themes that have been associated with the concept of 'popular epidemiology' (Brown 1992; Paigen 1982), and looks at some of the difficulties that arise with environmental controversies in interpreting data on the elusive phenomenon of illness or morbidity. To set the scene, however, we will first outline the background to the two studies which give rise to this discussion, giving particular emphasis to the contexts in which the research takes place, the interested parties, and the relationships between researchers and researched.

BACKGROUND TO STUDIES IN TYNESIDE AND TEESSIDE

In the first case to be described, in Tyneside, popular concern played a leading role in bringing about an empirical study: the research was a response to a long local debate. In the second case, in Teesside, research played more of an initiating role in the debate that developed through the later 1980s.

The coking works at Monkton, in the Hebburn area of South Tyneside, started operating in 1937, but it was in the 1980s that it became a source of local controversy, which continued until its sudden closure late in 1990. Concern can be traced back to the 1950s, when the post-war wave of slum clearance in Hebburn and Jarrow led to a series of new housing estates – predominantly council-owned – being built close to what had formerly been the relatively isolated site of the coking works. When the Lukes Lane council estate was started in the late 1960s the National Coal Board itself questioned the desirability of siting housing half a mile downwind of coking production. That historical fact was something local residents generally acknowledged, even when uneasy about the effects of atmospheric pollutants from the works: 'The coke ovens were there first, not houses, so the council in my opinion were responsible and shouldn't have built the houses so close.'

By the end of the 1970s a widespread expectation among residents seems to have been that the Monkton site was in the later stages of its life. But in 1980 a return to twin-battery production (sixty-six coke ovens instead of thirty-three), after the works had operated with only one battery for most of its history, overturned such assumptions, and led directly to the creation of a residents' action group in Hebburn, initially to campaign about the levels of pollution from the works.

Through the 1980s local concerns were voiced with growing frequency, several factors playing a part. Hebburn and Jarrow had been smokeless zones since 1968, and living in an area free of domestic

smoke but alongside a plant burning coal to make coke increasingly came to be seen as an unacceptable anomaly. The decline of heavy industry in the area might have made the preservation of jobs at the coking works a local priority sufficient to counteract environmental concerns. But not only did the decline in heavy industry mark out the Monkton works as one of the few remaining sources of pollution; it equally highlighted the fact that coke production had never formed part of the identity of the area in the way that ship-building and coal-mining had done. The Monkton works could not therefore call on the same local loyalty that pits or shipyards evoked. If this was so before the national miners' strike of 1984–5, it became even more the case afterwards, for redundancies and redeployment from other sites in the north-east ensured that from 1986 onwards less than 5 per cent of the workforce of about two hundred lived in the vicinity of the works.

The period 1986–90 saw local concern start to focus more on health issues: partly, we suspect, spurred on by the fact that closure during the miners' strike and for several months afterwards (twenty-one months in all) had provided residents with an unexpected natural experiment, in which they assessed for themselves the changes to their immediate environment and their health brought about by the stopping and then the restarting of coking operations. Several developments helped to give momentum to the campaign by local activists. A planning application by the company in 1987 to use waste gas from the coking process, at the time being flared, to generate electricity, was subject to two public inquiries, the first in 1987, with a second, reopened inquiry in 1990. These provided a public forum in which health issues received unprecedented local attention, the residents' action group financing the presentation of its own case both times. Between these two occasions the residents' group also pressed its case by conducting its own self-designed survey of residents' health in the areas closest to the coking works. The paradox of this initiative in self-help research was that while its findings were discounted ('unscientific') it proved an effective political instrument in persuading local and health authorities to give greater recognition to such manifest local unease. The decision in 1989 by South Tyneside Metropolitan Borough Council (MBC) to fund research into the possible health effects of air pollution from the Monkton coking works was thus the culmination of years of increasingly vocal concern by local residents, in a context of changing perceptions about environmental health questions.

