The social context of responses to lead contamination in an Australian community: implications for health promotion

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SUMMARY
This paper illustrates how an understanding of the social context of responses to health hazards assists in the development of health promotion strategies. In early 1992, chronic environmental lead contamination became a public issue in Broken Hill, New South Wales, Australia. This paper is based on a study completed between May 1992 and December 1995, which set out to explore the nature of social responses to this environmental health hazard. Fieldwork conducted over 9 months during six visits to Broken Hill included the use of participant observation and in-depth interviews with residents and representatives of organisations. Residents’ coping responses included thoughts and feelings about the significance and acceptability of the threat, and assignment of responsibility. Active responses included obtaining information about the hazard and exposure reduction, and using health interventions. Responses were found to be significantly affected by aspects of the social setting, including: stigma; individual and community economic factors; social support and undermining; social influence; and cultural assumptions, beliefs and values. I conclude that an understanding of social responses to health hazards, including factors underlying responses, provides an important basis for the development of appropriate and effective health promotion strategies.

Key words: community responses; lead contamination; social setting

INTRODUCTION
Health promotion theory recognises the importance of the social context of health. A number of models have been developed to illustrate the relationships between people and the ‘environmental’ context in which they live. Hancock and Perkins’ well accepted ‘Mandala of Health Model’, which was developed in the early 1980s, shows the interconnectedness of individual human beings, their physical and social environment and their health (Hancock, 1993). The Ottawa Charter for Health Promotion (1986) notes that health is affected by environmental, biological, behavioural, social, economic, political and cultural factors.

Legge (1989) provides a framework for understanding health in a social context, which provides the insights that people’s health behaviours reflect their life experiences and that their life experiences are determined by broader institutional structures, cultural forces and social relations. The framework also encompasses the health impact of various cultural influences, and points to ways in which these cultural influences express and determine social relations and institutional structures. It also indicates how action-responses at the personal, local and community levels will express, and may influence, broader social relations and institutional structures. Hancock (1992) has also developed a more recent model which also moves beyond the individual health focus, showing how the environment, economy and community are interrelated and related to health (Hancock,
Health promotion literature also draws attention to limitations and indeed negative effects of health interventions which focus on individuals, rather than recognising the fact that humans live in, are shaped by, and in turn shape their physical and social environment (Ryan, 1976; Short, 1990; Boothroyd and Eberle, 1990). It follows that an understanding of the social context or 'environment' would assist in the development of health promotion strategies.

This paper presents the results of a recent study which examined social responses to chronic environmental lead contamination in Broken Hill, New South Wales, Australia. It provides an overview of community responses, focusing on aspects of the social setting which significantly affected responses, and which are particularly relevant to the development of health promotion strategies. It is important to state that the specific results of this study cannot and should not be transferred to another community. Indeed, I argue that health promotion strategies need to reflect the specific natures of the people and communities involved. Instead, this paper's contribution lies in its examination of how an understanding of community responses can assist in the development of effective health promotion strategies. The results of this study also illuminate limitations of the medical and lifestyle health approaches which currently form the basis of intervention strategies for a range of health issues.

BACKGROUND

Broken Hill is a mining community located in semi-arid Far Western New South Wales, Australia (see Figure 1). In contrast to many communities dealing with environmental hazards, the biophysical health effects of lead exposure have been a concern in Broken Hill since the early days of mining which began in the 1880s. Concerns about lead poisoning of miners played an important role in major strikes of 1892 and 1919–1920, and in the early 1920s, a Technical Health Commission Inquiry was held into occupational health issues of mine workers, including lead poisoning. The Commission's findings confirmed that working conditions encouraged the development of lung diseases and lead poisoning in long-term mine workers. As a result, workplace controls and compensation of workers were introduced, and the health of mine workers improved considerably during the 1920s and 1930s.