Before the research had been under way a year, however, coking operations at Monkton finally ceased. Not surprisingly, this sudden

closure forced abrupt changes in research plans, but it was not without advantages, providing an opportunity for some 'before and after' comparisons of both environmental data and evidence on health (Bhopal *et al.* 1992).

In Teesside, home of the largest concentration of steel and petro-chemical industries in Britain, the context in which the research emerged is somewhat different. There, possible problems associated with air pollution stand out less starkly alongside acute problems of unemployment, consequent poverty, and housing problems in some areas (Beynon *et al.* 1989; Centre for Environmental Studies 1985; Hudson 1990; Sadler 1990).¹ Until the large-scale redundancies of the 1980s, which gave Cleveland the highest unemployment rate in mainland Britain, the local estates were heavily dependent on employment in steel and chemicals; and despite massive contraction these industries are still seen as the essential base for the long-term viability of the area's economy.

Against this background, research into health and environmental pollution in Teesside developed less from the concerns of local residents and more from a combination of general practitioners' (GPs') concerns about the health problems of their patients, coupled with research studies which showed that many of the poorer areas of Teesside experienced exceptional levels of premature mortality (Townsend *et al.* 1988; Phillimore and Morris 1991; Phillimore 1993). Whereas in South Tyneside our study started without any prior research to support residents' claims about a health effect from industrial pollution, in Teesside recent research had been instrumental in establishing that a health problem existed which required further scrutiny.

A feature common to both places, however, has been recent interest in testing legal claims through the courts against particular companies for damage to health arising from living close to polluting operations. The possibility of making legal claims based on residential, instead of occupational, exposure to toxic substances is a new development in Britain, and much of the initiative here has come from law firms with special interests in this field. But potential claimants have been ready to come forward, and the eventual outcomes of Monkton and Teesside cases are likely to set precedents which will be of national importance. In the context of the Monkton research, the possibility of litigation only emerged towards the end of the study and had no bearing on its conduct. But in Teesside, the likelihood of future litigation has introduced another set of participants into the story at an early stage, and already colours any dialogue between the main Teesside industries and

researchers, for claims are unlikely to be pursued in the courts until the findings of the present study are available.²

There was one further rationale for research in Teesside, which had little to do with local pressures and concerns. Teesside in this context simply provided a peculiarly appropriate setting to try to answer questions of wider interest about the impact of industrial air pollution on the health of local populations. One proposition underlying the present research programme may be expressed in these terms. If air pollution from industrial sources remains a hazard to human health at non-occupational levels of exposure anywhere in Britain, then the scale of steel and petro-chemical industries and the proximity of residential neighbourhoods in Teesside mean that significant effects are more likely to be demonstrable there than elsewhere. Should such significant effects not be found in Teesside, then the likelihood must be that industrial air pollution is not a serious contributor to public ill-health elsewhere in Britain. Moreover, the proximity of populations already known to experience severe material hardship enables us to explore the cumulative effects of air pollution in conjunction with other forms of poverty. In part, this work also arose, therefore, out of an extension into the environmental field of long-standing debates about health and poverty.

Despite the different ways in which research on air pollution emerged on local policy agendas in the two settings, it would be mistaken to conclude that environmental concerns have been dormant in Teesside. Public preoccupation in recent years has centred around new and planned developments (a toxic waste incinerator on the north side of the River Tees, and a new power station on the south side) rather than around existing operations. In the public debate these new developments have generated, a recurring theme has been the pollution burden Teesside already carries, and hostility to its enlargement. Concerns exist, therefore, but possible threats posed to health have generally been less tangible, and accorded a lower priority, than the daily economic pressures and material hardships of a decade of exceptionally high unemployment. A further difference between the two areas lies in the geographical scale involved. In contrast to the relatively compact boundaries of the Monkton controversy, potentially affected populations in Teesside are dispersed across a wide area. Inevitably, this makes it impossible to speak of a local community such as surrounds the Monkton coking works, for in Teesside there are several such areas. While the main illustration we use here is drawn from Monkton, where research has been completed, our understanding of the issues has developed just as much through our experience of research in Teesside.

TAKING LOCAL VOICES SERIOUSLY

Studies into possible health effects of pollution from industry might be expected to involve the people defined as being at risk, namely those living alongside these industries. Yet a thread running through the Monkton case, and a persistent undercurrent both in Teesside and elsewhere (Irwin and Wynne forthcoming), is that the issues are for scientific experts alone to evaluate. The subjects of study are thus human guinea-pigs, whose views of their experience are at best beside the point and at worst an obstacle to proper scientific assessment of the facts. Taking local concerns seriously in this context means challenging such a standpoint on two complementary levels. One is to re-assess the empirical evaluation of health, to take account of local experience in the ways that episodes of illness and pollution are actually measured. A second is to step back from questions of measurement and quantitative assessment, to explore the extent to which different 'ways of knowing' (Brown 1992) about the environment and its impact on human health shape disputes between residents who see themselves as being on the receiving end of pollution, and public authorities and professional advisers who base their assessments and policy responses on 'official' forms of knowledge (see also Irwin and Wynne forthcoming). These two levels reflect the duality of processes which are both socially caused and socially constructed. Scott and Williams emphasize the second of these when they write:

What is of central concern to sociologists, in contrast perhaps to their colleagues in public health, is not the evaluation of risk and danger in any absolute sense, but rather our shifting perceptions of risk and changing patterns of risk management.

(Scott and Williams 1992: 3)

However, questions of empirical measurement are likely to have great importance for local communities confronting public authorities in environmental disputes. The possibility of bringing about changes in policy that will have an impact on the immediate environment rests on the authority of the empirical evidence that can be marshalled in support of any contention about actual or potential adverse effects on health or daily lives. In short, the public priority is generally to know whether scientific findings identify harmful effects on health.

In the planning stages of the Monkton study, a recurring theme in descriptions by local residents of how coking pollution affected them was that short periods of severe pollution, perhaps lasting no more than

a few minutes, could trigger off bouts of respiratory illness that could linger on for several days. The emphasis in these accounts tended to be on the way that pollution incidents exacerbated chronic respiratory conditions. Particularly in the housing estates closest to the coking works, such localized pollution peaks were typically associated with the regular sequence of 'pushing' the coke from the ovens every twenty minutes or so, when meteorological conditions could readily combine with incomplete carbonization to produce intense fumes in a fairly small area. Such conditions were quite distinct from the continuous emissions of waste gases through the stack, which tended to be spread more widely but in more diluted form. While temperature-inversion conditions are well known as danger signs for the trapping of polluted air, often over quite a large area, the gist of our informants' experience was that blustery wind conditions could also be a significant but localized problem, for when the coke ovens were pushed swirling clouds of gas and smoke would sweep over some houses but not others. Yet pollution such as this, emitted close to ground level, is much harder to monitor and quantify than emissions from chimneys, which are subject to greater regulation. Scientific predictions about exposure are therefore based almost exclusively upon stack emissions, not those fugitive and other emissions occurring close to ground level.

Here, then, was a description of one way that pollution from the coking works was observed to take a toll on health. Speculation was widespread about hidden health effects with a latency period of years, notably in relation to cancers; but the difference in this case was that observation and personal experience linked cause and effect together directly because there was no time-lag to speak of between the two to obscure a link. Yet, however significant as personal experience, such observations also provided a cue for empirical investigation. Indeed, such investigation was essential if findings were to carry weight with bureaucracies and policy-makers. We approached this question by using air-pollution data from three monitoring sites set up by South Tyneside MBC from 1986 onwards to monitor smoke and sulphur dioxide levels around the coking works. Pollution data averaged by week or month were insufficiently sensitive for our purpose. Disaggregated data were essential to enable us to construct mean daily levels of pollution to match with daily data on consultations with a GP. This level of temporal disaggregation proved sufficiently sensitive to reveal a strong association between sulphur dioxide levels and the rate of consultation for respiratory problems on the same day. In view of that pattern, any further disaggregation – for instance to three-hourly intervals – seemed