Decades later, the concern changed from lead poisoning, to the potential effects of relatively low levels of lead exposure on children (see, for example, Smith et al., 1989; Centers for Disease Control, 1991; Alperstein et al., 1991; Needleman, 1992; Tesman and Hills, 1994) from environmental lead contamination in the community. Chronic environmental lead contamination became a public issue in the city following the release and associated media coverage of the results of a Regional Public Health Unit blood lead survey of 899 local children aged 0–4. The final results of the survey, released in February 1992, reported that 20.3% of children tested had blood lead levels higher than 25 μg of lead per dL of blood, the National Health and Medical Research Council level of concern at that time.

In the few months following the release of these results, information about the biophysical effects of exposure to relatively low levels of lead was made available to local residents through the media and Public Health Unit staff. Parents whose children had lead levels higher than 25 μg/dL received a list of suggestions about how to reduce children's blood lead levels, from the Public Health Unit. These guidelines included child rearing practices such as stopping children playing in dirt, discouraging dirt eating, and washing children's hands before meals; house cleaning routines including vacuuming carpets once per week, mopping floors and wet wiping furniture 2 h after vacuuming; and home additions or improvements such as installing a sand pit, and repairing cracks in walls and ceilings. Public Health Unit staff also conducted environmental sampling of the soil in the children's play areas, vacuum dust, indoor and outdoor flaking paint, ceiling dust, drinking water and rainwater, to identify potential sources of children's lead exposure.

RESEARCH METHODS

The three main research questions which formed the basis of the research were:

- how has the Broken Hill community, including residents and organisations, responded to the chronic environmental lead contamination?
- what factors mediate the community response process, and how?
- how can the results of this study contribute to the development of policies and programs which assist the response process of communities and community members?

The main data collection methods were in-
depth interviews and participant observation, conducted during fieldwork in Broken Hill over 9 months during six visits between July 1992 and December 1995. A snowball sampling method was used to contact both residents and representatives of organisations. Care was taken to contact a range of residents, including: people in various age groups, both men and women; those employed in a range of occupations as well as the unemployed, living throughout Broken Hill, and living in Broken Hill for varied periods of time. In total, 64 residents were interviewed, with most participating in two interviews during the study period. The second interviews provided an opportunity for follow-up discussion and changes of opinion. Organisations which were contacted included those which are health-related (for example, nurses, doctors, Broken Hill Environmental Lead Centre), resident groups, mining industry, City Council, unions, other state government agencies and voluntary services. In total, interviews were held with representatives of 38 organisations. Again, repeat interviews were held with many organisations.

Fig. 1: Broken Hill, New South Wales.
Participant observation was used throughout the fieldwork, and included informal conversations, discussions and meetings in settings such as the local Community Health Centre, a conference, early-childhood clinics, City Council meetings, community events, and everyday interactions in Broken Hill. In addition to interviews and participant observation, three focus group discussions, and several less structured discussions were conducted during fieldwork. Data collected via these methods were supplemented by those gathered through a review of historical and other relevant materials, media coverage and local demographics.

Tentative data analysis and theorising took place throughout the research process, and included reviewing data to uncover relationships with issues arising from the research. Emerging hypotheses were continually tested during the data collection process. Formal analysis followed the completion of the data collection. The first step involved creating a coding framework which included concepts and categories from a sample of interview transcripts. This framework was then used to analyse data gathered throughout the study. Data analysis was guided by a framework of community responses to environmental hazards (see Figure 2), which drew from a range of theory. The process included people’s thoughts and feelings about the hazard (cognitive responses), their actions (behavioural responses), and effects on health and well-being (outcomes). With cognitive coping strategies, people change the way in which they think about a situation in order to feel better about it; with behavioural strategies, they change their behaviour, or the situation itself. Effects on health and well-being include psychological and social effects at different levels of social organisation: individuals, families, social networks, and organisations. A range of factors may influence people’s thoughts and feelings, actions, and outcomes. These include characteristics of the individual, characteristics of the social setting, characteristics of the contaminant, organisational interventions, and other significant events or changes.

RESULTS

Community responses to chronic environmental lead contamination in Broken Hill (see Figure 3) began with public awareness of the lead contamination and potential biophysical health effects on
children at relatively low levels of exposure. However, it is important to reiterate the fact that people also responded to the emerging community response process, including health interventions.