redundant, though in theory that would have been the next step towards assessment of local claims. The empirical evidence has been summarized elsewhere and will not be reviewed here (Bhopal *et al.* 1994). It is sufficient to say that standard epidemiological methods of analysis were used before we concluded that the association between sulphur dioxide levels and consultations for respiratory complaints was largely attributable to air pollution from the coking works. These methods included: comparison with a control population elsewhere in the borough of South Tyneside; examination of differences between patterns for respiratory and all other problems; scrutiny of patterns before and after coking operations finally ceased; separation of the effects of air temperature from those of pollution; and a check on alternative pollution sources.

While acknowledging that consultations with a GP provide only an indirect reflection of morbidity or illness patterns, on the face of it this evidence would seem to lend support to claims by residents that pollution from the coking works had harmed their health. It also lends weight to arguments in favour of recognizing, and not ignoring, the insights which come from direct familiarity with a local environment. Brown expresses these well,³ and reverses the usual emphasis on the shortcomings of popular scientific understanding, stressing instead the limitations of the data available to scientists:

Many people who live at risk of toxic hazards have access to data otherwise inaccessible to scientists. Their experiential knowledge usually precedes official and scientific awareness, largely because it is so tangible. Knowledge of toxic hazards in communities and workplaces in the last two decades has often stemmed from lay observation.

(Brown 1992: 270)

Nevertheless, findings such as those mentioned above are commonly contested by epidemiologists, and 'reporting bias' is the main explanation given for such scepticism. In essence, the critique goes that the strength of pre-existing local concern about possible health effects of pollution is so great as to predispose a population to think that their health is being harmed. For example, the possibility cannot be ruled out that people in exposed neighbourhoods will anticipate health problems on days when they are aware that pollution is worse than usual, and go to see a doctor. The fact that the Monkton study found the association to be strongest between pollution level and consultation with a doctor on the same day may reinforce doubts about the interpretation of these linked

observations, for it might plausibly be argued that a time-lag between pollution incident and consultation would be more realistic. But the issue goes beyond dispute over one specific set of empirical findings or another, raising general questions to do with the interpretation of evidence where public controversy predates and surrounds scientific inquiry.

The standard argument in epidemiological studies is that human awareness of a health issue introduces a source of potential bias in any assessment of 'health behaviour' which is difficult to control for, compromising the use of self-reports of health states, and such actions as visiting a doctor. The influence of the double-blind trial and case-control methodology looms large here, with the premise that scientific knowledge is produced by screening off the intrusions of life outside the experiment. Prior familiarity with an issue is not seen as a source of insight and the product of experience, but is categorized as 'sensitization', the social equivalent of an allergic response. Given that it may well be impossible to demonstrate that epidemiological findings on any group of people known to be aware of a health issue are unbiased by their prior sensitization to this issue, it means that relatively subtle health effects may never adequately be recognized. *The Lancet* editorial, quoted previously, concluded by stating (1992: 822): 'From published evidence, environmental pollution is unlikely to result in gross excess mortality Effects should be sought at more subtle levels of health damage – for example, reproductive and developmental outcomes *and morbidity*' (our emphasis). Yet what kind of evidence of morbidity would not be vulnerable to the charge of the sceptical epidemiologist that it was simply an artefact?

For those who do not consider direct familiarity and experience should be underestimated, however, the main problem with this perspective is the assumption that the awareness, or knowledge, of those studied is an obstacle to researchers' knowledge. Indeed, if people's awareness poses problems, one could equally argue that so too would being totally unaware, inasmuch as people need to understand what they are being asked about sufficiently to provide intelligible answers in research. That our subjects of study have prior 'awareness' of the topics we are looking at is a precondition for our knowledge as researchers. One consequence of seeing popular awareness as an obstacle to scientific understanding of behaviour is that it implicitly assumes that people's thoughts distort their 'natural' behaviour. A notion such as 'over-visiting' the doctor (a relevant topic in a discussion of reporting bias) could only come from such a tradition of thinking about human

behaviour. The underlying assumption present in such instances is of an implicit dichotomy between 'real' need and 'artificial' (that is to say, culturally created) need. Yet as Blaxter among others has shown (1985, 1990), distinguishing a biological bedrock against which the cultural enactment of illness may be judged is beset by pitfalls in practice and flawed as an idea.

The complex relationship between the social and the biological is also apparent if we go back to the two complementary approaches to lay knowledge and subjective experience that we mentioned earlier. Lay beliefs offer on the one hand an insight into a cultural perspective on the world, and on the other a possible guide to aetiology, a source of hypotheses about causal pathways to disease which may be translated into the idiom of scientific research design. Both of these frameworks for understanding pose characteristic dilemmas. From an aetiological perspective, the paradox of popular epidemiology is this: if local knowledge is not used to enhance the sensitivity of studies measuring the health impact of environmental pollution, then possible effects may go undetected. Such circumstances simply reinforce the epidemiological tendency towards false negative rather than false positive reports noted by various commentators (Brown 1992; Paigen 1982). On the other hand, if local knowledge is used it may lead critics to dispute positive findings on the grounds that the subjects of the study were sensitized to the issue beforehand, thus predisposing them towards the possibility of reporting health effects. There is no straightforward resolution of this problem.

From a social-construction perspective, justice can be done to the subtlety and distinctiveness of popular understandings of environmental hazards, toxic effects and health impacts in different localities. In theory, the authenticity and strength of the account does not depend on validating interpretations by reference to bio-medical data. Yet in practice resort may be made to bio-medical criteria, as a kind of gold standard against which to judge how well founded local knowledge proves to be, and to underscore the argument for taking it seriously. Thus, Brown's fascinating analysis (1992) of the controversy surrounding the explanation for an apparent cluster of childhood leukaemia cases at Woburn, Massachusetts, rests on the assumption that there is a biological foundation on which the social 'story' of the dispute can be built. Likewise, Scott (1988) concludes his account of the different languages of medical, scientific and legal scrutiny of possible cases arising from exposure to the herbicide Agent Orange, by reference to likely biological confirmation of the effects of exposure, as raised levels of certain cancers started to appear.

If the dilemma for aetiological use of lay knowledge is that biological effects can never wholly be distinguished from the social discourse in which they emerge as potential data, the dilemma for a constructionist reading is that recourse to biological evidence is an almost inevitable consequence of attempting to demonstrate the wider legitimacy, in a political and social arena, of local claims.⁴

THE POLITICS OF EXCLUSION

We have to remember also that the views and insights of some groups are more readily discounted than those of others. Particularly in environmental controversies where a working-class community finds itself at odds with a major industrial concern, there are likely to be strong political-economic pressures that make it easier to ignore local voices raised in concern (Crenson 1971). As Becker (1967) observed many years ago, a 'hierarchy of credibility' ensures that the unwanted views of certain sections of the population can effectively be discounted. Environmental debates and disputes do not take place in a political vacuum, and where these involve industry, local government and a resident population the political context is potentially a charged one (Hudson 1990). Historically, there have existed strong political pressures inhibiting both scrutiny of air pollution and the possible consequences for public health in towns with a long-lasting reliance on particular heavy industries. Crenson's comparative (1971) study of city-level politics in the steel-making centres of Gary and East Chicago is highly instructive in this context. His examination of the way that air-pollution issues were tentatively addressed in one town and effectively kept out of the political arena in the other, in the years after the Second World War, illuminates how strongly influential industrial-economic interests can determine local and regional political agendas.