**Thoughts and feelings: cognitive responses**

On the whole, parents with young children, rather than the wider community, perceived the lead contamination as a significant threat to their well-being. Importantly, those who ‘filtered out’ the potential threat as not relevant were less likely to focus further attention on understanding it, or to use behavioural coping strategies including reducing their and their children’s exposure to lead (Baldassare and Katz, 1992). In addition, some current and former mine workers and other residents, including some parents with young children, perceived the lead contamination as an acceptable part of working and living in Broken Hill.

Lead contamination is invisible, both environmentally and medically (Vyner, 1988). In terms of environmental invisibility, the results of blood lead tests and environmental surveys provided some indication of a level of lead contamination threat and many parents used the National Health and Medical Research Council (NHMRC) Level of Concern as a guide to their evaluation of a level of danger. However, some participants questioned the use of an ‘acceptable level’, and some participants developed their own evaluation distinct from the scientifically based levels. Thus in some cases the results of these tests enabled the lead to be ‘detected’ in the environment by residents and the risk evaluated; however, this was not always the case. Lead contamination is also medically invisible. There are few visible biophysical health effects of relatively low levels of lead exposure, and in many cases, visible symptoms only occur at very high lead levels. In addition, both visible and invisible biophysical effects of lead exposure are difficult to attribute solely to lead (Smith, 1989). This environmental and medical invisibility made coping with the lead contamination more difficult than would otherwise be the case (Vyner, 1988). Importantly, invisibility and the associated uncertainty in many cases reduced residents’ concern about lead contamination and their use of coping strategies, including health interventions.

As part of their process of coping, Broken Hill residents developed beliefs about the lead contamination and resulting threat. Residents held varied beliefs about the source of children’s lead exposure, duration of the lead contamination and biophysical health effects, and geographic extent

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**Fig. 3:** Community responses to chronic environmental lead contamination in Broken Hill, New South Wales.
and distribution of the lead contamination. Perceived sources of exposure fell into three groups—the general environment; specific sources such as paint or mining operations; and lead ‘receptor’ areas such as homes, parents and the children themselves. There was also a lack of agreement about whether the lead contamination and biophysical health effects were historical or relatively recent. There were also varied beliefs about whether the lead contamination was a short-term or long-term problem, and whether lead exposure had short-term or long-term biophysical health effects. Beliefs about the geographic extent and distribution of the lead contamination also varied, with some participants believing that the contamination was widespread in the community, while others believed that it was isolated in certain ‘high areas’ such as dumps containing mining tailings (located on or near to former and existing mining operations), ungrassed areas, certain locations in the community or work areas, or specific families. This variation in beliefs meant that there was not a clear understanding of the nature of the lead contamination, and thus of the importance of reducing exposure.

In order to understand the level of danger associated with the lead contamination, many residents compared lead contamination in Broken Hill to lead poisoning of the city’s early days, lead contamination or other environmental issues in other cities, or other hazards. Generally, the result of this comparison was to reduce the perceived threat associated with the lead contamination in Broken Hill. Residents also varied in their perceptions of the controllability of children’s (and in some cases their own) exposure to lead. Many believed that parents could control children’s lead exposure by changing parents’ or children’s behaviour, or the home environment (i.e. by increasing the frequency of vacuuming in the home; restricting children’s play in dirt; or repairing cracks in walls). Some believed that control could be exerted in the home, but that exposure was, at least in part, out of parents’ control, because of contamination by sources outside the home, such as neighbours’ yards and schools. Others said that children’s lead exposure was hard to control, or uncontrollable.

As part of the process of coping with this hazard, people also assigned responsibility both for causing and solving (by reducing or eliminating) lead exposure. The majority of parents participating in the study laid responsibility for causing their children’s lead exposure on themselves, for not acting to prevent exposure. Other residents also predominately attributed responsibility to parents. Most parents laid responsibility for solving children’s lead exposure on themselves, and a combination of mining companies, government and community residents. Many other residents also said that parents were responsible for reducing children’s lead exposure. In addition, many parents indicated that Broken Hill needed to pull together as a community to solve the lead contamination problem, including cooperation between mining companies, government and other organisations.