Taking seriously the views of the subjects of study is in itself liable to provoke unease among other interested parties – most obviously the industries themselves, but also sometimes local and health authorities, as Paigen (1982) shows. There is a dilemma here. From the research point of view, to investigate thoroughly the possibility of air pollution either triggering episodes of acute respiratory illness or contributing to the onset of chronic conditions probably requires a combination of methods. The more intensive the study, we would argue, the greater the chance of reaching a conclusion that does not leave open the possibility that the methods chosen were simply insufficiently sensitive. At the same time, the development of sufficiently sensitive methods is unlikely

to take place unless researchers and others see that there is a case to answer. But to critics, suggesting that there is a case to answer is tantamount to making a false charge, implying a predisposition on the part of the researchers to be biased against the industry under scrutiny.

Although it concerns water-borne, not air-borne pollution, few cases in this context are as instructive as the Love Canal saga (Levine 1982; Paigen 1982). Love Canal, in New York State, was the site of post-Second World War housing which became contaminated when highly toxic chemical waste legally disposed of in an abandoned canal by the Hooker Electrochemical Corporation started to leach into homes and a school playground, raising serious local alarm by the mid-1970s. The communities' concerns about the risks to health received contradictory and ambiguous responses from the relevant authorities, which were compounded by ferocious disputes between scientists and regulatory authorities. One of the scientists on the receiving end of the displeasure of Health Department officials and influential medical scientists concluded that 'the Love Canal controversy was predominantly political in nature, and it raised a series of questions that had more to do with values than science' (Paigen 1982: 29). As the account of a biological scientist, this article by Paigen is particularly interesting on the recognition of the values that underpin scientific research assumptions and design. Some of these points are brought out in a section headed 'The failure to resolve any controversy may be advantageous to one side', where Paigen observes:

The advantages to delay were graphically brought home to me in a conversation I had with a Health Department epidemiologist concerning the data on adverse pregnancy outcomes at Love Canal. We both agreed that we should take the conservative approach only to find that in every case we disagreed on what the conservative approach was. To him 'conservative' meant that we must be very cautious about concluding that Love Canal was an unsafe place to live. The evidence had to be compelling because substantial financial resources were needed to correct the problem. To me 'conservative' meant that we must be very cautious about concluding that Love Canal was a safe place to live. The evidence had to be compelling because the public health consequences of an error were considerable. And so we disagreed about specific detail after specific detail.

(Paigen 1982: 32)

ALTERNATIVE MEANINGS OF RISK

Much of the conflict in cases like this revolves around the nature and extent of any risk to health. Too often, scientists, local authorities and the industries concerned see complaints and anxieties voiced by the public as out of proportion to the risk posed, or even irrational and anti-scientific. These authorities have their own ideas about 'real' risks, based largely on the ways that individuals behave, denoted in the concept of 'risky behaviour' (British Medical Association 1990). The retort from local communities caught up in an environmental health controversy is of official and expert unconcern. Both sides speak the language of 'risk', but the languages are fundamentally different (see Dake 1992; Douglas 1985). On the one side, risk is a technical term and risk assessment a highly technical matter, to be 'carried out' by experts and then expressed in quantifiable probabilities. On the other side, risk is part of the currency of everyday life, a concept rooted in daily experience and assessed by reference to experience. The one counts, the other does not (see Hayes 1992).⁵ Yet the evidence from studies such as that at Monkton is that people weigh up carefully the manifold influences upon their health. They compare their own and their family's health at different periods: before coming to live near the coking works and afterwards, for instance; or the period of closure of the works during the miners' strike with the periods either side; or the interlude away from home provided by going on holiday. They draw on their knowledge of the health of friends or neighbours. And they witness the way that pollution behaves under different weather conditions and by night and day. Taken in the round, they reach a judgement about risk that is informed by as many different variables as make up scientific assessments of risk. The following remarks by residents living close to the coking works illustrate concern about risk based on observation and experience:

'I have always believed that the cokeworks were to blame for all my sinus problems as I never had any symptoms before I exchanged houses to my present address. I lived at my previous home for seven years without any sinus problems.'

(Woman, aged 42)

'Although I have no noticeable chest or health problems now, after living here 12 years, the unknown factor is the long-term effects of dust on lungs and when or if they show up in 10-20 years' time.'

(Man, aged 39)

An essential feature of such personal judgements is that they are grounded in a local context, and are specific to that context, as Irwin has argued (Irwin and Wynne forthcoming). Using a case study in Manchester, he shows how, in an area associated for many years with one particular industry, residents were far from apathetic or unconcerned, but combined scepticism about information provided by the industry itself or scientific-review bodies with resigned recognition that alternatives to the *status quo* were few.

CONCLUSION

That air pollution from industry can cause severe ill-health and death can hardly be gainsaid. The sulphurous smogs of past decades caused excess deaths in the rich countries of the world, and industries at that time contributed significantly to total pollution (as continues to be the case in poorer countries, including those of Eastern Europe). The disasters of Bhopal and Seveso also provide well-known instances of the possible dangers in the circumstances posed by major accidents.

Nevertheless, several factors have combined to inhibit conclusions about the current role of routinely produced air pollution in contributing to variations in ill-health between cities, or neighbourhoods within cities. It has proved extremely difficult to design studies which can disentangle the effects of air pollution under the operational conditions prevailing today in Western Europe or North America, where pollution is no longer at a level to create short-term fluctuations in mortality (Lippmann and Liroy 1985). Routine emissions may overall be a fraction of their former level; but in particular places short and often localized periods of relatively high exposure continue to occur, and we are a long way from monitoring the range of pollutants released into the air. The problem is accentuated when we consider historical changes, and try to encompass the conditions experienced through the life-course by those who are now in middle age or elderly. As Scott noted in his study of the Agent Orange controversy, with any latent disorders the time-lag between exposure and consequence strains methodologies 'to the point where it is difficult to establish evidence' (1988: 156). When we acknowledge also that people living in more exposed neighbourhoods are likely to have problems of pollution compounded by damp housing, occupational exposure to pollutants, and smoking, these methodological problems are amplified still further. Studies of the steel-foundry towns of Armadale and Bathgate in Scotland by Lloyd and colleagues (Lloyd 1978; Lloyd *et al.* 1985a, 1985b), which indicated raised lung-cancer

incidence (as well as distorted sex ratios at birth) in the 1960s and 1970s, stand out as unusual examples of localized effects attributable to industrial pollution.

These well-known methodological problems have provided obstacles to the development of research to clarify the role of air pollution. Yet this is only half the story. The other side of it has to do with the ways that the problem of air pollution and health has been socially and politically constructed, particularly where the impact of pollution from industry is at issue. For not only are studies of industrial air pollution difficult to design; they are also liable to be politically contentious. One consequence of the methodological complexity alluded to has been to protect industries of a polluting kind from close scrutiny. This insulation has allowed industries to maintain confidently that their emissions have no effect, in the knowledge that any conclusions would be hard to reach, and the claims of affected populations, based on experience, easily deflected. On the other hand, by comparison with even a decade ago, there are signs that the situation is changing. Local authorities struggling to attract new investment, particularly in high-tech sectors, find themselves today at an increasing disadvantage if they cannot guarantee environmental standards that would not have been expected in years gone by (Hudson 1990). Such new economic pressures are likely in the long run to sustain greater pressure on those industries which are the major contributors to air pollution than local community or resident groups could ever achieve.

To the extent that the influence of air pollution is examined, moreover, it echoes some of the main features of more general debates about the causes of health variations within the population. Contrasting emphases on the individual and the behavioural – the realm of personal 'lifestyle' – or the structural and societal have their unacknowledged counterparts in air-pollution epidemiology.