The nature of these responses—perception of relevance and acceptance, invisibility, beliefs about the nature of the hazard, and attribution of responsibility, also had significant implications for the behaviour of residents.

**Actions: behavioural responses**

Many parents with young children sought information about the lead contamination and measures to reduce their children’s lead exposure, from family and friends, local activists, health service providers, and other sources including published information and media coverage. Public discussion about the lead contamination varied over time, with little discussion prior to the release of the Public Health Unit’s blood lead test results in late 1991 to early 1992. Subsequently, discussion occurred between friends and family, and within groups of mothers. However, discussion appeared to decrease over time, and some residents said that there was little if any discussion about the lead contamination.

Participation in the Public Health Unit’s blood lead testing program for children aged 0–5 also fluctuated over time. There was a general decline in the number of children returning for yearly retesting in 1992 and 1993 (Western NSW Public Health Unit, 1994); however, there was a significant increase in participation following the establishment of the Broken Hill Environmental Lead Centre in late 1994. In addition, most residents were aware of, and most parents participating in the study implemented at least some of the behavioural guidelines. In some cases, parents continued to use the guidelines over time, as the changes became part of their normal routine; however, several participants spoke about the difficulties in sustaining the changes and the tendency to return to old behaviours.

Only a few residents appeared to move away from Broken Hill because of the lead contaminatio-
tion; however, some participants limited their planned family size in order to avoid exposing future children to this hazard. There was relatively little vocal community response to the environmental lead contamination in Broken Hill. The small number of residents who were publicly active, including parents and mine employees, had varied roles including attending meetings with government officials, obtaining media coverage, conducting research, and providing information to parents.

**The social context of responses**

A range of factors affected how people thought, felt and behaved in response to the lead contamination threat. These included characteristics of the lead contamination itself, characteristics of individual residents, aspects of the social setting or context, responses of organisations and responses to the significant reduction in employment in the local mining industry in February 1993 (McGee, 1996). This paper focuses on aspects of the social context of responses which are particularly relevant to the development of health promotion strategies—specifically stigma, economic factors, social support, social influence and cultural factors. Some aspects relate to the social context of individuals (for example, incomes), while others relate to characteristics of the wider community (for example, diversity of the local economy).

Stigma involves a ‘spoiled’ identity due to an undesirable variation from expectations (Goffman, 1963). A stigma was often attached to a child with a high blood lead level, and their parents, in part because the ‘lead risk reduction measures’ component of the health intervention strategy indicated that a change in parents’ household and child rearing practices would lower children’s blood lead levels (see also Lupton, 1995). As one mother said,

> At the [public] meeting, they said some things, and gave us the impression that we weren’t good housekeepers and parents [if our children had elevated blood lead levels].

Many Broken Hill residents also formed this association between children’s high lead levels and inadequate parenting and house cleaning skills.

Economic factors were also important. The Broken Hill mines provided plentiful and well paid employment for local workers, throughout most of the city’s history. However, since 1987, there have been significant reductions in mine and related employment, and in 1993, 500 of the mining company’s 1346 workers were made redundant. As would be expected, the redundancies would have significant economic implications for laid off workers, their families, and the community as a whole. In most cases, redundancy meant a significant decline, or total loss of income for individuals and families, many of whom were reliant on the one wage. In addition to affecting the financial situation of former employees and their families, the redundancies also had a flow-on effect to other local businesses and residents, as redundant workers and families restrained their spending. In addition to the redundant workers, other local residents and families were dependent on a low-income or unemployment benefits.

The perceived availability of social support may buffer a person from potentially adverse effects of stressful events, and it may also contribute to a person’s general well being (Cohen and Wills, 1985). However, the opposite, social undermining (Vinokur and van Ryn, 1993), may also occur. Some parents who were trying to reduce their children’s lead exposure received social support from friends and family; however, some received little support, or even social undermining. As discussed earlier, many residents attributed responsibility for causing and solving children’s lead exposure to parents. This focus on individual parents, rather than the wider community, generally detracted from the social support needed by those parents. In addition, the lack of clear understanding of the nature of the lead contamination and thus of the importance of reducing exposure, also detracted from the support provided to parents.

Social influence relates to the process whereby people agree or disagree about what are appropriate thoughts, feelings or behaviour (Turner, 1991). These ‘appropriate’ reactions are then endorsed or expected by a group because they are perceived as the ‘right thing(s) to do’. Social influence affected the attitudes and behaviours of Broken Hill residents. Importantly, many participants compared their use of behavioural guidelines to their perceptions of others’ ‘over reactions’. Perceptions of what were ‘normal responses’ varied considerably, but generally related to the use of some, but not all, of the behavioural guidelines. Both those who were perceived as overreacting, and those perceived as falling below the norm, were negatively sanctioned. This also ties strongly to the lack of social support perceived by many parents.
Cultural factors affect our views of the world and ourselves (Douglas and Wildavsky, 1982). Cultural values and beliefs were also important mediators in the community response process. Broken Hill’s isolation fostered an independence in local residents. Throughout much of its history, Broken Hill has been isolated from the rest of Australia. Historically, there has been a relatively stable population, with several generations living in the city. In addition to physical isolation from larger centres on the coast, the city was also isolated politically. Broken Hill’s weak political links with the rest of New South Wales fostered the city’s local political structure which has been dominated by strong union influence representing the collectivity of local workers. In addition, historically, the mines and unions provided welfare and protection in the community, and local charities and service clubs, and community networks of family and friends also provided assistance in times of need. While this isolation has decreased in recent years, it still plays a part in shaping the views of many local residents.

In addition to valuing independence, residents’ values and beliefs about parenting also influenced their responses. Parents held beliefs about what constitutes normal parenting, and what is normal children’s behaviour. These beliefs are derived from a variety of sources, including their own parent’s behaviours and what the parents themselves had done when they were children—including playing in dirt and sleeping on the floor.

DISCUSSION

Health promotion models illustrate the interconnectedness of people and their social environment, and the influence of ‘environmental’ factors on a person’s health. In the case of this Australian community dealing with environmental lead contamination, stigma, economic factors, social support, social influence and cultural factors affected responses to environmental lead contamination, including residents’ use of health promotion interventions; and affected the health and well-being of children, parents, families and the community. Importantly, an understanding of these aspects of the social setting provides direction for enhancing health promotion policies and strategies.

Stigma clearly affected residents’ behaviour. One way that people attempted to reduce stigma was to limit their public discussion about their children’s lead levels (Goffman, 1963). For example, in one parent’s words:

But it is not a conversation that you hear all the time . . . people don’t really want to advertise that their children have high lead levels . . . you just don’t say . . . you don’t talk about it . . . Its like giving yourself a big stigma . . . [by saying] ‘my daughter is 24 [μg/dl].

Stigma also affected residents’ use of the health interventions. If parents were not aware of their child’s high blood lead levels, not having participated in the blood lead testing program, they could remain unstigmatised. It is therefore important that health promotion interventions aim to reduce stigma for the health and well-being of residents, and in order to increase participation in lead risk reduction programs.

Economic difficulties in some cases both resulted from, and affected residents’ use of health interventions. Some parents with limited financial resources, many of whom had lost their jobs during redundancies from the local mining industry, spent considerable amounts of time and money attempting to reduce their children’s exposure to lead. In addition, the limited economic resources of some individuals and families reduced their ability to use some of the recommended behavioural guidelines, and other risk reduction strategies such as moving house. For example, several residents spoke about having to slow the pace of changes to reduce children’s lead exposure, because of financial constraints. Interventions must be economically appropriate for all residents, including the unemployed, and the families of redundant workers. Many parents dealing with lead contamination require financial assistance in order to implement lead exposure reduction measures. Such assistance must be an integral part of an intervention strategy.