Smoking habits – the ultimate in personalized air pollution – and emissions from industrial plants – the epitome of externally imposed air pollution – neatly exhibit the two ends of the spectrum. Traffic-exhaust fumes, and indoor pollution from domestic fuel or even home furnishings and clothing fall somewhere between these two extremes, although there is a tendency to treat all of these as closer to the 'lifestyle' than the structural end of the pollution spectrum. To the extent that individual exposure entails a more-or-less unique combination of these pollutants, it is not surprising that consideration of the effects of external air pollution invariably takes personal smoking habits into account also. But from there it has proved a short step to the discounting of external

sources in the case of individuals who smoke. As we mentioned at the start of this chapter, smokers who express concern about air pollution are seen to exemplify an almost irrational concern with a minor and remote problem at the expense of the major and immediate one over which they have personal control. Thus is the ideology of health as an individual achievement brought into air-pollution risk assessment. To put the point differently, here is another instance of the way in which private risks always receive priority over public dangers (Scott *et al.* 1992).

There seems little doubt that the rising tide of environmental pre-occupation will lead to a growing number of epidemiological studies being undertaken against a background of public concern. In this chapter we have explored some of the challenges to received epidemiological ideas posed by public interest in the issues under investigation, and the wider context within which such studies take place. On the one hand, the days of a public who passively have research 'done' on them are disappearing; at the same time, it remains all too easy to discount the voices of those being studied, especially where the issue under scrutiny is – like air pollution – seen as too technical a matter for non-experts to participate in.

Yet one of the main implications of this chapter is that, whatever the methodological challenges involved, the voices of those living in local communities most at risk from possible environmental hazards must be heard. This basic lesson applies both to the range of public authorities which are likely to be the first to respond to local concerns, and to researchers who may come into the picture at a later stage. Assumptions about public misunderstanding, ignorance or hysteria in relation to environmental issues simply fan the flames of controversy, and caricature the insights and understanding people bring to the circumstances in which they find themselves. Instead, as several writers have argued (Brown 1992; Hance *et al.* 1989; Nash and Kirsch 1986), public authorities and research teams need to recognize that the community may very well have expert knowledge about possible routes of exposure, based on long and direct familiarity. This knowledge needs to be respected and sought, so that its implications can be studied thoroughly. In the wake of the infamous Love Canal saga, some of these lessons are being learned in the USA. Researchers involved in the US Environmental Communication Research Program, having examined a number of disputes, recommended 'paying [as much] attention to the community's perception of the risk and to the community's concerns, as to scientific variables' (Hance *et al.* 1989: 114).

NOTES

- 1 One difference between South Tyneside and Teesside is the amount of recent social science literature on the two places. While there has been a steady stream of publications on Teesside over the last decade or so, little has been written on South Tyneside.
- 2 The importance of the interplay between scientific findings and legal judgments in the USA has been noted recently by Brown (1992: 279): 'Legal definitions of causality, developed in an expanding toxic tort repertoire, are initially determined by judicial interpretation of scientific testimony. Once constructed, they can take on a life of their own.' See also Scott 1988: 156–8.
- 3 A similar point is made by Nash and Kirsch in quoting a local figure in a dispute involving contamination by polychlorinated biphenyls in Pittsfield, Massachusetts (1986: 134): 'This is the area we grew up in and we know the problem, better than management. They've only been here a short period of time. I'm sure they meant no harm; they've been cooperative, but none-the-less, we have the problem.'
- 4 The discussion between Bryan Turner and Richard Fardon (in Turner 1992: especially pp. 252–6) sets these questions within the broader context of social theory.
- 5 De Waal's (1989) discussion of alternative understandings of 'famine' – the one technical and quantitative, the other experience-based – in his ethnography of Darfur, in Sudan, provides an apposite parallel to the contrasting notions of risk being explored here.

ACKNOWLEDGEMENTS

The research on which this essay draws has been conducted with Raj Bhopal, Chris Dunn, Chris Foy, and Jacqui Tate. Their role is acknowledged gratefully. We are also indebted to Raj Bhopal, Chris Dunn, Erica Haines, Jennie Popay and Gareth Williams for constructive criticism of earlier drafts.

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