Social support, or a lack of support, also influenced parent’s behavioural responses, including their use of health interventions. Parents’ participation in the blood lead testing program was influenced by their friends and family (many of whom were not concerned about the lead contamination), the community health nurses who conducted the testing, and other residents. For example, a child’s parents may be discouraged from participating in the blood lead testing program by the child’s grandmother who does not believe that the lead contamination is a significant threat. Responses of other people, including friends and family, also affected residents’ use of the behavioural guidelines. Thus, health interven-
tions should be designed to increase social support to those dealing with the lead contamination. This should include ensuring that support and information is available to the wider community, and providing opportunities for parents to be brought together (see McGee, 1996).

Cultural factors significantly affected responses to the lead contamination. Independence may foster a resistance to accepting support, including a reluctance to use health interventions (see also Humphreys, 1996). Importantly, some of the behavioural guidelines suggested behaviours which were inconsistent with some parents’ beliefs and values. For example, children’s play in dirt was considered by many parents to be a normal part of childhood. While in some cases parents changed their behaviour despite their contradictory beliefs, in order to reduce children’s exposure to lead, some parents only followed the behavioural guidelines to a point where they felt comfortable, where their use did not conflict with their previous beliefs and values. The messages used in an education campaign can be designed to target these factors which significantly affect the success of a health intervention program.

CONCLUSIONS

The ‘New Public Health’ approach was developed in part as a response to growing awareness of limitations of the individual-focused medical and lifestyle health approaches. It moves health from the arena of medical doctors and lifestyle educators focusing on the individual, to an interdisciplinary system which considers the individual, community and environment or social setting. In addition, a growing amount of literature recognises the limitations of solely individual level interventions, and argues the need for ‘multi-level’ interventions, which combine individual and community strategies (see, for example, Sims and Baumann, 1983; Jeffery, 1989). An individual-focused program also appears to have limited effectiveness in sustaining changes over the long term (Schofield, 1991).

The results of this study highlight the limitations of health promotion strategies which focus solely on individuals. The two main components of the health intervention program during most of this study—the blood lead testing of children aged 0–5 and behavioural guidelines to reduce children’s lead exposure—were based on the medical and lifestyle health approaches (Short, 1990), which focus on the individual. This has several important implications. Interventions which are focused on individuals tend to ‘blame the victim’ (Ryan, 1976). The primary focus on parents with young children contributed to other residents’ perceptions that the lead contamination was not relevant to them, thus effectively separating parents with young children from the rest of the community. In this way, the individual family focus of interventions contributed to reducing the positive support available for parents, changed the social environment, and had direct effects on parents use of active coping strategies, including the health intervention program.

This study also illuminates the complexity of the community response process, including the nature of cognitive and behavioural coping strategies and aspects of the social setting which influence social responses. Importantly, this complexity provides a rich database which can be used to tailor health promotion interventions to the community, responses and factors that affect responses. Such a strategy will have maximum potential for meeting the needs of community members. The intervention strategy used in Broken Hill, including the behavioural guidelines which were provided to parents, was based on programs used elsewhere. It was not tailored to the characteristics of recipients, particularly the variation within the community, or the nature of the social setting, including residents’ cultural beliefs, the nature of the local economy, physical environment, political relationships, as well as social support and influence, all of which affect health. This lack of tailoring in some cases reduced residents’ use of interventions. For example, the lack of funding restricted some families’ ability to implement some behavioural guidelines, and reduced parents’ use of interventions over time.

The results of this study have implications beyond lead contamination in Broken Hill or similar hazards and communities. The study provides an important example of how an understanding of the social context of social responses to health hazards assists in the development of health promotion strategies. I argue that such an understanding would benefit the development of health promotion strategies for numerous health promotion issues from lead contamination to drug use to child immunization. Without such an understanding, interventions will fall short of the mark, and may be detrimental to the health and well-being of individuals and communities.
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